# Barrow Alaska Coastal Erosion Feasibility Study

## Appendix B: Environmental Assessment

**Barrow, Alaska**

US Army Corps
of Engineers
Alaska District

# Environmental Assessment
# Barrow Alaska Coastal Erosion, Barrow, Alaska

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## ABBREVIATIONS AND ACRONYMS

ADEC – Department of Environmental Conservation, State of Alaska
ADFG – Alaska Department of Fish and Game
AHRS – Alaska Heritage Resources Survey
APE – Area of Potential Effect
BP – Before Present
CO – Carbon Monoxide
CWA – Clean Water Act
cy – cubic yard(s)
DMMP-Dredged Material Management Plan
EA – Environmental Assessment
EFH – Essential Fish Habitat
EJ – Environmental Justice
EPA – U.S. Environmental Protection Agency
ESA – Endangered Species Act
FR – Federal Register
Ft – Feet/Foot
MHHW – Mean Higher High Water
MLLW – Mean Lower Low Water
MOA – Memorandum of Agreement
MSFCMA – Magnuson-Stevens Fisheries Conservation and Management Act
NARL - Naval Arctic Research Lab
NMFS – National Marine Fisheries Service
NOAA – National Ocean and Atmospheric Administration
NOx – Nitric Oxide and Nitrogen Oxide
PA – Programmatic Agreement
PAH – Polycyclic aromatic hydrocarbon(s)
PM – Particulate Matter
PED –Pre-construction Engineering and Design
SHPO – State Historic Preservation Office
USACE – U.S. Army Corps of Engineers
USFS – U.S. Forest Service
USFWS – U.S. Fish and Wildlife Service
VOC – Volatile Organic Carbon

# 1.0 PURPOSE AND NEED

## 1.1 Introduction

The United States Army Corps of Engineers (USACE), Alaska District (POA) has prepared this environmental assessment (EA) to evaluate the effects of material placement above the Mean Higher High-Water line (MHHW) for reducing the risk of coastal erosion and flooding along an approximately 5-mile length of Chukchi Sea coastline in Barrow, Alaska. This EA has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and the Council of Environmental Quality's regulations (40 CFR 1500–1508), as reflected in the USACE Engineering Regulation (ER) 200-2-2. Attachment 1: Cultural Resource Supplemental Information and Attachment 2: Memorandum of Agreement are referenced in the EA and appended to this document. The appendices referenced throughout this document are appended to the main report, in addition to this EA, which is referenced as Appendix B.

## 1.2 Project Description

The community of Barrow, currently recognized as the City of Utqiaġvik, is the northernmost community in the U.S., located on the Arctic Ocean (Figure 1). The State of Alaska officially renamed the community Utqiaġvik on 01 December 2016. However, for the purpose of this project, the former name of Barrow is used as a practical matter to keep the name consistent with a previous USACE study and the current Feasibility Cost Sharing Agreement (FCSA).

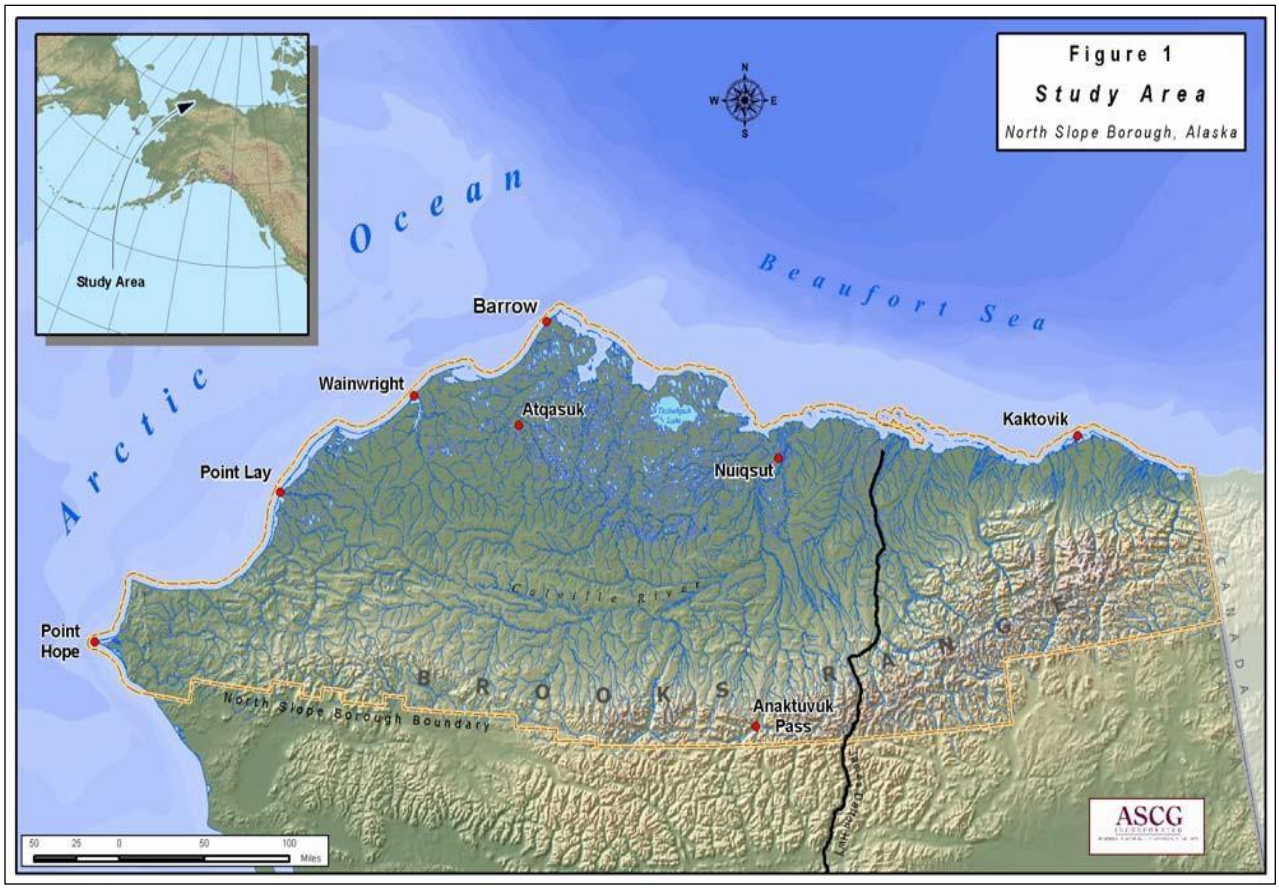


Figure 1. Project Vicinity Map.

The project, as proposed, would provide erosion control for an approximately 5-mile stretch of coastline. Erosion control along the 5-mile stretch would be accomplished with the use of several erosion control techniques that are referred to as measures for the remainder of this document. One measure would construct approximately 1 mile of rock revetment against the natural bluff in Barrow. Another project measure consists of constructing a 1-mile long revetted berm to prevent salinity intrusion into the lagoon area (Figure 2). Should salinity encroach on the freshwater lagoon, public health would be directly impacted, as the lagoon is the freshwater source for the community. Another construction measure would raise and revet Stevenson Street (up to 3-miles long) to reduce the risk of flooding and over topping of the road during strong weather events that cause damages to the community. This stretch of road has the potential to extend just past the Naval Arctic Research Lab (NARL).

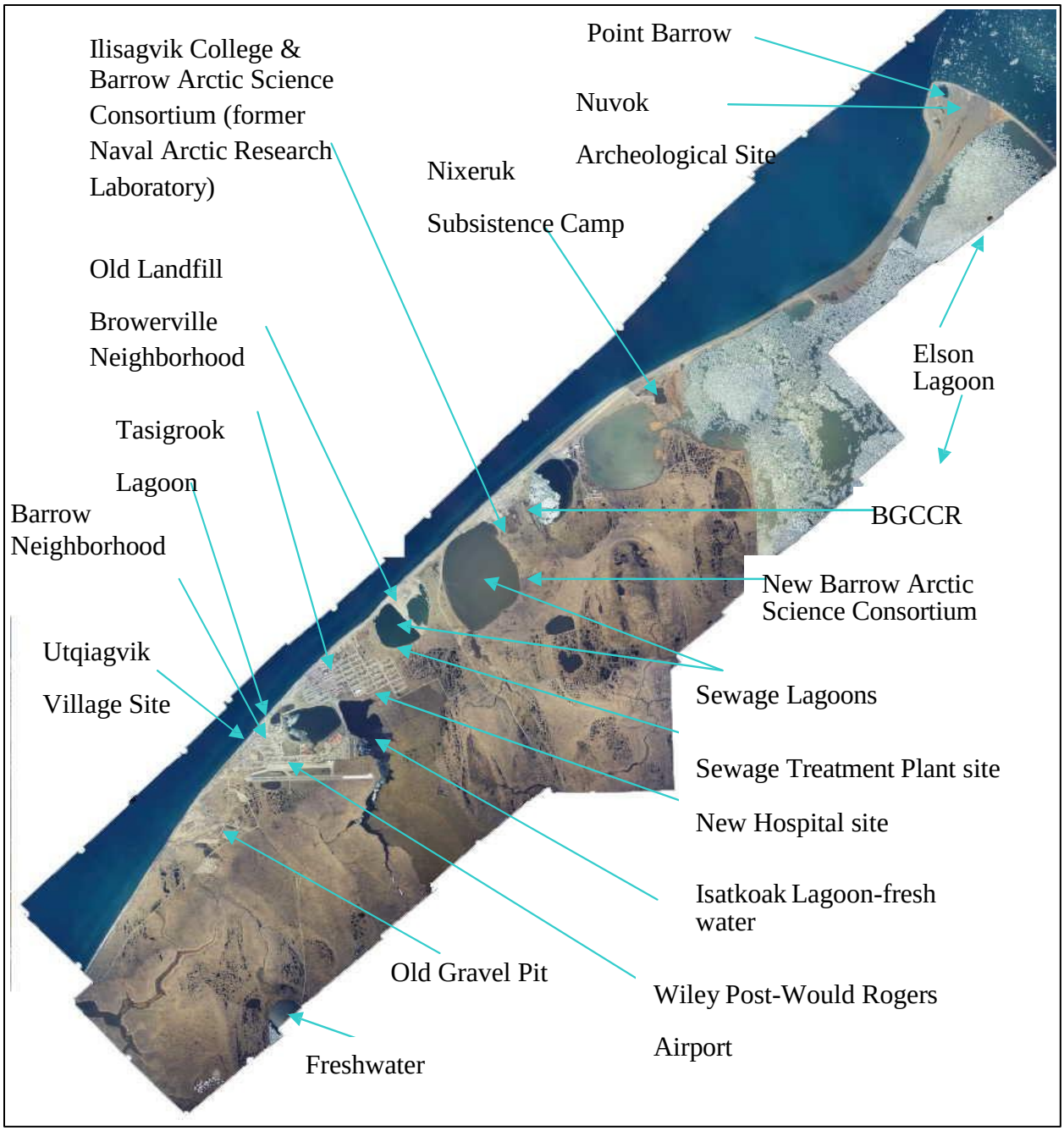


Figure 2. Local Features (Approximate location, not drawn to scale) (Attachment 1).

### 1.3 Purpose and Need for the Action

The purpose of the proposed action is to reduce coastal erosion and the risk of flood damages in the vicinity of Barrow, Alaska (Figures 1 and 2). The proposed project is needed because major flooding events took place in 1963, 1985, 1986, 2002 (APPENDIX I), and most recently in August 2015 and September 2017, which caused damage to infrastructure in Barrow. These events caused flooding and erosion damage to shoreline roads, endangered private and public establishments, unearthed and washed away Alaska Native cultural materials and human remains from the Utqiaġvik Village archaeological site, and threatened other cultural sites.

Salt water inundation of the old Barrow landfill is a major concern, as it houses solid and hazardous wastes disposed of by the United States Navy and Air Force between 1950 and 1981 (APPENDIX I). When a high-water event threatens the fresh water lagoon and Utilidor, public health and safety is at risk. Constructing coastal erosion protection structures to mitigate these issues could lessen the risk of damages to people's homes and public properties, safeguard important cultural sites that contain human remains, and defend the community's Utilidor and fresh water supply. The study area is depicted in Figure 3. Additional details on the existing conditions and problems faced in Barrow due to coastal erosion and flooding are provided in Sections 2 through 4 of the Feasibility Report (FR).


Figure 3. Project Area.

## 2.0 ALTERNATIVES

As a result of the planning process, a total of eight alternatives were identified, plus the No-Action alternative, for analysis within this EA. Generally, the proposed project has been divided by reach, based on what construction solutions (labeled measures for the remainder of this EA) would be most effective in preventing erosion and flooding, given terrain and existing infrastructure. Possible measures have been identified, such as using rock revetment, berm construction (also a revetted feature), and providing a lift to the height of an existing road (a measure labeled "raising" or "raise" as noted in the legend of Figure 4).

Figure 4 depicts combinations of reaches (labeled A through H) considered as the final array of alternatives. In this figure, the measure (v, b, or r) corresponds to a specific reach labelled along the yellow line at the bottom of the figure. A sensitivity analysis was conducted to determine which combination of measures and reaches would result in the most cost effective plans. Alternatives A, B, C, and G are cost effective. Alternatives D, E, F, and H are best buy plans. Best buy plans are cost-effective plan alternatives that provide the greatest increase in environmental output for the least increase in cost per alternative, which extends the alternative evaluation past an initial cost comparison.


Figure 4. Alternative Plans by Reach.

The dimensions of the measures identified earlier for all alternatives are:

- +19 feet Mean Lower Low Water (MLLW) Rock Revetment
- +14.5 feet MLLW Revetted Berm
- +14.5 feet MLLW Raised and Revetted Stevenson Street

Heights of the previously identified measures were established using previous assumptions and modeling information for “wave run-up” analysis located in a 2010 Technical Report (APPENDIX I). These heights could increase based on updated modeling taking place in the Pre-Engineering and Design (PED) phase and the inclusion of relative sea level change (RSLC) estimates for Barrow. For the Bluff, the wave crest height is set at 19 feet, which is 0.5 foot higher than the 50-year run-up (Appendix D, Section 10.5). Two additional heights were considered for each feature; however, the modeling was based on the lowest height based on current data. For the feasibility phase, these reaches were evaluated using a sensitivity analysis to ensure the project delivery team (PDT) captures the uncertainty associated with outdated modeling that does not include the

impacts of RSLC. The detailed alternative descriptions discuss reaches and measures without reference to the crest elevations since they were listed previously. These dimensions are subject to change as new H&H information becomes available in the optimization process in PED. The relative sea level change has not been incorporated into the design of the Feasibility Study; however, it would be incorporated in the final design before construction (Appendix D, Section 10.5.3). The Recommended Plan, Alternative H, includes retention of four points of beach access within the established project footprint.

Three staging and two barge offloading areas have been identified for the recommended plan (Figure 5). The two barge offloading areas are directly offshore of both the south and north staging areas. These areas are already used by the community and would be where the project rock and equipment are offloaded.


Figure 5. Staging Areas Identified.

Table 1. Alternatives Carried Forward.

| Alternative | Description (Reaches Included) |
|---|---|
| No-Action | This alternative would be to take No-Action and leave the city susceptible to storm effects. |
| Alternative A | Barrow and Lagoon |
| Alternative B | Barrow, Lagoon, and Bluff |
| Alternative C | Barrow, Lagoon, Bluff, and Browerville |
| Alternative D | Barrow, Lagoon, and South and Middle Salt |
| Alternative E | Barrow, Lagoon, Bluff, and South and Middle Salt |
| Alternative F | Barrow, Lagoon, Bluff, Browerville, and South and Middle Salt |
| Alternative G | Barrow, Lagoon, Bluff, South and Middle Salt, and NARL |
| Alternative H (Recommended Plan) | Barrow, Lagoon, Bluff, Browerville, South and Middle Salt, and NARL |

The alternatives presented in this EA include the No-Action alternative, the Recommended Plan (Alternative H), and alternatives that were carried forward in the process that involved different lengths or combinations of coastline risk reduction.

## 2.1 No-Action Alternative

The No-Action Alternative would not take action to reduce or halt erosion and flooding along the coastline of Barrow, Alaska. The study objective would not be met and no opportunities would be realized. Erosion would continue to take place and flooding would occur during storm events. Public and private infrastructure, historical buildings, and cultural resources would continue to be lost as the ground beneath them erodes away. The North Slope Borough (NSB) would also continue to utilize local material and resources to maintain their protective sacrificial berm during the open water season, at a cost of approximately $8 million. The community would also focus most of their time and resources each year to prevent or repair damage caused by coastal storms and erosion.

## 2.2 Alternative H (Recommended Plan)

Alternative H, the Recommended Plan, is described in detail in Section 7 of the FR and is summarized in this EA. A conceptual design of the alternative is shown in Figure 6.

Alternative H, consists of the construction of a rock revetment along the bluff area (Figure 6) with a combination of a revetted berm and raising and revetting Stevenson Street for the remainder of the 5-mile length of the proposed project area. The overall design of the barriers have been determined, but the height of the barrier may be modified during the PED phase.

Work would start with the construction of a rock revetment along the bluff, from the bluff area in front of the airport to the start of Tasigarook Lagoon (an approximate 1-mile stretch). The revetment would stabilize the bank and reduce undercutting from waves and localized melting of permafrost. Permafrost is soil that is frozen more than two consecutive years. Melting permafrost results in slumping of material and block (ice-wedge) failure. The revetment would consist of fill material to achieve the design slope, filter fabric, gravel, and then core material overlaid by two layers of B rock then two layers of 2.7-ton armor rock. An example of armor rock from a previous USACE project in another part of the state can be seen in Figure 7. B rock, core, gravel, and filter fabric would be buried to match the existing beach elevation below the armor rock, to prevent beach material from being washed through the armor layer. Fill material would be used to achieve the design slope rather than excavating into the bluffs to reduce impacts to cultural resources (further discussed in Section 3.1.2). Existing beach access ramps, boat launches, and interior drainage points would be considered relocations under the recommended plan.

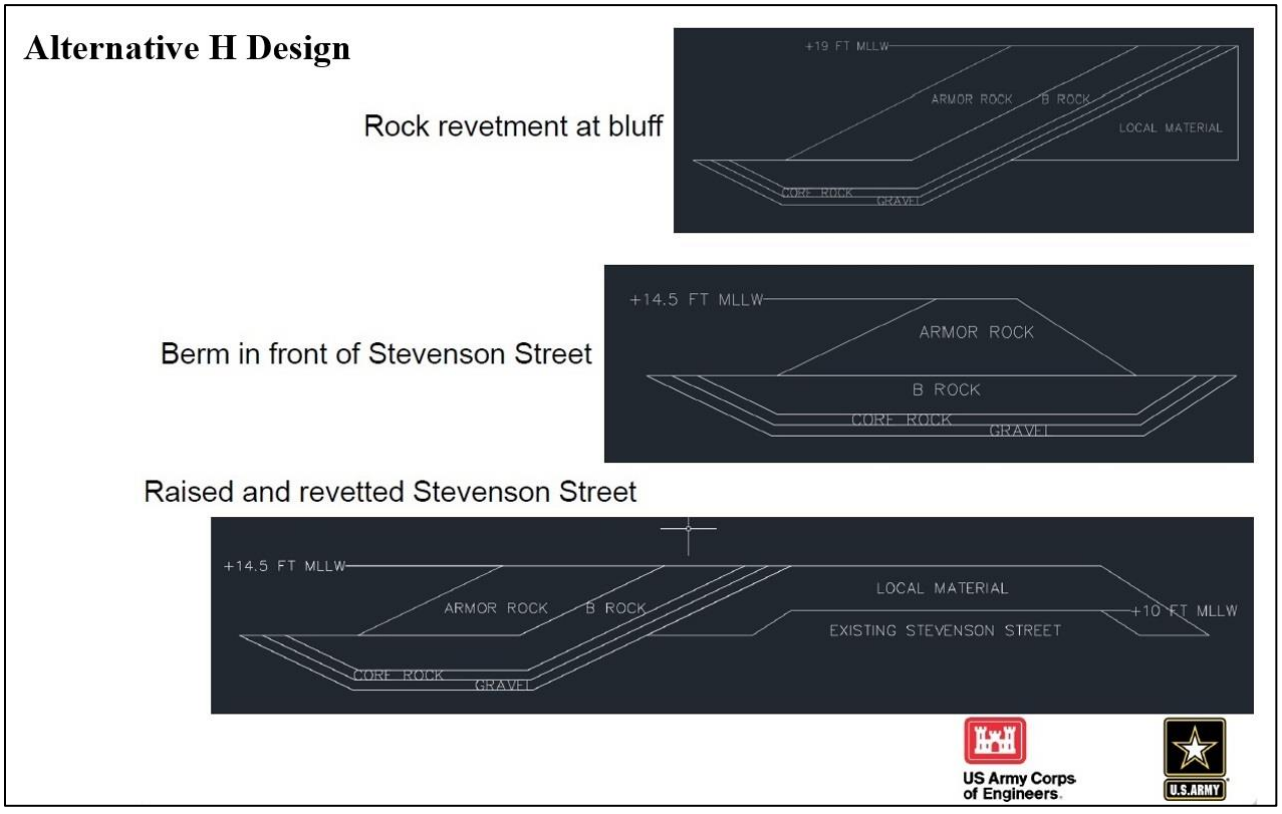


Figure 6. Conceptual design of the Recommended Plan.

Figure 7. An example of a rock revetment from a USACE project on Cape Lisburne (about 280 miles SW of Barrow). Armor rocks shown are approximately 3.5 tons each.

**Revetment.** The revetment along the bluff area would consist of two layers of 2.7 ton armor stone on the structure slope and two layers of B stone, using 32,694 cy of armor stone. The B rock (30,887 (cy), core (7,404 cy), and gravel (7,404 cy) filter layers would be buried to match the existing beach elevation. The crest height is set at +19 feet, which is 0.5 foot higher than the 50-year run up. The bluffs would not be excavated to provide a uniform slope on which to build, rather they would be dressed with local fill material to achieve a uniform slope. The bluffs are archaeologically rich, so no excavation would be permitted on the bluff face.

**Revetted Berm Structure.** Because the structure is set back from the beach, a two armor stone thickness would result in a +14.5 feet crest elevation using 32,694 cy of armor stone. The filtering B rock layer (30,887 cy), core (7,404 cy), gravel (7,895 cy), and fabric would be placed below the natural beach line for ice survivability. The structure would consist of two layers of 2.7 ton stones with a 2 horizontal on 1 vertical seaward slope and a 1.5 horizontal on 1 vertical landward slope. The reduced size of the structure would likely result in increased maintenance, due to ice impact, but the reduced size would make the maintenance of the structure easier to perform. A stockpile of replacement stone would be kept at Barrow for maintenance activities. The B rock would be a double layer placed on a 1 foot layer of core, 1 foot layer of gravel, and an underlayment of filter

fabric. The B rock, core, and gravel filter layers would be buried to match the existing beach elevation.

**Raise Stevenson Street.** As an alternative to a revetted berm, Stevenson Street can be raised. Raising Stevenson Street, as opposed to constructing a revetted berm, would decrease the quantity of armor rock required, while maintaining a view of the ocean from the street. Stevenson Street would be raised to the elevation of the revetted berm with fill material to ensure a 100-year level of risk reduction, using 140,262 cy of armor stone. The seaward slope of the street would be revetted with two layers of the 2.7 ton armor stone and two layers of B stone. The B rock (126,971 cy), core (126,971 cy), and gravel (43,963 cy) filter layers would be buried to match the existing beach elevation.

## 2.3 Alternatives Protecting Limited Reaches

The following alternatives are all variations of Alternative H (Recommended Plan), but were analyzed independently for the EA. As such, the alternative descriptions that follow reference the reaches in Figure 4.

### Alternative A: Barrow and Lagoon

A rock revetment would be constructed against the natural bluff in the area marked "Barrow" in Figure 4. The Lagoon area would have a revetted berm constructed to reduce the risk of saltwater inundation to the community's freshwater source.

### Alternative B. Barrow, Lagoon, and Bluff

Alternative B is Alternative A with the addition of a rock revetment constructed against the natural bluff in the area marked "Bluff" in Figure 4.

### Alternative C: Barrow, Lagoon, Bluff, and Browerville

Alternative C is Alternative B with the addition of raising and revetting Stevenson Street, in the area marked "Browerville" on Figure 4, in order to reduce the risk of flooding to the neighborhood, which is a low lying area.

### Alternative D: Barrow, Lagoon, and South and Middle Salt

Alternative D is Alternative A with the addition of raising and revetting Stevenson Street, in the area marked "South and Middle Salt" on Figure 4, to reduce the risks of over topping of the road and flooding to the landfill and sewage lagoons.

### Alternative E: Barrow, Lagoon, Bluff, and South and Middle Salt

Alternative E is Alternative B with the addition of raising and revetting Stevenson Street, in the area marked "South and Middle Salt" on Figure 4, to reduce the risks of over topping of the road and flooding to the landfill and sewage lagoons.

**Alternative F: Barrow, Lagoon, Bluff, Browerville, and South and Middle Salt**

Alternative F is Alternative E with the addition of raising and revetting Stevenson Street, in the area marked "Browerville" on Figure 4, in order to reduce the risk of flooding to the neighborhood, which is a low lying area.

**Alternative G: Barrow, Lagoon, Bluff, South and Middle Salt, and NARL**

Alternative G is Alternative E with the addition of raising and revetting Stevenson Street, in the area marked "NARL" on Figure 4, to reduce the risk of flooding and over topping of the road during strong weather events.

## 3.0 AFFECTED ENVIRONMENT, FUTURE WITHOUT PROJECT CONDITIONS AND ENVIRONMENTAL CONSEQUENCES

This section describes the existing environment for each resource category and includes a brief discussion of the consequence of each alternative. Descriptions of potential consequences are provided for information and consistency when used later on throughout this section. The range of potential effects in this section are defined as:

- **No Effect**–This means that the species or environmental attribute (e.g. water quality) would not be affected, directly or indirectly, by the project. This level of impact, is due to either:
    - The species not being in the project area year-round
    - The species not being in the area during the construction window and not having any habitat overlap with the project area during the period of the year when they are in the region.
- **Insignificant Effect**–These effects relate to the size or severity of the impact and include those effects that are undetectable, not measurable, or so minor that they cannot be meaningfully evaluated.
- **Discountable Effect**–Are effects that are extremely unlikely to occur.
- **Beneficial Effect**–This means an immediate positive effect, without any adverse effects to the species or habitat. This situation would typically occur after construction is completed. For example, the dredged material placement site could provide improved foraging habitat for a bird, fish, or marine mammal.
- **Minor Adverse Effect**–This means a species or environmental attribute would likely be affected by the project, but the effects would likely be very low level in the short or long term and would be in a similar range to many of the existing impacts in the area caused by local, private, and commercial boat and vehicle use. For instance, the proposed project would introduce an increase in vessel activity during construction in an area that already has similar activities. For analysis, the assumption is that animals are habituated to existing vessel traffic.
- **Moderate Adverse Effect**–This means a species would be affected by the project as revealed by a noticeable, but temporary change in habitat use or behavior. For example, a species might avoid the immediate area during drilling and dredging and for a few hours

after blasting. This could lead to lost foraging opportunities in the immediate area, albeit at some energetic cost or increase in stress. In some instances, the species would be expected to successfully find other local foraging opportunities to replace lost opportunity.

- **Major Adverse Effect**–This means a species or environmental attribute would be affected by the project, or an aspect or the project, and would be impacted in a way that ranges from long-term displacement (after project completion) to lethal effects.

## 3.1 Cultural and Historic Resources

Cultural resources are defined as any resource that may be considered of cultural character. These include any or a combination of: Native American graves and cultural items, shipwrecks, museum collections, historical documents, historic districts, sites, buildings, structures, religious sites, religious practices, cultural use of natural resources, folklife, tradition, other social institutions, theater groups, orchestras, and other community cultural amenities (King 1998:6; NPS 2012).

Cultural resources are limited, nonrenewable resources that have cultural value as traditional materials or locations, or have potential for scientific research, which may be easily diminished by actions impacting their integrity. Numerous laws and regulations require that possible effects on cultural resources be considered during the planning and execution of federal undertakings. These laws and regulations establish a process of compliance, define the responsibilities of the federal agency proposing the action, and prescribe the relationship among other involved agencies. This include the State Historic Preservation Officer (SHPO) as well as the Advisory Council on Historic Preservation. In addition to NEPA, the primary laws that pertain to the treatment of cultural resources affected by federal actions are the National Historic Preservation Act (NHPA) (especially Sections 106 and 110), the Archaeological Resources Protection Act, the Antiquities Act of 1906, the American Indian Religious Freedom Act, and the Native American Graves Protection and Repatriation Act (NAGPRA).

The area of potential effect (APE) under NHPA for this action includes those areas that could potentially be disturbed by the proposed construction activity. The APE for this undertaking follows the Recommended Plan, encompassing the beachfront of the city, starting at the bluff at the southwestern extent of Barrow, to the NARL to the northeast (see Figure 3). The total area within the APE is 5 miles by approximately 45 feet along the seaward side of Stevenson Street and the southern bluff.

### *3.1.1 Cultural History*

The far northern shore of Alaska has had a number of cultural transitions, and, as with much of Alaska, experienced significant change after contact with Euroamerican explorers and their following expansion. Significant sea level and environmental changes over the span of millennia have altered the shoreline and continue to alter the landscape, likely hiding or erasing sites. The largest community in the Alaskan Arctic is the City of Barrow. Cultural resources in the Barrow area range from prehistoric subsurface sites to historic structures dating from approximately 5,000 years ago to the Cold War. More information on the archaeological sites and historical structures can be found in Attachment 1.

#### 3.1.1.1 Affected Environment, Environmental Consequences and Future Without Project Conditions

*No-Action Alternative and Future without Project*

The No-Action Alternative would leave the Utqiaġvik Village site (BAR-002) exposed to further damage from erosion and flooding. Portions of the site have already become exposed to the environment and have lost portions of its physical property. Not only does thawing permafrost cause building damage through foundation destabilization (Nelson *et al*. 2002), it threatens the integrity of subsurface organic cultural resources that were formerly protected. Without permafrost, organic archaeological materials deteriorate and are increasingly susceptible to surface pressure (Martens 2017; Matthiesen et al. 2014). Cultural resources and heritage sites have been found to be vulnerable to climate change, with increased variation of the freeze/thaw cycle and thawing of permafrost leading to destruction of site integrity, and increases in mold, rot, and other moisture-related destructive forces (Markham et al. 2016; Hollensen et al. 2016). Furthermore, six previously mentioned sites (Esatkuat, Browerville Ice Cellar, Browerville site, Dora Elavgak House, Refuge Station, and NARL), which are further north up the coast from BAR-002, would be directly threatened by the continual washout from the storms and may eventually succumb along with the disappearing shoreline or be significantly impacted as a result. Other local sites that were listed in Table 3 would also be susceptible to storm flooding damage and eventual erosion damage and loss.

*Consequences of Alternative H (Recommended Plan)*

The Recommended Plan would adversely affect a section of the Utqiaġvik Village site (BAR-002). The seaward bluff section would have a section of the revetment laying against the site. This has the combined effect of putting pressure on subsurface artifacts, which has been found to increase deterioration of artifacts, as well as capping the shat section of the site from future archaeological research (Martens 2017; Matthiesen et al. 2014). Although this would have an adverse effect on the site, it would protect the sections of the site that are farther inland from the effects of storm surges, and may help resist permafrost thaw and calving events from happening; therefore, protecting more of the site over time. There are a number of cultural resources identified within the community of Barrow. As seen in Table 3, which separates cultural resources by reach, these cultural resources would be protected from future storm surges and flooding with the construction of the Recommended Plan.

*Consequences of the Alternatives Protecting Limited Reaches*

The alternatives to the proposed project are listed as A-G, as shown previously, on Figure 4. Alternatives A and D are the only two that do not have the revetment along the bluff. This would expose BAR-002 to continual erosion from storm surges, and sloughing and calving of the bluff from permafrost thaw. All of the alternatives, except H, would expose areas of the community and local cultural resources. Table 3 and Figure 4 outline cultural resources by reach and show which reaches would not be constructed depending on the alternative. It is surmised that if a reach was

not constructed, the cultural resources in that area would be threatened by flooding during large storms and may suffer from future erosion damage.

Table 2. Cultural Resources Separated by Reach.

| | AHRS # | Site Name | Reach Effect |
|---|---|---|---|
| Reach 1 | BAR-002 | Utqiaġvik Village Site | Reach 1 would have an adverse effect on BAR-002; however, the absence of the Reach 1 barrier would leave the site open to continual erosion and loss to storm surge events. All other sites would be protected from future erosion or flood events. Without the Recommended Plan these sites may be threatened by future storms. |
| | BAR-022 | Kugok | |
| | BAR-059 | Old government building | |
| | BAR-087 | Grave | |
| | BAR-101 | Face-down burial (Uncle Foot) | |
| | BAR-102 | Nungasak House | |
| | BAR-103 | Yong House | |
| Reach 2 | BAR-004 | Utqiaġvik Presbyterian Church Manse | Reach 2 has no cultural resources directly impacted by the construction of the proposed barrier. However, the barrier would protect these sites from future erosion and flood damage. Without the Recommended Plan these sites may be threatened by future storms. |
| | BAR-015 | Sod House | |
| | BAR-055 | NWS House 1 | |
| | BAR-056 | NWS House 2 | |
| | BAR-057 | NW House 3 | |
| | BAR-058 | NWS Recreation Hall | |
| | BAR-061 | NWS House Duplex B-4 | |
| | BAR-063 | NWS Upper Atmosphere Facility | |
| | BAR-065 | NWS Office Building B-6 | |
| | BAR-073 | Suvlu House | |
| | BAR-138 | BUECI Water Treatment Plant Utilidor | |
| Reach 3 | BAR-009 | Esatkuat | Reach 3 has no cultural resources directly impacted by the construction of the proposed barrier. However, the barrier would protect these sites from future erosion and flood damage. Without the Recommended Plan these sites may be threatened by future storms. |
| | BAR-016 | Elavgak House | |
| | BAR-060 | Browerville Ice Cellar | |
| Reach 4 | BAR-007 | Browerville | Reach 4 has no cultural resources directly impacted by the construction of the proposed barrier. However, the barrier would protect these sites from future erosion and flood damage. Without the Recommended Plan these sites may be threatened by future storms. |
| | BAR-012 | Refuge Station (Brower Café) | |
| | BAR-074 | Brower House | |
| Reach 5 | BAR-129 | South Barrow Test Well #1 | Reach 5 has no cultural resources directly impacted by the construction of the proposed barrier. However, the barrier would protect these sites from future flood damage. Without the Recommended Plan these sites may be threatened by future storms. |
| Reac | BAR-041 | POW-M (DEW Line) | |

| | | | |
|---|---|---|---|
| | BAR-046 | Building 100 | Reach 6 has no cultural resources directly impacted by the construction of the proposed barrier. However, the barrier would protect these sites from future flood damage. Without the Recommended Plan these sites may be threatened by future storms. |
| | BAR-047 | Building 101 | |
| | BAR-053 | LRRS Road System (DEW Line) | |
| | BAR-075 | NARL | |
| | BAR-076 | Building 250 | |
| | BAR-079 | NARL Airstrip | |
| | BAR-081 | Building 133 | |
| | BAR-082 | Building 134 | |
| | BAR-083 | Building 130 | |
| | BAR-084 | Sewage Plant Generator | |
| | BAR-085 | Water Treatment Plant | |
| | BAR-121 | Seabee Core Test Well #1 | |
| | BAR-123 | Barrow Big Rig Test Well #1 | |

## 3.2 Physical Environment

Barrow is at latitude 71°18'N, longitude 156°47'W, approximately 329 miles (530 km) north of the Arctic Circle, and within the region of continuous permafrost. The Chukchi Sea of the Arctic Ocean borders the city to the northwest, and Point Barrow, the northernmost point in Alaska, is approximately 10 miles (16 kilometers) to the northeast.

APPENDIX I describes the physical environment surrounding Barrow in great detail. However, because APPENDIX I is a Technical Report and not an EA, the primary resources that are likely to be impacted by the proposed action are described below.

### *3.2.1 Sea Ice, Climate, and Hydrology*

Barrow is located in an arctic environment with an average annual precipitation (rain and melted snow water) of 5 inches and average annual snowfall of 29 inches. Temperature extremes are rarely below -36°Fahrenheit (F) or above 60°F, with average temperatures ranging -19°F to 47°F. The daily minimum temperature is below freezing 324 days of the year. The sun does not set between 10 May and 02 August every year, nor does it rise between 18 November and 24 January. The Chukchi Sea is typically ice-free from early July at Barrow. Freezing typically occurs in November, but the formation of stable shorefast ice may be delayed. During the winter of 2017-2018, shorefast ice had not formed until January (NWS 2018). Stability is achieved after one or more significant pack ice “shoves” deform and ground the ice.

Barrow is in an area of semi-diurnal tides with two high waters and two low waters each lunar day. Mean Sea Level (MSL) is +0.25 feet MLLW and Mean Higher High Water (MHHW) is +0.50 foot. Prevailing winds are easterly and average 12 miles per hour (mph) with maximum wind speeds recorded up to 48 mph. Barrow’s wave climate is dictated by storms in the Arctic Ocean limited in extent by the pack ice. Tidal fluctuations at Barrow are minimal, so the predominant source of currents is wind generation. Longshore sediment transport at the site was estimated at an average net transport rate of 7,300 cubic yards (CYs) per year to the northeast.

A changing climate is leading to accelerated permafrost loss, decrease sea ice formation, and increase wet precipitation in the Arctic. Although the USACE cannot change this natural process, this study does recognize them as influencing factors and has developed an array of alternatives to help mitigate their impact. Along with the delay of sea ice, warmer climates are affecting permafrost melting. As the average temperature increases, precipitation has increased, which in turn results in the weakening and eventual collapse of buildings in areas that lie upon the permafrost. In Barrow, reduction in permafrost is one factor adding to erosion, especially along the bluff.

The driving concern for this study is that the City of Barrow is centered within a dynamic coastal environment. Due to the changing nature of sea ice, which would normally buffer the coastline, the City of Barrow is now exposed to storm and wind driven waves during increasing ice-free periods. The Chukchi Sea is typically ice-free from early July at Barrow. There has been a noticeable shift when sea ice forms along the coastline. Shore fast ice and freezing has historically been recorded in September, but now typically occurs in November, and has been delayed to as late as January (NWS 2018). Ocean surface temperatures along the Chukchi Sea coast near Barrow have increased by about 2 percent over the period from 1982 to 2002, with a slight cooling near shore in January and February (APPENDIX I). High latitude coasts are susceptible to increases in global temperature through extended periods of ice thaw and reduced summer sea ice extent, thereby creating greater wave exposure. The increased frequency of winter and early spring break-off events and shortened sea ice seasons suggests that the coastal sea ice system has been responding to some of the recent changes observed in the Arctic atmospheric and ocean data.

3.2.1.1 Consequences of Alternatives

*Future without Project Condition/No-Action Alternative*

Progressively later freeze up time in the fall will likely persist, leading to continued coastal erosion from fall storms. Sea ice extent and the thickness and age of ice will likely diminish for the foreseeable future.

*Recommended Plan*

The proposed action would have no effect on the sea ice, climate, or hydrology near Barrow or in the region. The proposed action does not have an in-water footprint and would be out of the water, except due to waves from storm events.

*Alternatives A thru G*

None of action alternatives would affect the sea ice, climate, or hydrology near Barrow or in the region. The action alternatives do not have an in-water footprint and would be out of the water, except due to waves from storm events.

*3.2.2 Air Quality*

North Slope Borough is listed as “attainment/unclassified” for National Ambient Air Quality Standards under the Clean Air Act. 83 FR 25776. Limited industrial development, low

population density, and strong meteorological influences combine to maintain good to excellent air quality in the Barrow area. No non-attainment areas exist in the region. Air pollution sources in the vicinity include automobiles, aircraft, fishing vessels, incinerating solid wastes, electrical power generating facilities, and dusty or unpaved roads. Despite the presence of air pollution point sources, air quality is generally considered to be good because of the predominant winds that occur in the area year-round.

Currently, the City of Barrow maintains a temporary berm along the coast to help protect the community from flooding and heavy wave action during storms. This is done using heavy machinery to push sand up from the nearshore areas onto the beach. The use of heavy machinery adds to air pollution, which is quickly dissipated by the predominant winds. This would likely remain the with the No-Action alternative because this is the current means of shoreline risk reduction implemented by the city.

#### 3.2.2.1 Consequences of Alternatives

*Future without Project Condition/No-Action Alternative*

Air quality in the Barrow are is likely to remain similar to the current condition. There are no foreseeable circumstances that would noticeably affect air quality in the area.

*Alternatives A thru H*

All of the action alternatives, including the Recommended Plan, would require the use of heavy machinery during construction. This would decrease air quality for the short term. However, since these alternatives are more permanent solutions to reduce the risk of coastal erosion and flooding, the long-term impacts to air quality would be less than with the No-Action alternative. There would no longer be a need to maintain the temporary berm, thus reducing yearly impacts caused by this action. No significant impacts to air quality would be anticipated.

## 3.3 Biological Resources

Biological resources near Barrow are described extensively in APPENDIX I. The environmental content provided in the report was not part of an EA, but was provided in a summary of the existing environment for a previous erosion control study. The biological resources discussed were for a previous study that considered a much wider range of alternatives, including significant development in the nearshore marine environment and development of new gravel sources on the tundra in Barrow. APPENDIX I goes into great detail regarding Arctic flora and fauna, to include terrestrial wildlife, marine mammals, essential fish habit (EFH), nearshore fish species, vegetation, and protected species.

Because this study’s reduced scope would predominantly impact the bluff, beach, and nearshore environments, this section discusses those biological resources that are likely to be found within the proposed study footprint. An in depth description and inventory of resources can be found in APPENDIX I. The material source would be from an existing quarry, likely in Nome, Alaska. It is possible that some gravel would come from Barrow, but it would be from an existing commercial quarry.

### *3.3.1 Tundra*

The predominant vegetation type in Barrow is tundra, which in the study area is formed over a permafrost layer. Coastal wetlands and moist tundra regions are particularly vulnerable to climatic variation and extreme events. Many of these areas are unstable and easily or frequently changed by erosion and flooding. Erosion has been observed along the north slope of Alaska in large part due to seasonal storm surges (APPENDIX I). The top of the bluff, adjacent to the airport runway, is vegetated with tundra and topped with six houses. The bluff face terminates onto the beach and is within the wave-impact zone during storms and heavy wind events, causing active erosion during the summer and fall.

#### 3.3.1.1 Consequences of Alternatives

*Future without Project Condition/No-Action Alternative*

While it is difficult to predict what changes might take place and when, there are a range of changes that are possible in the coming years. Species composition of tundra vegetation could change and more woody plants could take hold. As permafrost thaws deeper and longer, some tundra could be either lost to lakes or coastal erosion or have altered surface hydrology leading to a change in plant species. Permafrost thaw and future storm events could cause further calving of land from berms, removing sections of tundra at a time. Climate change will largely dictate the pace and extent of any changes, but it is difficult to predict at this point over such a large area with many variables.

*Consequences of the Recommended Plan*

Alternative H, includes an element of bluff revetment. Construction of the revetment would consist of rocks abutting against the bluff face; however, it would not include a rock cap on the top of the bluff. The revetment along the bluff would stop future loss of tundra from future erosion and storm events. No significant impacts to tundra habitat would be anticipated.

*Consequences of the Alternatives Protecting Limited Reaches*

Alternatives A and D include a smaller area of bluff revetment in front of Barrow, leaving the unprotected bluff area with similar impacts as the No-Action alternative. This alternative would only protect a small section of the bluff, leaving it susceptible to the natural elements and causing harm from both erosion and salt water exposure.

Alternatives B, C, E, F, and G would have similar impacts as the Recommended Plan because they each include the measure of armored bluff revetment extending along the same reach as Alternative H. As stated with the Recommended Plan, the revetment would not extend over the bluff and so there would be no effect to the tundra habitat on top of the bluff. The revetment would also protect the tundra area from further erosion. None of the proposed staging areas would impact tundra. No significant impacts would be anticipated.

### *3.3.2 Marine Fish and Invertebrates*

Nearshore marine fish and invertebrates were sampled extensively near Barrow and along the Beaufort and Chukchi Sea coasts annually between 2004 and 2009. These surveys took place for the previous study, where several alternatives involved placing large amounts of fill in the water. The results suggested that nearshore fish and invertebrate species are highly variable along the coast. Data from these surveys are discussed in APPENDIX I, Thedinga et al. 2013, and Johnson et al. 2010.

#### 3.3.2.1 Consequences of Alternatives

*Future without Project Condition/No-Action Alternative*

Future changes in the sea ice and water temperature regime could lead to changes in species assemblages, including a decrease or change in range of traditional Arctic species, and the arrival of new species to the area near Barrow from the Bering Sea and more southerly portions of the Chukchi Sea. The extent and timescale for these potential changes are uncertain.

Coastal erosion and, to a greater extent, coastal flooding, typically leads to contamination and degradation of the marine environment. Erosion and flooding scatter everything from building materials to all types of personal property throughout the landscape, leaving debris strewn across the tundra, in freshwater lakes including drinking water sources, and into the marine environment. This debris can impact everything from human health to marine mammals, birds, and fish.

In addition to the debris, a more persistent potential problem involves spills of fuel and oil from a major erosion event or a flood. This issue concerns everything from large scale releases, such as the gas station or large fuel tanks and the landfill, to numerous small spills from fuel cans, four-wheelers, snow machines, home heating oil tanks, etc. These sorts of items are moved, toppled, and displaced during major erosion and flood events and can lead to long term pollution of terrestrial, freshwater, and nearshore marine habitats, and the humans and wildlife species that rely on them. Because a large portion of the subsistence resources are locally harvested, the effects of debris and spills could have long term effects on subsistence.

*Consequences of the Recommended Plan*

Because the Recommended Plan (Alternative H) does not involve placing fill in the water, there would be no consequences anticipated for nearshore fish and invertebrates. EFH would not be impacted by the proposed project and is not considered further in this document. The proposed staging areas (Figure 5) for construction materials are all located in disturbed areas on shore and would not impact marine fish or invertebrates.

*Consequences of the Alternatives Protecting Limited Reaches*

The sections of coastline left unprotected under all of the action alternatives, except the Recommended Plan, would leave open the possibilities described under the No-Action Alternative, in terms of impacts to marine fish and invertebrates from debris and contamination from future coastal erosion and flooding.

### *3.3.3 Protected Species*

The protected species that may occur in the study area are listed in Table 4. The study area includes both the study footprint and the surrounding marine and terrestrial habitat. Extensive additional information on species covered in this section is discussed in APPENDIX I. As stated previously, this additional information was prepared as part of a previous USACE study for erosion issues at Barrow and contains detailed information on marine mammals because alternatives for that study involved features that extended into the marine environment.

The marine mammal discussion in this section is a brief summary because there is no marine footprint in the Recommended Plan or the other alternatives for this project. Protected species of concern for this study include both eider species, polar bears, bowhead whales, and gray whales; other species are briefly addressed.

Table 3. Protected species that may be present in the study area.

| Common name | Species name | Regulatory protection | ESA Status |
|---|---|---|---|
| Steller's eider | *Polysticta stelleri* | ESA - USFWS | Threatened |
| Spectacled eider | *Somateria fischeri* | ESA - USFWS | Threatened |
| Polar bear | *Ursus maritimus* | ESA - USFWS | Threatened |
| Humpback whale | *Megaptera novaeangliae* | ESA - NMFS | Endangered |
| Bowhead whale | *Balaena mysticetus* | ESA - NMFS | Endangered |
| Killer whale | *Orcinus orca* | MMPA - NMFS | Depleted |
| Gray whale | *Eschrichtius robustus* | MMPA - NMFS | Recovered |
| Beluga whale | *Delphinapterus leucas* | MMPA - NMFS | Protected |
| Harbor porpoise | *Phocoena phocoena* | MMPA - NMFS | Protected |
| Ringed seal | *Pusa hispida* | ESA - NMFS | Threatened |
| Bearded seal | *Erignathus barbatus* | MMPA - NMFS | Threatened |
| Spotted seal | *Phoca largha* | MMPA - NMFS | Threatened |
| Ribbon seal | *Histriophoca fasciata* | MMPA - NMFS | Protected |
| Pacific walrus | *Odobenus rosmarus divergens* | MMPA - USFWS | Not listed |
| Narwhal | *Monodon monoceros* | MMPA - NMFS | Protected |

*Eiders*

Both Steller's and spectacled eiders can be found at nearshore leads in the sea ice in late May and early June. From June through early fall both species can be found on the tundra near Barrow during pre-nesting (adult males and females), nesting, and rearing of their broods. Males and unsuccessful females may briefly be found in marine waters near Barrow after nesting is initiated (males) and if the nesting is unsuccessful. Males and females may be found in nearshore marine waters for a brief period early in the nesting season, if they choose not to initiate a nest that season. In the early fall, both species may briefly be present in nearshore marine waters as they leave the tundra from either the Barrow area or pass through the area from more distant breeding grounds to the east.

*Polar Bears*

Polar bears were listed as *threatened* under the Endangered Species Act in 2008 by the U.S. Fish and Wildlife Service due to loss of their sea ice habitat. Polar bear populations also are susceptible to other human-caused disturbances, such as offshore development, habitat alteration and human-caused mortality. These bears can be present in Barrow during every month of the year and can be found on the tundra, the beach, swimming near shore when pack ice is in the area, and on sea ice when present. Bears that are undetected by people or are moving through on either the beach or around the outskirts of town on the tundra are generally allowed to pass by unharmed. Polar bears present in town or those that are acting aggressively outside of town are often shot for safety reasons and used for subsistence. Polar bears are most common outside of Barrow, closer to the tip of the spit, where bowhead whale bones from the subsistence harvest are deposited. This "bone

pile" area is approximately 4.3 miles north of the northernmost extent of the footprint of the Recommended Plan.

*Whales*

Humpback whales are very uncommon in in the Chukchi Sea, especially as far north as Barrow, although their range may be increasing. These whales are only rarely observed on summer aerial surveys in the Chukchi Sea.

Bowhead whales are very unlikely in the study area during the summer as they are found farther east and well into Canadian waters. Bowhead whales move back into the Barrow area in the fall, where they are present for subsistence harvest by Barrow hunters, typically in October.

Killer whales are uncommon in the Chukchi Sea, though they have been spotted during aerial surveys, vessel-based surveys, and by Native Alaskan seal hunters in the past few years.

Gray whales are occasional visitors to the Barrow area in summer and can often be found nearshore. USACE biologists encountered gray whales several times incidental to nearshore fishery studies near Barrow between 2003 and 2008.

Beluga whales can be found near Barrow in winter and spring, but are generally far more abundant much farther north, when the area near Barrow is sea ice free.

*Harbor Porpoise*

These porpoises are uncommon near Barrow. When encountered, they typically occur near shore alone or in very small groups. If present in Barrow, they would most likely be encountered during the open water period.

*Seals*

The Arctic subspecies of ringed seals is listed as *threatened* under the Endangered Species Act, primarily due to changes to their snow and ice habitat. Their presence near Barrow is strongly influenced by the presence of sea ice; they are abundant during late winter and spring and much less common in the area during the open water season, when the area is sea ice free.

Bearded seals are typically closely associated with sea ice and therefore are often found along leads or near the edge of the pack ice. As such, their presence in the Barrow area peaks during the spring and early summer, when leads form and the pack ice retreats to the north, and in the fall as sea ice forms nearshore and the pack ice forms.

Spotted seals are also closely associated with ice habitat, but are more likely than any other seal in the area to be encountered during the open water period, in low numbers on a very infrequent basis.

Ribbon seals are relatively solitary and are usually found much farther offshore than other ice seals. It is very unlikely that they would occur in the project area.

*Walrus*

Walrus are typically found far offshore from Barrow, near the ice edge. It would be very unlikely to encounter a walrus nearshore in Barrow during the open water period in later summer or fall.

*Narwhal*

Narwhal are very uncommon in Arctic waters off the coast of Alaska and it is extremely unlikely that they would be encountered near Barrow.

3.3.3.1 Consequences of Alternatives

***Future without Project Condition/No-Action Alternative***

*Steller's Eider*

Steller's eiders near Barrow are best described as having an open population model. This means that it is not a closed system, but that it received input from the much larger population of Steller's eiders from the Russian-Pacific breeding population. The mean projected results from this open model indicate that the Alaskan breeding population will likely remain relatively stable throughout the next 100 years, with no probability of permanent local extinction; however, this projection is dependent on immigration and, thus, the viability of the large Russian source population. This suggests that immigration plays a critical role in the population dynamics and consequently the viability of the Alaskan breeding population of Steller's eiders (Dunham and Grand, 2016).

*Spectacled Eider*

Spectacled eiders on the Arctic coastal plain have experienced a slight population decline in the past 25 years, after suffering a very large decline in the 1980s. In the future, it is likely that this slight population decline will continue, but it is possible that this trend will change in some unknown manner, if the habitat in the area changes due to climate change.

*Marine Mammals*

The bowhead whale population is growing and is likely to continue this trend for the foreseeable future. Climate changes could lead to increased use of Arctic waters by species such as gray whales and orca whales, but the implications of this possible occurrence are unknown at this time.

Polar bears could lose foraging habitat if changes continue with sea ice extent, especially as the sea ice edge retreats beyond where the seals that use the ice edge are able to dive to the bottom to forage. While the future of polar bears is uncertain, the fact that they are ESA listed due to potential habitat loss indicates that there is some possibility of future population decline.

Seals and walrus could be at risk from continued sea ice retreat, especially if the retreat extends for long durations past the continental shelf where the bottom is within foraging depths. The extent of this risk and the timeline are uncertain.

Narwhal are so infrequent in Alaska waters that there is no clear picture of what the future might hold for them in the area.

The No-Action Alternative could lead to several negative impacts for marine mammals and birds. While this alternative avoids all potential construction impacts associated with revetments, there are several potential implications of the No-Action Alternative. Coastal erosion and, to a greater extent, coastal flooding, typically leads to contamination and degradation of the marine environment. Erosion and flooding scatter everything from building materials to all types of

personal property throughout the landscape, leaving debris in the marine environment. This debris can impact birds and marine mammals through entanglement and ingestion. In addition to the debris, a more persistent potential problem involves spills of fuel and oil from a major erosion event or a flood. This issue concerns everything from large scale releases such as the gas station, large fuel tanks, and the landfill, but also includes the potential for numerous small spills from fuel cans, four-wheelers, snow machines, home heating oil tanks, etc. These sorts of items are moved, toppled, and displaced during major erosion and flood events and can lead to long term pollution of nearshore marine habitats and the marine mammals and birds that rely on them. Because a large portion of the subsistence resources are locally harvested, the effects of debris and spills could have long term effects on subsistence, especially for protected species like seals (excluding ribbon seal which is threatened) and bowhead whales.

***Consequences of the Recommended Plan***

The Recommended Plan (Alternative H) would have no effect on either species of eider. There are no plans to extract gravel from new sites on the tundra where impacts to nesting eiders could occur. There would be no impacts to eiders staging in the nearshore marine waters in springtime because any materials arriving by barge would not arrive until the region is free of sea ice. In the late summer and early fall, it is possible that there would be some project related barge traffic in the area to bring in material for the revetment, but the additional traffic would occur in an area where there is already frequent barge traffic for both supplies (north of Barrow near NARL) and for routine fuel deliveries (immediately south of Barrow). It is common for exiting barge traffic to circle or stand offshore for several days awaiting their turn to unload or awaiting calm weather to ground on the shoreline, and the addition of extra traffic to the area would not pose a risk to these species that might be in the area for a very brief period, at low density. The proposed staging areas (Figure 5) for construction materials are all located in disturbed areas that are not used by eiders.

The Recommended Plan would have no effect on polar bears. The project area is already degraded and disturbed, due to active coastal erosion and the continual placement of sacrificial gravel to mitigate the effects of erosion from storm events. Dump trucks spend large portions of the summer and fall placing sacrificial gravel along several miles of coastline in Barrow and bulldozers work in the water in the nearshore environment during storms to fight the loss of beach material. Under the Recommended Plan, larger and more durable material would be placed, which would eliminate the need to continually disturb this coastal area. This would greatly reduce the construction activity along the coastline after the project is constructed and would be less disruptive to passing polar bears. The footprint of this project and the proposed staging areas would not involve valuable habitat for polar bears or serve an important function other than passage along the coastline. Polar bears would still be able to pass through the area during and after construction.

The Recommended Plan would have no effect on whales (humpback, bowhead, orca, and gray) as there would be no marine construction taking place and the barge traffic necessary to bring in construction materials would occur in an area where there is existing disturbance. Humpback and orca whales might only be present at very low densities on rare occasions and likely would not be present at all. These alternatives would have no effect on bowhead whales due to the very unlikely overlap between their distribution and the timing of material transport. Bowhead whales are

typically far north and west of the Barrow area near the start of the open water season when barge traffic would bring in materials and are still typically well north of Point Barrow near the end of the construction season in October. Gray whales could be present in the area coincidental with barge traffic, albeit at low densities on an occasional basis, but tug boats in the project area are typically either holding the barge against the shoreline during unloading or travelling very slowing in a holding pattern offshore while waiting to offload. There would also be no marine construction occurring as the project footprint is above the MHHW line.

Most seal species and walrus would be out of the area during construction. Spotted seals could be encountered in small numbers on a very infrequent basis. There are no areas within the project footprint or several miles in either direction where seals and walrus would be expected to haul out of the water.

Narwhal are extremely rare in Arctic waters in Alaska and would not be affected by this project.

***Consequences of the Alternatives Protecting Limited Reaches***

Alternatives A through G would have the same effects as the Recommended Plan, but would have a smaller footprint and therefore take a shorter period of time to construct and involve less material. These alternatives would have no effect on either species of eider, polar bears, bowhead or humpback whales. By not protecting the entire coastline, the unprotected areas would still be at risk to erosion and flooding, and the risk of debris and pollutant contamination to protected species would remain a threat to all of the protected species discussed in this section.

### *3.3.4 Marine Mammals*

All marine mammals are protected under the Marine Mammal Protection Act (MMPA) and some have additional protection under the ESA. Therefore, all of the species are discussed, and the consequences have been considered in the Protected Species section (3.3.3).

### *3.3.5 Birds*

Many non-breeding seabirds occupy marine waters of the Chukchi and Beaufort seas offshore of Point Barrow during summer. Some species, including gulls and loons, nest on inland tundra ponds. Some common marine seabirds found near Barrow include black guillemots, common and thick-billed murres, horned puffins, and fulmars.

Habitat on and near point Barrow is used for foraging by post-breeding shorebirds and as resting and foraging habitat for some sea ducks. For shorebirds, the food resources provide an important source of energy after the energetic demands of the breeding season and in preparation for fall migration.

Shorebirds include three species of plovers and numerous species of sandpipers. Plovers common in the Point Barrow area include the golden, black-bellied, and semipalmated plovers. Sandpipers include whimbrel, bar-tailed godwit, spotted sandpiper, long-billed dowitcher, ruddy turnstone, black turnstone, rock sandpiper, pectoral sandpiper, knot, dunlin, Baird’s sandpiper, semipalmated sandpiper, and possibly the western sandpiper. Although not a shorebird, the Wilson’s snipe is also

a regular summer visitor to Point Barrow. Most of these species nest on the tundra of the National Petroleum Reserve, including Point Barrow, and non-breeders of many species might be present near the project area.

Birds in Barrow are discussed in detail in APPENDIX I and protected species (Steller's and spectacled eiders) are discussed in section 3.3.3 of this EA.

#### 3.3.5.1 Consequences of Alternatives

*Future without Project Condition/No-Action Alternative*

As with the issues described for tundra in 3.3.1, future conditions for birds depend largely on the condition of the breeding habitat on the tundra. The magnitude and timescale of potential changes in breeding bird assemblages is uncertain, but climate change could lead to a slightly longer breeding season and the arrival of new species and resulting competition.

Coastal erosion and, to a greater extent, coastal flooding, typically leads to contamination and degradation of the marine environment, leaving debris scattered across the tundra, in freshwater lakes including drinking water sources, and into the marine environment. This debris can impact birds on land, freshwater, and marine waters. In addition to the debris, a more persistent potential problem involves spills of fuel and oil from a major erosion event or a flood. These sorts of items can lead to long term pollution of terrestrial, freshwater, and nearshore marine habitats and the bird species that rely on them.

*Consequences of the Action Alternatives, including the Recommended Plan*

The proposed project area for the Recommended Plan (Alternative H), as well as all action alternatives, would not be used for nesting by any bird species. The area is eroded and filled annually and receives a large amount of disturbance from vehicle and foot traffic. Several species of waterfowl and gulls would rest offshore, but this typically occurs farther north along the spit, especially near Point Barrow. The area of the spit adjacent to Elson Lagoon is heavily used as a crossing point for waterfowl migration to the west along the Beaufort Sea before turning south along the Chukchi Sea, and is well north of the project footprint. Other birds common in the project area include glaucous gulls and arctic terns, but these species already appear to tolerate the large amount of activity in the area and do not nest anywhere in the project footprint.

## 3.4 Land Use and Aesthetics

The project area is used year around for recreation and subsistence access. In the winter and spring, the beach is important for accessing seal and bowhead whale hunting sites. The beach is used in the summer for recreation to include hiking, and all-terrain vehicle riding for both pleasure and to access subsistence and cultural sites, and group gatherings. Having a view of the Chukchi Sea is important for residents to determine sea ice condition, wave conditions, and approaching weather fronts.

### *3.4.1 Consequences of Alternatives*

*Future without Project Condition/No-Action Alternative*

There are no anticipated changes to land use and aesthetics for the foreseeable future, though continued coastal erosion could alter the coastline and infrastructure and lead to changes in areas used for hunting, fishing, festivals and whale butchering.

Housing, utilities, and roads would remain at risk along the coast as storms and erosion continue. Aesthetics would be affected by continued flooding and erosion in the long term. The City of Barrow would likely still maintain a temporary berm, similar to the existing conditions, thus limiting beach access and coastal views.

*Consequences of the Recommended Plan*

Construction of the Recommended Plan (Alternative H) would likely cause temporary displacement of people using the beach while the area is under active construction, but access would be available on either side of the construction area. When completed, points along the revetment would be included to allow for boat launching, all-terrain vehicles, snow machines, pedestrian pull-outs, areas to view the water, escape routes from polar bears, and flood control point. The revetted bluff would not disrupt the view of the Chukchi Sea, but the locations nearest the beach would no longer provide a clear view of the water. Residents would have to travel to either a raised section of the road or to the beach via an access point in the revetted berm.

*Consequences of the Alternatives A thru G*

For Alternatives A thru G, the revetment would progressively increase in distance between the alternatives, but no one alternative would cover the entire 5 mile stretch. Beach access would not likely change where the project does not construct a revetment or berm. These areas would also be highly susceptible to flooding and erosion, where the beach would likely become more eroded over time. The revetted bluff would not disrupt the view of the Chukchi Sea, but the locations nearest the beach with revetment would no longer provide a clear view of the water. Residents would have to travel to either a raised section of the road or to the beach via an access point in the revetted berm.

## 3.5 Subsistence

Subsistence practice over the last 11,500 years in the Arctic region have been reconstructed through archaeological data, ethnographic information, and traditional ecological knowledge (Grover and Laughlin 2012). The coastal areas of the arctic have been populated for at least the last 3,500 years, with the Iñupiat population subsisting on a range of different animals for food and resources for survival. However, the majority of the subsistence resources consisted on the reliance of hunting large marine mammals including whales, walrus, and seals (Langdon 2002). Subsistence practices have continued into modern day, fulfilling several different functions. These include: mitigating substance abuse, protection from labor downturns, maintaining Native Alaskan involvement with natural resource co-management, and helping local communities continue to be current with environmental knowledge (Kerkvliet and Nebesky 1997). The whale harvest brings in

approximately 1.1 to 2 million pounds of food, which saves the community approximately 11 to 30 million dollars in beef per year (IWC 2018).

### *3.5.1 Primary Subsistence Food*

One of the most important food sources for the Iñupiat in the Barrow region are whales, specifically the bowhead whale (*Balaena mysticetus*). These large mammals are hunted in the spring or fall, depending on migration routes. Whaling crews are highly organized, and are led by an *umialik* (captain), and may consist of a number of boats per village. Traditionally, these hunts would use a number of *umiaqs* (skin boats); however, many traditional tools and equipment have been modernized. After a successful kill, they would pull the whale onto the shoreline for butchering. The captain's wife would then portion out the meat and blubber to the crew and their families (Friesen 1999).

Beluga (Belukha) whales were also harvested in areas of the arctic. This would happen from mid-July to late August. As beluga whales are smaller than bowheads, hunting for them is less organized and involves small groups of individuals for harvest. Traditionally this was done with a number of kayaks, with the hunters driving the belugas into shallow water and then killing them, rather than killing them in open water (Friesen 1999). While dated, the NSB's statistics for beluga harvest between 2007-2011 averaged 48 landed belugas out of the Beaufort Sea (0.1 percent of estimated population), which includes the communities of Barrow, Diomede, Kaktovik, Kivalina, Nuiqsut, and Point Hope, and 62 belugas landed out of the East Chuckchi Sea (1.7 percent of estimated population), consisting of the communities of Wainwright and Point Lay (NSB 2018).

### *3.5.2 Other Subsistence Resources*

Alongside the hunting of whales, the Iñupiat hunt a number of smaller sea mammals that are in the area, including three species of seals (bearded: *Erignathus barbatus*, ringed: *Pusa hispida*, spotted: *Phoca largha*) and walrus (*Odobenus rosmarus*). While the successful hunt of bowhead whales would have the advantage of lessening the need to hunt or fish on winter ice, these other sea mammals provide needed materials for tools and clothing as well as a supplemental food source (Langdon 2002). While many materials have been replaced with modern western tools and equipment, some subsistence materials are still utilized. Bearded seal skins are still used for the construction of *umiaqs*, and ivory, bone, antler, and baleen are utilized for art. The subsistence harvesting of caribou (*Rangifer tarandus*) also continues to supply meat to hunters, especially when not enough whale meat is harvested.

Fishing also supplies the diet, with the different species of whitefish being a large share of an alternative food source. Sockeye salmon (*Oncorhynchus nerka*) are also a common harvest, comprising of the second most caught fish by far. Another fish caught en mass are cisco (*Coregonus artedi*), which are caught and used often as dog food. Grayling (*Thymallus thymallus*) is also a popular fish. Geese are taken, including the snow goose (*Chen caerulescens*) and the Canada goose (*Branta canadensis*), to supplement the foods acquired. Another type of bird commonly hunted are eiders, including the common eider (*Somateria mollissima*), the king eider

(*Somateria spectabilis*), the spectacled eider (*Somateria fischeri*), and the Steller's eider (*Polysticta stelleri*). Sometimes, eider eggs are also collected to eat (Bacon et al. 2011).

A baseline harvest profile by the Alaska Department of Fish and Game (ADF&G) displays that both bowhead whale and caribou were the largest subsistence resources harvested in 2014, the last time the data was published (Table 5). While the arctic region is a "mixed economy," research has found that cash income is sporadic and less reliable than subsistence, and so the population tends to favor heavily in relying on subsistence as a primary form of diet procurement (Ellanna and Wheeler 1989). Food is often shared with the elderly or disabled, and most of the community participates in some way, even if they are not directly hunting. This would include purchasing fuel, mending or creating clothing, or helping butcher (Whitaker 2010).

Table 4. 2014 Dominant Subsistence Resources Identified from Harvest Records for Marine Resources in Barrow (ADF&G 2014).

| Marine Resource | Pounds Harvested |
|---|---|
| Salmon | 57,262.3 |
| Non-Salmon Fish | 196,047.4 |
| Seal | 340,089.1 |
| Walrus | 103,602.2 |
| Beluga | 24,341.0 |
| Bowhead | 546,085.1 |
| Caribou | 587,897.1 |

*3.5.3 Timing of Subsistence*

*Marine Mammals*

Subsistence patterns in the Arctic follow the seasons. Typically, villages in the region hunt for bowhead whales in the spring; however, the Barrow community has been capable of harvesting them in both the spring and fall. Walrus, when available, are taken in July and August when they drift with the floe ice. Bearded seals have recently been taken in July and August as well (Bacon et al. 2011).

*Terrestrial Mammals*

The dominant terrestrial mammal taken in the arctic are caribou, which are harvested in July and August (Bacon et al. 2011). Some moose are taken in August and September, when the season has not been closed by the state. Caribou are an important food source, calculated to be second to bowhead in the amount of pounds of meat harvested (Bacon et al. 2011).

*Fishes*

Freshwater fishing often begins during breakup in June and continues into November. Arctic cod and some salmon can be taken through cracks in the sea ice, but this often happens in the fall. The whitefish are taken from June through October, but often beaks after September. Grayling can be taken from August through October and Arctic cisco peaks in October (Bacon et al. 2011).

*Birds*

The hunting of migratory birds happens during the spring migration, the molt period, and the fall migration. Eider harvest reaches its peak in May, followed by the fall July and August return migration. Over 80 percent of the eider taken are king, with some common following second. The geese are harvested almost entirely in the month of May (Bacon 2011).

### *3.5.4 Environmental Consequences of Alternatives*

*Future without Project Condition/No-Action Alternative*

With the No-Action Alternative, barriers would not constructed and subsistence hunting and fishing access would continue as normal. There would be no changes to current practices or animal harvesting. There are no known species that actively use the beach or berms as part of their lifecycle that would benefit from this alternative. The No-Action Alternative could lead to negative health effects on many subsistence resources, as debris and contaminants enter the freshwater, marine, and terrestrial environments due to damage from continued coastal erosion and flooding. Flood damages could also cause loss of access to the NARL airstrip, which is currently used as a landing area to butcher whales after successful hunts. This may impact how the community conducts its primary subsistence taking of bowhead whales.

*Consequences of the Recommended Plan*

The Recommended Plan would include access points along sections of the barriers to allow residents to have multiple entrances to the beach and water. These access points would also be used by the construction teams as the barriers are being constructed to safely move from either side for construction. The access points would be open to local subsistence hunters and whalers to deploy their boats. There would be no change to the subsistence lifestyle nor any known detriment to local wildlife.

*Consequences of Alternatives A thru G*

The effects of the various alternatives that protect a limited reach of coastline would involve the effects described previously for the Recommended Plan and the No-Action Alternative. The overall effects of any of Alternatives A thru G would involve differing proportion of coastline with the effects of revetment and the consequences of No-Action. Leaving section of coastline unprotected could lead to negative health effects on many subsistence resources, as debris and contaminants enter the freshwater, marine, and terrestrial environments due to damage from continued coastal erosion and flooding.

## **3.6 Socio-economic**

Frigid flood waters during storms in the study area result in unusually dangerous conditions. Additionally, the current practices of flood fighting during storms place equipment operators in extremely hazardous conditions to protect the community. The community faces risk of damage to personal property, including residential and non-residential structures and their contents. The high risk of flooding during storm events has negatively impacted the quality of life of local residents. Current flood damages to Stevenson Street have resulted in hazardous road conditions during storms. An in-depth discussion of socio-economic resources is located in Appendix C.

### *3.6.1 Environmental Consequences of Alternatives*

*Future without Project Condition/No-Action Alternative*

With the No-Action Alternative, expected coastal storm/flood damages would likely result in negative employment and income impacts, reduction in infrastructure, and a reduction in population. A large potential risk to employment and income in the study area is loss of the utility services provided by the underground Utilidor. The risk of coastal storm damage serves as a disincentive for businesses to invest in the community, further reducing the potential for future employment and income growth in Barrow.

The risk of flooding with the No-Action Alternative negatively impacts the quality of life of local residents. While local medical facilities and emergency response resources are not expected to be physically impacted by coastal flooding and erosion, localized coastal storms may fully occupy local emergency response personnel and limit their ability to serve regional outlying communities within the City of Barrow. Additionally, degradation of the landfill and sewage treatment plant barriers, caused by flooding, would leach contaminants and trash into the environment, causing significant negative affects to health, safety, and environmental resources.

*Consequences of the Action Alternatives*

All of the action alternatives, including the Recommended Plan, would not cause more than transitory effects or minor inconveniences to people, including low- income or minority people gathering fish or marine mammals. Each alternative would reduce the identified risks to personal safety and mortality associated with coastal flooding, erosion, and flood fighting activities. They would also reduce the risk of coastal storm and erosion damages to property. There would be an increase in the quality of life, a reduction in safety risk along the coastal roads for residence, reduction of risk to life-sustaining infrastructure, and a decreased risk of coastal flood emergencies. There would be not significant negative impacts as a result of any action alternative.

Alternatives A, B, and C would not protect the South and Middle Salt lagoon, thus exposing it to the possibility of being flooded. The South lagoon has been used as a landfill, and has contaminants that would be harmful for the community and the wildlife if released into the Chukchi Sea, contaminating subsistence wildlife and non-subsistence wildlife. Alternatives A, B, D, E, and G, would not protect Browerville in Reach 4. Reach 4's barrier would protect both the community and the utilidor, an important utility infrastructure that is critical for the community, and has become increasingly threatened by storm flood surges.

All the alternatives are consistent with Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, and none would increase danger to children.

## 3.7. Environmental Justice

Executive Order (E.O.) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," directs Federal agencies to identify and address any disproportionately high and adverse human health or environmental effects of their actions on low-income, minority, and tribal populations, to the greatest extent practicable and permitted by law. An Environmental Justice (EJ) analysis typically includes the following elements (USEPA 2017):

a) Identification of any minority and/or low-income status communities in the project area
b) Identification of any adverse environmental or human health impacts anticipated from the project
c) Determination of whether those impacts would disproportionately affect minority and/or low-income communities.

### *3.7.1. Identification of Minority or Low-income Populations*

The Village of Barrow is considered the affected population for the purposes of this EJ analysis. The Barrow community includes minority populations, low-income populations, and populations that are both. As of the 2010 U.S. Census, Barrow was approximately 67 percent American Indian and Alaska Native alone or in combination. Alaska Native populations are treated as minorities under E.O. 12898. Income data from the U.S. Census Bureau's 2009-2013 American Community Survey show an estimated 14.1 percent of Barrow residents, regardless of minority status, have incomes below the Federal poverty level.

### *3.7.2. Identification of Adverse Impacts*

There have been no adverse impacts identified to EJ that rise to a level of significance that could require mitigation. The proposed action is intended to impact the population in strongly positive ways, enabling the EJ community to maintain its cultural identity and carry on traditional practices in a safe and sustainable setting. The potential impacts on another resource category of particular concern to this community, "Subsistence," were found to be minor.

### *3.7.3. Determination*

USACE has determined that there would be no disproportionate adverse impact on minority or low-income communities as a result of the proposed action. This decision was informed by the following considerations:

a) A substantial majority of the affected population, the City of Barrow, is minority, low-income, or both; this entire population is regarded as an EJ community for the purposes of the EJ analysis.
b) The City of Barrow has been an active participant in the design and approval of the proposed action.

c) Upon completion, the proposed action would reduce the risk of coastal erosion and flooding that negatively impacts the entire population of Barrow.

## 3.8 Cumulative Effects

Federal law (40 CFR 651.16) requires that NEPA documents assess cumulative effects, which are the impact on the environment resulting from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. The past and present actions that have occurred within and adjacent to the project area include construction of the original road, past dredging and placement of beach nourishment, and the continual construction of sacrificial beach berms which are maintained throughout the open water period. Together, these actions have resulted in the existing conditions of the study area.

The reasonably foreseeable future actions under consideration in this analysis are identified below. The list includes relevant foreseeable actions within and adjacent to the study area, including those by USACE, other Federal agencies, State and local agencies, and private and commercial entities.

- Continued construction of sacrificial berms along the roadway
- Continued armoring of the bluff area with a variety of non-permanent solutions such as gabion baskets, super sacks, and other measures

Regardless of any action taken or not taken, Barrow would likely continue to exist as a major city in the region and function as a hub for transportation and logistics to other communities. Construction of the proposed project described in this assessment would provide much needed reduction in risk of storm damage, but it is unlikely to lead to an increase in development in Barrow or change its current functional role in the region.

### *3.8.1 Cultural and Historic Resources*

The City of Barrow has a number of known historic properties ranging from the Cold War to precontact village sites. The Recommended Plan would involve a 5 mile stretch of the beachfront, involving a precontact village listed on the NRHP. This site, the Utqiaġvik Village site (BAR-002), is located on the bluff above the southern beach and experiences active erosion; this erosion has exposed cultural materials and human remains. Building the proposed barrier would cause damage to BAR-002 during construction; however, it would protect the site from future erosion and storm damage. There are concerns about the long term damage to the site by the loss of permafrost support, combined with the weight of a revetment that would cause pressure on subsurface cultural materials and limit future archaeological recovery efforts. There are five additional historic properties in the proximity of the project area (BAR-007, 009, 012, 016, and 060), but they are not impacted by the proposed alternative. The construction of the barrier would further protect these sites from future storm and flood damage. On 10 January 2019, USACE found that the proposed revetment associated with the Recommended Plan would have an adverse effect on the Utqiaġvik Village site (BAR-002) (Appendix H). On 28 January 2019, the SHPO concurred with the assessment, and agreed to the development of a Memorandum of Agreement

(MOA) among all interested parties in order to determine the appropriate mitigation of adverse effects on BAR-002. This letter can be found in Appendix H: Correspondence of the main report.

### *3.8.2 Biological Resources*

Biological resources include fish, wildlife, vegetation, Federal threatened and endangered species, and other protected species. While historic development within and adjacent to the project area has modified the shoreline and the sediment regime, these actions occurred in a regulatory landscape that is different from today. While future development would likely have localized impacts on these resources, under the current regulatory regime these resources are unlikely to suffer significant losses. Any future Federal actions would require additional evaluation under NEPA at the time of their development.

### *3.8.4 Land Use and Aesthetics*

Land along the beach and nearshore environment is currently being eroded away during high wave and flooding events, particularly during heavy storms. Access to the beach is limited to areas between the temporary berm, which is maintained throughout the year. Future developments would likely increase access points along the beach from what currently exists by creating permanent boat and pedestrian ramps along the revetments. The temporary berm also limits the view of the beach. Construction of the project would enable the community to view the ocean and beach from the revetment because it would be a solid structure or part of a road that people can walk on or over.

### *3.8.4 Subsistence*

There is no indication that any reasonably foreseeable future action near the project area would contribute to cumulative impacts on subsistence resources.

### *3.8.3 Socio-economic*

There is no indication that any reasonably foreseeable future action near the project area would contribute to cumulative impacts on socio-economic resources.

### *3.8.3 Environmental Justice*

There is no indication that any reasonably foreseeable future action near the project area would contribute to cumulative impacts on EJ.

### *3.8.6 Cumulative Effects Summary*

The cumulative impacts analysis evaluated the effects of implementing the proposed action in association with past, present, and reasonably foreseeable future USACE and other parties' actions within and adjacent to the project area. Past and present actions have resulted in the present conditions in the project area. Reasonably foreseeable future actions that have been considered included relevant foreseeable actions within and adjacent to the project area, including those of the

USACE, other Federal agencies, State and local agencies, and private and commercial entities. The cumulative impacts associated with implementation of the proposed action were evaluated with respect to each of the resource evaluation categories, and no cumulatively significant adverse impacts were identified.

## 4.0 CONCLUSION

The proposed construction to reduce risk of coastal erosion and flooding during storm events by means of the Recommended Plan would not constitute a significant impact to the quality of the human environment. The project area is already disturbed annually by coastal erosion and flooding impacts and is constantly disturbed by human activity. The proposed activity, considering the construction and long-term existence of a new structure, and cumulative effects does not constitute a significant impact to the quality of the human environment and the preparation of an environmental impact statement (EIS) is not warranted.

## 5.0 AGENCY AND PUBLIC INVOLVEMENT

### 5.1 Public Scoping Meetings

As part of the scoping process, a planning charette, held in Barrow from 11-13 September 2017, was conducted with the local sponsor and stake-holders. USACE also received comments from the NSB and public regarding impacts of coastal erosion and flooding, as well as the need to maintain beach access for subsistence and recreation. Public feedback was collected from two open public meetings, and agency feedback was received during a public draft period; responses from public feedback were integrated into the EA.

### 5.2 Federal & State Agency Coordination

In-person meetings were held between biologists from the USACE Alaska District Environmental Resources Section and biologists with the National Marine Fisheries Service (NMFS) Protected Resource Division and Habitat Division on 23 October 2017 in Fairbanks, and the U.S. Fish and Wildlife Service (USFWS) Project Planning and Endangered Species sections on 9 October 2017 in Fairbanks. Both NMFS and USFWS informed the USACE biologists that they would not prepare a Coordination Act Report (CAR). The USACE received the letter from USFWS on 19 October 2018, and received the letter from NMFS on 5 November 2018. These letters can be found in Appendix H: Correspondence of the main report.

The Alaska SHPO has been notified of the Recommended Plan, and concurred with USACE's finding of adverse effect on 24 January 2019 [36 CFR § 800.5(d)(2)] (Appendix H). The SHPO and USACE have developed a MOA in consultation with interested parties that has identified appropriate mitigation to resolve this adverse effect [36 CFR § 800.6(c)(1)(i)]. The Advisory Council on Historic Preservation (ACHP) was notified of the finding of adverse effect, and was invited to participate in the development of an MOA; the ACHP has declined to participate. An MOA kick-off meeting was held in Barrow on 21 March 2019. The MOA was signed on 7 June 2019 and is included in the final submittal package to Headquarters scheduled for 14 June 2019.

Per the NHPA, the agency official should invite parties who assume a responsibility under an MOA to be signatories to that MOA [36 CFR § 800.6(c)(2)(iii)]. The following parties were invited to participate in the development of an MOA:

- North Slope Borough

Per the NHPA, Federally-recognized Tribes and Alaska Native Corporations formed under the Alaska Native Claims Settlement Act of 1971 shall be consulted with during the Section 106 process [36 CFR § 800.3(f)(2)]. The agency official may invite all consulting parties to concur in a MOA [36 CFR § 800.6(c)(3)]. The following parties were invited to participate in the development of an MOA:

- Native Village of Barrow Iñupiat Traditional Government
- Inupiat Community of the Arctic Slope
- Arctic Slope Regional Corporation
- Arctic Slope Native Association
- Ukpeaġvik Iñupiat Corporation
- City of Utqiaġvik

### 5.3 Status of Environmental Compliance

Compliance with various authorities is described in Table 6.

Table 5. Status of compliance

| Federal Statutory Authority | Compliance Status | Compliance Date/Comment |
|---|---|---|
| Clean Air Act | **FC** | The project is not expected to produce any pollutants in quantities that would exceed Federal thresholds. |
| Clean Water Act | **N/A** | No in-water construction or fill. |
| Coastal Zone Management Act | **N/A** | As of July 1, 2011, the CZMA Federal consistency provision no longer applies in Alaska. Federal agencies shall no longer provide the State of Alaska with CZMA Consistency Determinations or Negative Determinations pursuant to 16 U.S.C. 1456(c)(1) and (2), and 15 CFR part 930, subpart C. |
| Endangered Species Act | **FC** | "No Effect" determination made by USACE. |
| Marine Mammal Protection Act | **FC** | "No Effect" determination made by USACE. |
| Magnuson-Stevens Fishery Conservation and Management Act | **N/A** | No in-water construction |
| Fish and Wildlife Coordination Act | **FC** | USFWS did not choose to prepare a Coordination Act report. |
| Marine Protection, Research, and Sanctuaries Act | **N/A** | No in-water construction or fill. |
| Migratory Bird Treaty Act | **FC** | The proposed project will not affect any nesting or feeding areas used by migratory birds. |
| Submerged Lands Act | **FC** | No in-water construction or fill. |
| National Historic Preservation Act | **FC** | Concurrence on Finding of Effect reached on 28 January 2019. The MOA resolving adverse effects was signed on 7 June 2019 and is included in the final submittal to HQ and appended to the EA (Attachment 2). |
| National Environmental Policy Act | **FC** | This document presents sufficient information regarding the generic impacts of the proposed construction activities at the proposed project. |
| Rivers and Harbors Act | **FC** | USACE does not issue permits to itself, so no specific permit is required under this act. |
| Executive Order 11990: Protection of Wetlands | **FC** | The project has avoided impacts to adjacent wetlands. |
| Executive Order 12898: Environmental Justice | **FC** | Proposed project will have no cumulative impacts on EJ. |
| Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks | **FC** | The project does not expect that construction of the project will create disproportionate adverse effects on the more vulnerable elements of the community. |
| Executive Order 13112: Invasive Species | **FC** | This project is not anticipated to cause or promote the spread of invasive species. |
| Executive Order 13186 Protection of Migratory Birds | **FC** | This project is not expected to have a significant impact on migratory birds. |

FC: Fully Compliant; PC: Partially Compliant; N/A: Not Applicable

## 6.0 MITIGATION OF ADVERSE EFFECTS OF THE RECOMMENDED PLAN

On 19 July 2018, USACE found that the proposed revetment associated with the Recommended Plan would have an adverse effect on the Utqiaġvik Village site (BAR-002) (Appendix H). On 21 August 2018, the SHPO requested that the USACE reengage in consultation once more specific construction details were identified (Appendix H). Upon further details of the project's recommended plan being outlined, USACE reinitiated consultation with the SHPO on 10 January 2019. The SHPO concurred with the assessment of adverse effect on the Utqiaġvik Village site on 28 January 2019. The SHPO agreed that the development of a Memorandum of Agreement (MOA) to identify appropriate mitigation strategies would best resolve this adverse effect [36 CFR § 800.6(c)]. The USACE has developed an MOA with the SHPO, signatories, and consulting parties to identify an appropriate mitigation strategy. The MOA was signed on 7 June 2019 and included as Attachment 2 of this EA.

## 7.0 PREPARERS OF THIS DOCUMENT

This environmental assessment was prepared by Project Manager Jen Cate, Biologist Chris Hoffman, Archaeologist Joseph Sparaga, and Archaeologist Kelly Eldridge of the Environmental Resources Section, Alaska District, U.S Army Corps of Engineers. The USACE Project Manager for the proposed project is Jenipher Cate.

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# Attachment 1: Cultural Resource Supplemental Information

This cultural resources attachment details the archaeological and historical backgrounds of the community and local area of Utqiaġvik (will be referred to as Barrow for the remainder of this document). It also documents previous archaeological works within the project area, and describes some of the sites that would be adversely affected or protected from the proposed barrier.

## Historical Context

### *Precontact History*

Several archaeological sites in the Brooks Range have been dated to the American Paleoarctic tradition, at around 11,500 years before present (BP) (Grover and Laughlin 2012). However, there are no coastal Paleoarctic sites documented or discovered. It has been assumed that any coastal Paleoarctic sites have been covered by rising sea levels after the Younger Dryas period began (Jensen 2014). The earliest coastal archaeological sites in northern Alaska date to the Denbigh Flint Complex, an early regional variant of the Arctic Small Tool tradition, at approximately 4,000 years ago in the Norton Sound (Dumond 1998a; Tremayne and Rasic 2016).

The number of coastal settlements in northern Alaska began to increase around 2,500 BP (Anderson 1984; Dumond 1998b). Beginning around 1,550 BP, the climate had a second warming period, which decreased the amount of offshore ice, creating open waters during the summer season and new resources. This required people to adapt to these changes and develope new hunting technique,s which were adapted to the progressively open waters during summer seasons (Friesen and Mason 2016). During this time, whale hunting increased at some coastal sites (McClenahan 1993). These new cultural developments were labeled the Birnirk culture, and have been identified at the Utqiaġvik Village site (BAR-002) and Birnirk (BAR-001) sites at Barrow, and the Kugusugaruk site (BAR-003), Coffin site (BAR-014), and Walakpa site (BAR-013) site to the southwest (Anderson 1998; Gerlach and Mason 1992; Stanford 1976).

By about 1,000 BP, the Thule people inhabiting the coast of northern Alaska were easily recognizable as the direct ancestors of the Iñupiat people (McClenahan 1993). Material culture artifacts known from ethnographic records have been recovered at sites dating to this period. In addition, technology developed for winter ice-hunting and hunting with kayak and umiaq on the open sea, along with a subsistence focus on whaling, continued use of some land-based resources, dog traction, and settlement in large communities (Anderson 1984; McClenahan 1993; Morrison 1998). Sites occupied by the Western Thule culture at or near Barrow include the Walakpa site (BAR-013), the Utqiaġvik Village site (BAR-002), the Nuwuk site (BAR-011), and Birnirk site (BAR-001) (Jensen 2016).

### *Russian Alaska*

Northern Alaska was not noticeably affected during the Russian Period; the farthest north known Russian exploration was conducted by Bering and Chirikov in 1728 AD, who traveled up through the Bering Strait and turned around west of Kotzebue Sound (Black 1988). Captain Cook's exploration of Alaska in 1778 AD pushed north of Point Hope, but he turned back just beyond it (Black 1988). The impacts from Western cultures were not discernable until approximately 1850

AD, when European explorers moved across the Arctic (Hall 1984). The Russian government did not consider the northern parts of Alaska a priority due to the lower quantity of fur-bearing animals in the vicinity. However, trade goods such as tobacco, iron, copper, and glass beads did make it north, via traditional trade fairs and trading routes (Jensen 2012; Kunz et al. 2005; Murdoch 1892).

The first two recorded Euroamerican visits to northern Alaska both took place in 1826 AD. Captain Frederick Beechey of the English Royal Navy, in command of the fifteen-gun sloop HMS *Blossom*, led an expedition into the Bering Strait and east to Icy Cape (Beechey 1832), while Sir John Franklin's expedition traveled west from the Mackenzie River until they reached Return Island just west of Prudhoe Bay (Franklin 1828). Although Beechey and the HMS *Blossom* did not make it much past Icy Cape due to shallow waters, the *Blossom*'s barge, under the command of Thomas Elson and William Smyth, made it as far as Point Barrow and the settlement of Nuvuk (Beechey 1832).

In the 1840s, commercial whalers began hunting in the Bering Strait, followed by the Chukchi Sea in the 1850s, and the Beaufort Sea soon after (Bockstoce 1986). Euroamericans established shore-based whaling stations, including one at Point Belcher slightly north of Wainwright, and many local Iñupiat moved from subsistence whaling to participating in the commercial whaling industry (Allen 1978; Brower 1842; Cassell 2000, 2005). While the initial targeting of whales was primarily for the purpose of acquiring oil from the blubber, there was also a secondary market through the baleen trade, which continued to support the industry even after the discovery of petroleum in the eastern United States. A combination of the collapse of the baleen market and the depletion of the whale stock essentially ended commercial whaling in about 1916 AD (Bockstoce 1986; Spencer 1959; Stefansson 1913, 1914).

*American Period*

There were limited changes in Barrow during World War II. However, the beginnings of the Territorial Guard were being created throughout Alaska. Barrow was determined to be the location of one of the Alaska Scout Battalions after the war; in 1949 the "C" Company of the 1st Battalion was stationed at Barrow (Hendricks 1985). This military unit was formed to protect and keep watch of Alaska's northern shores, but are considered more relevant during the Cold War period.

The Cold War period had significant impacts on the village of Barrow and its inhabitants. In 1948, the Office of Naval Research established the Naval Arctic Research Laboratory (NARL) in Barrow with the purpose of conducting research in the arctic environment to better the military's responses in the region (Hummel 2005). The development of NARL increased the population during the summer season as military and civilian researchers used the site. One of the greatest impacts to northern Alaska came in the form of the Distant Early Warning (DEW) radar system, whose stations stretched over 3,000 miles across Alaska and northern Canada to alert the military in the case of a surprise circumpolar attack by the Soviet Union (USSR) (Hummel 2005). A DEW Line station at Point Barrow, listed as POW-MAIN, was constructed in 1955 and served as a main hub for the northern Alaskan DEW stations. There was also a military garrison established in Barrow; both the National Guard and Alaska Territorial Guard (also known as the "Eskimo

Scouts"), were stationed there (Hummel 2005). Construction work and other associated jobs attracted people to the area, and the town of Barrow grew.

*Previous Archaeological Studies*

Barrow has a number of known historic properties near or within the APE which have been recorded in the Alaska Heritage Resources Survey (AHRS). A number of these sites are eligible for or have been listed on the National Register of Historic Places (NRHP; Table 1. The proposed project would have an impact on the integrity of the Utqiaġvik Village site (BAR-002) at the southwestern end of Barrow. The revetment would lay against it and partially on top of it; however, the site is also actively eroding out of the seaward bluff. There are also five other sites located near the APE, including Browerville (BAR-007), Esatkuat (BAR-009), the Refuge Station (Brower Café; BAR-012), the Elavgak House (BAR-016), and the Browerville Ice Cellar (BAR-060). The proximity of the proposed project to these sites makes the impact on these properties a possibility. However, the majority of known cultural resources are not in proximity to the proposed project area and would not be adversely affected by the construction.

Table 6. Sites within general vicinity of the APE (OHA 2018).

| AHRS # | Site Name | Type | NRHP Status | In APE |
|---|---|---|---|---|
| BAR-001 | Birnirk | Subsurface | National Historic Landmark | No |
| BAR-002 | **Utqiaġvik Village Site** | **Subsurface** | **Eligible** | **Yes** |
| BAR-004 | Utqiaġvik Presbyterian Church Manse | Structural | Listed | No |
| BAR-007 | **Browerville** | **Structural** | **None** | **Near** |
| BAR-009 | **Esatkuat** | **Subsurface** | **None** | **Near** |
| BAR-011 | Nuwuk | Subsurface | Eligible | No |
| BAR-012 | **Refuge Station (Brower Café)** | **Structural** | **Listed** | **Near** |
| BAR-015 | Sod House | Structural | None | No |
| BAR-016 | **Elavgak House** | **Structural** | **None** | **Near** |
| BAR-022 | Kugok | Subsurface | None | No |
| BAR-041 | POW-M (DEW Line) | Structural | Eligible | No |
| BAR-046 | Building 100 | Structural | Eligible | No |
| BAR-047 | Building 101 | Structural | Not Eligible | No |
| BAR-053 | LRRS Road System (DEW Line) | Structural | Eligible | No |
| BAR-055 | NWS House 1 | Structural | Eligible | No |
| BAR-056 | NWS House 2 | Structural | Eligible | No |
| BAR-057 | NW House 3 | Structural | Eligible | No |
| BAR-058 | NWS Recreation Hall | Structural | Eligible | No |
| BAR-059 | Old government building | Structural | None | No |
| BAR-060 | **Browerville Ice Cellar** | **Subsurface** | **None** | **Near** |
| BAR-061 | NWS House Duplex B-4 | Structural | Not Eligible | No |
| BAR-063 | NWS Upper Atmosphere Facility | Structural | Not Eligible | No |
| BAR-065 | NWS Office Building B-6 | Structural | Not Eligible | No |
| BAR-066 | Old Navy Bridge | Structural | Not Eligible | No |
| BAR-069 | Cooper Is. Navy Station | Structural | Not Eligible | No |
| BAR-070 | Cooper Is. 2 | Subsurface | Eligible | No |
| BAR-073 | Suvlu House | Structural | Not Eligible | No |
| BAR-074 | Brower House | Structural | Not Eligible | No |
| **BAR-075** | **NARL** | **Structural** | **Eligible** | **Near** |
| BAR-076 | Building 250 | Structural | None | No |
| BAR-079 | NARL Airstrip | Structural | None | No |
| BAR-081 | Building 133 | Structural | None | No |
| BAR-082 | Building 134 | Structural | None | No |
| BAR-083 | Building 130 | Structural | None | No |
| BAR-087 | Grave | Subsurface | None | No |
| BAR-101 | Face-down burial (Uncle Foot) | Subsurface | None | No |
| BAR-102 | Nungasak House | Structural | None | No |
| BAR-103 | Yong House | Structural | None | No |
| BAR-121 | Seabee Core Test Well #1 | Structural | Eligible (assumed) | No |
| BAR-123 | Barrow Big Rig Test Well #1 | Structural | Eligible (assumed) | No |
| BAR-129 | South Barrow Test Well #1 | Structural | Eligible (assumed) | No |
| BAR-138 | BUECI Water Treatment Plant Utilidor | Structural | None | No |

Within the APE is the historic property known as the Utqiaġvik Village site (BAR-002). This site was originally identified as having 61 house mounds, but with the continual growth of the City of Barrow, the site has been reduced to approximately 35 (as recorded by Sheehan in 1982). The site also includes a number of historic ice cellars and other cultural features; it covers approximately a 2-acre tract of tundra within Barrow (Figure 1). A number of excavations were conducted at this site between the 1950s and 1980s. The research gives evidence of the area slowly developing a larger community; increasing population sizes subsequently increased stresses on local resources. This led to the increasing importance of the whaling captains, *umialit*, as leaders in their communities, which still continues in the modern day (Sheehan 1997).

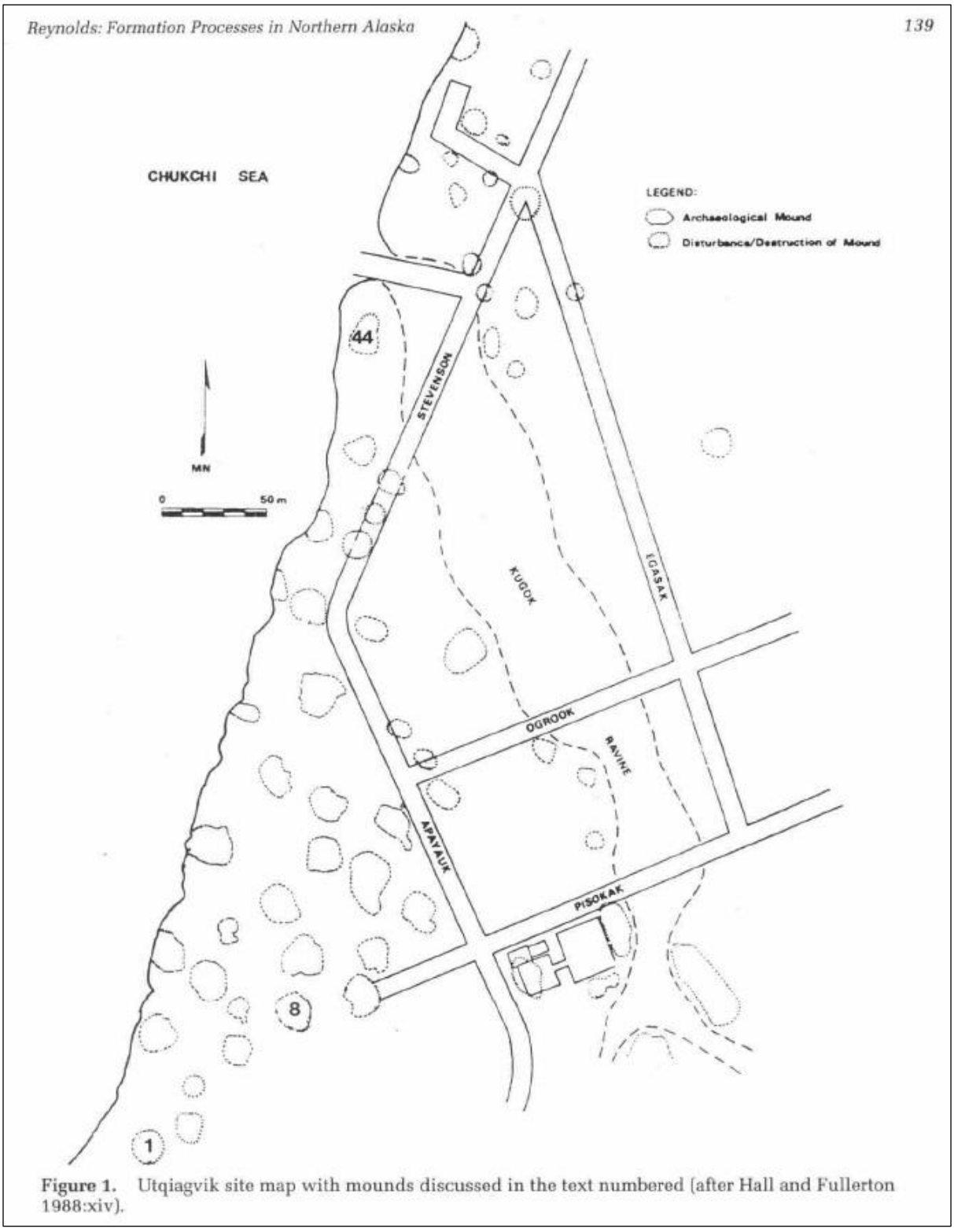


**Figure 1.** Utqiagvik site map with mounds discussed in the text numbered (after Hall and Fullerton 1988:xiv).

Figure 8. Sketch map of the Utqiaġvik Village site (BAR-002), with modern roads and some buildings drawn in relation to the mounds (from Reynolds 1995).

Archaeological excavations have recovered bone, stone, ivory, baleen, and wood artifacts from the Utqiaġvik Village site. Human remains have also been recovered from a number of house features. Artifacts and human remains were identified *in situ* in a protocontact house that was crushed by an

*ivu* while the inhabitants were sleeping. An *ivu* is a specific type of ice movement, formed when a combination of strong winds, temperature changes, tidal change, and current all work in tandem to push sections of sea ice onto itself or onto land. This can push other ice or objects, or in some cases the ice would calve after being pushed up and crush anything underneath it (Reynolds 1995). The Utqiaġvik Village site was determined to be eligible for the NRHP by the Keeper of the National Register (OHA 2018). It is actively eroding out of the bluff in southern Barrow as seasonal storms continue to impact the coastline (Figure 2).

Figure 9. Section of BAR-002 eroding out of the bluff in 2017.

Other known cultural resources near the APE include two historic properties and four unevaluated properties. The Refuge Station (Brower Café) (BAR-012) is the oldest frame building in the Alaskan Arctic. It was constructed in 1893 by the government to be a whaler refuge station. It was acquired by Charles D. Brower in 1897 as the base of his whaling and trading station, which came to be known as Browerville (BAR-007). The building was repurposed as a café in 1977, and is still in good condition. It has fulfilled a number of functions throughout its life, and is known for its association with most of the explorers, whalers, scientists, missionaries, politicians, entrepreneurs, and adventurers who visited the region. The site was listed on the NRHP in 1980 (OHA 2018).

The Naval Arctic Research Laboratory (BAR-075), or NARL, is a historic complex. The Navy constructed most of the building in 1944; this Point Barrow Camp supported naval oil exploration at NPR 4. The Navy established the Arctic Research Laboratory on site in 1946, and the complex

was officially renamed as “NARL” in 1965. Of the original 190 or so structures, 46 are still standing. This site was determined to be eligible for the NRHP in 2011 (OHA 2018).

The Browerville site (BAR-007) was named after Charles D. Brower, who established a whaling station in the Barrow area in 1886. He later established a trading post near the Refuge Station (BAR-012). The Browerville site has not been evaluated for its eligibility for the NRHP (OHA 2018). Esatkuat (BAR-009) was a former Iñupiat camp which was reported in 1892 by Sgt. John Murdoch. It was reportedly located at the northwestern end of Esatkuat Lagoon. Murdoch (1892:27) states that the site was already ancient by the time he wrote of it, but does not go into any further description. This site has not been evaluated for its eligibility for the NRHP (OHA 2018). A house owned by Dora Elavgak (BAR-016) is one of the oldest frame structures in Browerville. It was constructed in 1890 with lumber left over from the construction of the Charles D. Brower trading post; the approximate size of the house is 10 feet by 15 feet (Alaska Army National Guard 2009). The site has not been evaluated for its eligibility for the NRHP (OHA 2018). The Browerville Ice Cellar (BAR-060) is a traditional ice cellar associated with the Browerville site (BAR-007). Although it has not been evaluated for its eligibility for the NRHP (OHA 2018), it is identified as an important tourist attraction by the community (Figure 3).

Figure 10. Ice cellar (BAR-060) near the Refuge Station (Brower Café) in 2017.

*Impacts on Cultural Resources by Reach*

The project area encompasses 5 miles of beach along Barrow, stretching from the bluffs west of the airport to NARL. This area includes a large number of cultural resources throughout the community. The Recommended Plan would construct a barrier for all the proposed reaches along the shoreline, protecting the entire community. As BAR-002 is located within Reach 1 and the southwestern portion of Reach 2, it would be adversely impacted by the construction of the barrier. However, without the protective barrier, the site would be exposed to further storm damage and erosion, which in turn exposes more of the permafrost within the site to air and increases its thawing, and calving into the beach. Beyond BAR-002, no other sites within the area are within the area of potential effect; however, if a reach was not constructed, the nearby cultural resources would be exposed to storm surges and flooding (Table 2). This would have the effect of either immediate destruction of these resources or would cause cumulative damage that would damage their integrity.

Table 7. Table of sites protected by reach.

| Reach | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Site within APE | Yes | No | No | No | No | No |
| Sites Protected | 7 | 11 | 3 | 3 | 1 | 14 |

Each alternative, other than the Recommended Plan, would leave sections of the coast exposed to storm surges and flooding. If a storm event was large enough, the flooding could potentially spread to areas that have barriers, causing the cultural resources in that area to be affected.

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# Attachment 2: Memorandum of Agreement (MOA)