SITKA HARBOR, ALASKA
CHANNEL ROCK BREAKWATERS

DEFICIENCY CORRECTION EVALUATION REPORT

Appendix A

FINDING OF NO SIGNIFICANT IMPACT
and
ENVIRONMENTAL ASSESSMENT

June 2011

ENVIRONMENTAL ASSESSMENT

AND

FINDING OF NO SIGNIFICANT IMPACT

Channel Rock Breakwaters

Corrective Navigation Improvements

Sitka Harbor, Alaska

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
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MARCH 2011

FINDING OF NO SIGNIFICANT IMPACT

Channel Rock Breakwaters
Corrective Navigation Improvements
Sitka, Alaska

In accordance with the National Environmental Policy Act (NEPA) of 1969, as amended, the U.S. Army Corps of Engineers, Alaska District (Corps), prepared an environmental assessment (EA) which evaluated the potential environmental impacts of the Channel Rock Breakwaters corrective navigation improvements project in Sitka, Alaska.

Background

In 1992, the Corps completed an environmental impact statement for the original Channel Rock Breakwaters, Sitka Harbor project. The Corps, along with the City and Borough of Sitka, its non-Federal sponsor, completed construction of the Channel Rock Breakwaters project in 1995 to provide protection for Thomsen Harbor and to protect additional moorage that would be constructed in the natural anchorage and channel between Sitka and Japonski Island. After the Channel Rock Breakwaters were constructed, Sitka Harbor users and the city reported that excessive wave energy entering through the breakwater gaps adversely affected harbor use and damaged boats and harbor facilities during high tide and swell conditions.

Congress provided the Corps with funding from 2001 through 2003 to study the excessive swell in the harbor. Additional Congressional legislation in 2005 and in 2007 defined the problem and specified the general solution, that is, the damages being experienced resulted from design deficiencies and the design deficiencies should be corrected by adding to, or extending, the existing breakwaters to reduce wave and swell motion. The same Congressional legislation also directed the Secretary of the Army acting through the Corps' Chief of Engineers to design and construct the Channel Rock Breakwaters corrective measures.

In response to this Congressional legislation, Corps Headquarters issued consolidated guidance instructing the Corps to prepare a Deficiency Correction Evaluation Report (DCER) which, among other things: (1) describes the corrective action's impacts on prior environmental concerns and commitments; (2) documents any mitigation requirements resulting from implementing the corrective action; and (3) documents the coordination of the corrective action with applicable Federal and State agencies.

After carefully evaluating as many as 18 corrective action plans, the Corps selected an alternative (Alternative 4) that would construct a 315-foot-long extension to connect the main breakwater and the south breakwater. Breakwater material from an established and permitted quarry operation would be placed into the marine environment using the same traditional ecologically-sound engineering methods used to construct the original Channel Rock Breakwaters in 1995. Approximately 9,000 cubic yards of armor stone, 13,000 cubic yards of B-type rock, and 30,000 cubic yards of core material would be required. The armor and B-type rock on the existing breakwater would be removed where the extension begins. Approximately

3,000 cubic yards of armor stone and 1,100 cubic yards of B-type rock would be removed at the southern end of the main breakwater and used in construction of the extension. The estimated cost for this alternative is $8,140,000.

Federal, State of Alaska and Public Coordination

The EA was coordinated with numerous State of Alaska and Federal agencies, and via a Public Notice (ER-11-04) dated April 4, 2011, the public was provided 30 days to review and comment on the EA and unsigned Finding of No Significant Impact (FONSI). Public comments were received only from the City and Borough of Sitka and the Sitka Tribe of Alaska, both of which commented on issues surrounding the potential quarry site of Kasiana Island.

Both the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) have provided input under authority of the Endangered Species Act, Marine Mammal Protection Act, and Fish and Wildlife Coordination Act. The NMFS also provided essential fish habitat information under the authority of the Magnuson-Stevens Fishery Conservation and Management Act. Harbor water quality and circulation issues were coordinated with staff biologists from the USFWS, NMFS and the Alaska Department of Fish and Game (ADF&G). The Corps also completed an evaluation to determine consistency with Section 404(b)(1) of the Clean Water Act, which governs discharge of dredged or fill material. The Corps and the Alaska State Historical Preservation Officer determined that the project would not affect known historical or prehistoric resources.

The Alaska Division of Coastal and Ocean Management coordinated the State's review of the Corps' proposed action for consistency with the Alaska Coastal Management Program (ACMP). Based on an evaluation by the Alaska Department of Environmental Conservation, ADF&G, Alaska Department of Natural Resources, and the Sitka Coastal District, the State of Alaska concurred with the Corps' determination that its proposed activities, which include specified mitigation measures, are consistent with the ACMP to the maximum extent practicable.

Evaluation and Findings

<u>Source of Quarry Rock</u>. The Corps typically does not identify a source of quarry rock for its projects and encourages construction contractors to select existing quarries as a rock source. In this project's case, the Corps assumed for project cost-estimation purposes, all rock needed for breakwater construction would be obtained from an existing commercial quarry on Kasiana Island. However, based on comments received from the City and Borough of Sitka and the Sitka Tribe of Alaska, the Corps' assumption was wrong. Therefore, the project's bidding document will not identify the Kasiana Island site as the project's source of quarry rock. If the chosen construction contractor selects other than an existing operational quarry, the Corps would perform an extensive NEPA review of the selected quarry in coordination with State of Alaska and Federal agencies, the results of which might involve the contractor having to obtain additional permits and/or other forms of authorization from State, Federal and local government agencies. Proposals to operate out of an existing quarry would also be evaluated and environmental concerns, if any, would be coordinated with State and Federal resource agencies.

Fish and Wildlife Resources. The primary environmental issues associated with the proposed corrective action focused on the project's potential impacts on Pacific herring, water quality and circulation, marine mammals, soft/mixed bottom essential fish habitat (EFH), and Endangered Species Act (ESA) species; however, environmental benefits associated with the project were also identified. The Corps expects that within 5 years the newly placed armor rock will be recolonized with mature marine algae, thus creating high-value Pacific herring spawning habitat and rocky subtidal EFH. Therefore, the overall environmental benefits lead the Corps to conclude that the described Federal action may affect, but is not likely to adversely affect, EFH and EFH-managed species/species complexes for Gulf of Alaska groundfish and Alaska stocks of Pacific salmon.

The Corps has determined that its proposed action may affect, but is not likely to adversely affect, the Pacific herring Southeast Alaska distinct population segment (DPS), a candidate ESA species. Because the Corps' project would have minimal effects on the Pacific herring stock or their spawning areas, indirect effects on humpback whales (an endangered species) would be negligible and not measurable. Therefore, the Corps has determined that its proposed action may affect, but is not likely to adversely affect, the humpback whale. The Corps has also determined that its proposed action: (1) may affect, but is not likely to adversely affect, the endangered Steller sea lion western DPS and threatened Steller sea lion eastern DPS; and (2) not effect designated critical habitat for threatened or endangered Steller sea lions.

By conducting circulation studies, the Corps determined that water circulation behind the breakwaters would be sufficient to not cause water quality degradation.

No historical, archeological or cultural resources would be adversely affected by the Corps' recommended plan.

The Corps believes, and the State of Alaska has concurred, that its corrective action is consistent with State and local coastal zone management programs to the maximum extent practicable.

Incorporating the following mitigation measures into the recommended plan is expected to ensure that no adverse impacts would occur on local fish and wildlife resources, including ESA-listed species, marine mammals and EFH.

- The proposed action shall cease in-water construction between March 15 and June 1 during peak herring spawn activities, juvenile salmon outmigration and rearing activities, and when Steller sea lion and humpback whale feeding and abundance is expected to be greatest in the project area.

- To minimize the danger to marine mammals from project-related vessels, speed limits (e.g. less than 8 knots) shall be imposed on vessels moving in and around the project area.

- Project-related vessels and barges shall not be permitted to ground themselves on the bottom during low tide periods, unless there is a human safety issue requiring it.

- A construction oil spill prevention plan shall be prepared.

- Breakwater construction shall use core material, B rock and armor stone clean of organic debris and invasive species.

- To accelerate recolonization of the new breakwater segment, all armor rock removed from the existing breakwaters that have established colonies of sessile or attached adapted marine organisms and marine algae shall be used in constructing the new breakwater face.

- Project-related vessels shall not travel within 3,000 feet of designated Steller sea lion critical habitat (haulouts or rookeries).

Overall, the Corps expects the environmental impacts associated with the recommended action to be short term and not have any long term, significant, or cumulatively adverse impacts on the area's fish and wildlife resources. Therefore, the Corps concludes: (1) the Channel Rock Breakwaters corrective navigational improvement project in Sitka Harbor, Alaska does not constitute a major Federal action significantly affecting the quality of the human environment; and (2) the preparation of an environmental impact statement is not necessary.

Reinhard W. Koenig
Colonel, Corps of Engineers
District Commander

23 Jun 11
Date

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ENVIRONMENTAL ASSESSMENT

1.0 INTRODUCTION

1.1 Project Purpose and Need

The U.S. Army Corps of Engineers, Alaska District (Corps), along with the City and Borough of Sitka (CBS), its non-Federal sponsor, completed construction of the Channel Rock Breakwaters feature of the Sitka Harbor complex in 1995 to provide protection for Thomsen Harbor and to protect additional moorage that would be constructed in the natural anchorage and channel between Sitka and Japonski Island. After the Channel Rock Breakwaters were constructed, harbor users and the city reported that excessive wave and swell motion entering through the breakwater gaps damaged boats and harbor facilities during high tide and swell conditions.

Congress provided the Corps funding from 2001 through 2003 to study the subject excessive swell. In May 2002, the Corps completed a Section 905(b) Analysis and recommended further study. Additional Congressional legislation in 2005 and in 2007 defined the problem and specified the general solution: the damages being experienced are a result of design deficiencies and the design deficiencies should be corrected by adding to, or extending, the existing breakwaters to reduce wave and swell motion. The same Congressional legislation also directed the Secretary of the Army, acting through the Corps' Chief of Engineers, to design and construct the Channel Rock Breakwaters corrective measures.

In response to the Congressional legislation and Corps Headquarters-issued guidance, the Corps Alaska District was instructed to prepare a Deficiency Correction Evaluation Report (DCER) which, among other things: (1) describes the corrective action's impacts on prior environmental concerns and commitments; (2) documents any mitigation requirements resulting from implementing the corrective action; and (3) documents the coordination of the corrective action with applicable Federal and state agencies. The Corps' DCER, in addition to the three aforementioned items, evaluated potential alternative corrective actions, considered the environmental and social impacts of the actions, and recommended a plan to alleviate the identified problems.

1.2 Project Location

Sitka is in the southeastern panhandle of Alaska (figure 1), 862 miles northwest of Seattle, 95 miles south southwest of Juneau, the state capitol, and 185 miles northwest of Ketchikan. The city of about 8,600 residents is on the eastern shore of Sitka Sound, a bay on the western coast of

Figure 1. Sitka Location and Vicinity Maps. Sitka is located on the Southeast Panhandle of Alaska, about midway by air between Seattle, Washington and Anchorage, Alaska.

Baranof Island in Southeast Alaska. The Corps' Sitka Harbor project area is composed of four separable navigation features: Harbor Rock Channel, Crescent Bay Basin, Forest Service Basin, and the Channel Rock Breakwaters. The Channel Rock Breakwaters feature crosses the western channel area of Sitka Sound about 0.6 mile northwest of Eliason Harbor (figure 2), and provides wave protection for Eliason Harbor, Thomsen Harbor, and other shoreline facilities along Sitka Channel (figure 3).

The Sitka coastline is within the Alaska Coastal Management Program, a program for the protection of activities and development in the coastal areas of Alaska. The Sitka Coastal Management District includes the entire 4,710 square miles of coastal area within the political jurisdiction of the CBS. In this plan, projects that are water-dependent or have no other feasible alternative are given priority.

1.3 National Environmental Policy Act

In 1992, the Corps completed an environmental impact statement (EIS) for the original Channel Rock Breakwaters, Sitka Harbor project (USACE, 1993). During its development the Corps worked with Federal and State agencies, city officials, and interested citizens to gain insight into harbor needs and potential environmental impacts. Areas of controversy were identified (e.g. degradation of water quality and destruction of herring spawning habitat) and resolved by developing a suitable mitigation plan that included now-completed long-term monitoring of herring spawning habitat/success and water quality.

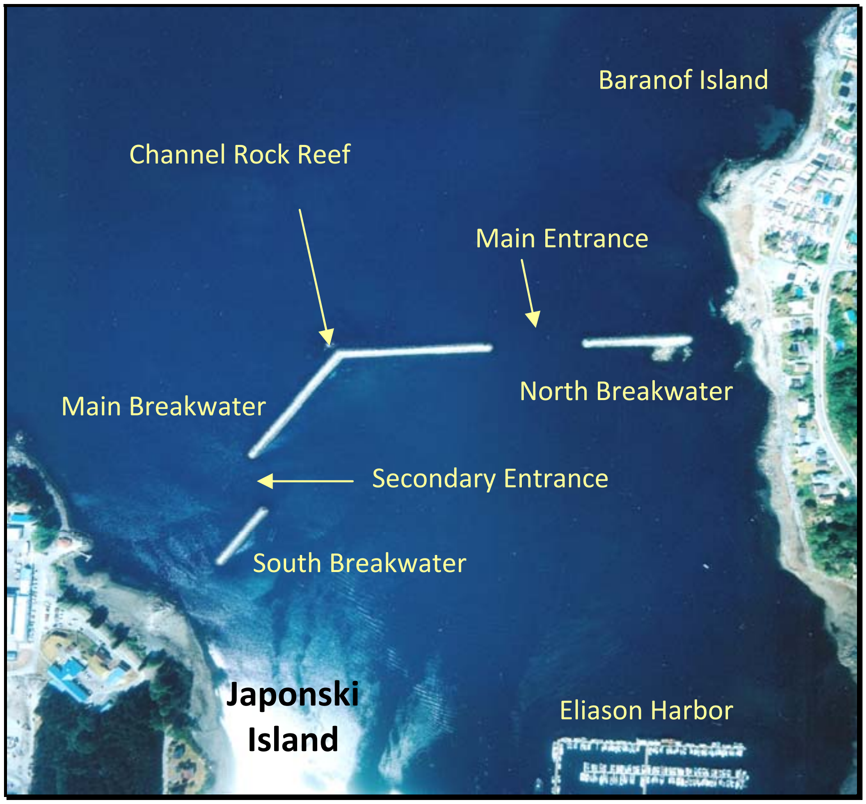

Figure 2. Channel Rock Breakwaters and western anchorage area. North is at the top of the page.

Figure 3. Looking from southwest, showing Channel Rock Breakwaters, Western Anchorage, Thomsen Harbor and Eliason Harbor.

Federal and State of Alaska environmental laws were reviewed for the project. The Corps determined consistency with Section 404(b)(1) of the Clean Water Act, which governs discharge of dredged or fill material, and the State of Alaska issued the Corps a 401 Water Quality Certification, meaning that the project complies with State of Alaska water quality standards. The State of Alaska found the project consistent with its Alaska Coastal Management Program, as did the CBS. The U.S. Fish and Wildlife Service (USFWS) prepared a final Fish and Wildlife Coordination Act report, which included a monitoring study plan and mitigation plan. Coordination with the USFWS and National Marine Fisheries Service (NMFS) pursuant to the Endangered Species Act was conducted. At that time, the NMFS found that the project would have no effect on threatened and endangered species and the USFWS determined that no federally-proposed or listed threatened and endangered species under their purview occurred in or near the project area.

In concert with the preparation of the DCER the Corps' Alaska District has prepared this environmental assessment (EA) which: (1) complies with Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA); (2) determines whether the proposed federal action (i.e. the Sitka Harbor design deficiency corrective action) is a major action significantly affecting the quality of the human environment; and (3) assists the Corps Alaska District in determining if the environmental impacts associated with the proposed federal action require preparing an environmental impact statement.

The subject DCER and EA are prepared in accordance with Engineer Regulation (ER) 1165-2-119 *Modifications to Completed Projects*; ER 1105-2-100 *Planning Guidance Notebook, Principles and Guidelines* adopted by the Water Resources Council; CEQ and guidance for implementation of the NEPA; ER 200-2-2 *Procedures for Implementing NEPA*; and Corps Headquarters guidance dated May 15, June 16, and October 7, 2009, and January 7, 2010.

2.0 CORRECTIVE ACTION ALTERNATIVES

The proposed corrective action's planning objective is to reduce the existing wave and swell motion behind the Channel Rock Breakwaters in a cost effective manner for the remaining life of the project. The Corps used a cost effective analysis to screen out plans that produced the same output level (i.e. desired results of energy reduction at Eliason Harbor) as another plan, but cost more, <u>or</u> cost either the same amount or more than another plan, but produced less output. The Corps assumed that all rock needed for breakwater construction would be obtained from an existing commercial quarry on Kasiana Island, 2 miles north of the breakwaters and placed into the marine environment using the same traditional ecologically-sound engineering methods used to construct the original Channel Rock Breakwaters is 1995. See Appendix 1 for a description of rubble mound breakwater construction methods and materials. Of the 18 plans screened, only four plans (1, 4, 14, and 15) were determined by the Corps to be cost effective and most responsive to project objectives. Therefore, the four plans were identified as alternatives, developed in more detail, and environmentally evaluated.

2.1 Alternatives Considered in Further Detail

In this and the remaining sections of the EA, the aforementioned four plans are referred to as alternatives and use the same numbering system used in the DCER. For comparative purposes and as required by CEQ, this section also introduces the No-Action as an alternative.

2.1.1 No-Action Alternative

No project design changes or construction is associated with the No-Action alternative. Existing Channel Rock Breakwaters features would remain in place and unaltered. No construction costs are associated with the No-Action alternative.

2.1.2 Alternative 1, Japonski Island Breakwater

Alternative 1 would involve constructing a 500-foot-long stub breakwater from Japonski Island to provide a 100-foot overlap of the existing south breakwater. Plan views of this alternative are shown in figure 4, the cross section for the head of the breakwater in figure 5, and the cross section for the trunk of the breakwater in figure 6. Approximately 7,000 cubic yards of 2,000-pound armor stone, 10,000 cubic yards of B rock, and 21,000 cubic yards of core material will be required for this alternative. The estimated cost of constructing this alternative is $6,981,000.

Figure 4. Alternative 1, stub breakwater, would extend from the Japonski Island shore northward to form a 100-foot overlap with the south breakwater–drawings not to scale.

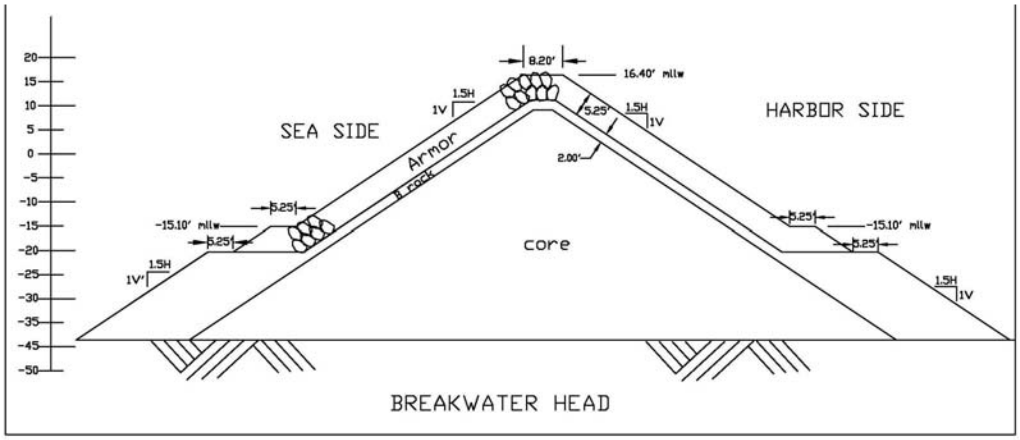

Figure 5. The Breakwater Head Cross Section is common to Alternatives 1 and 15.

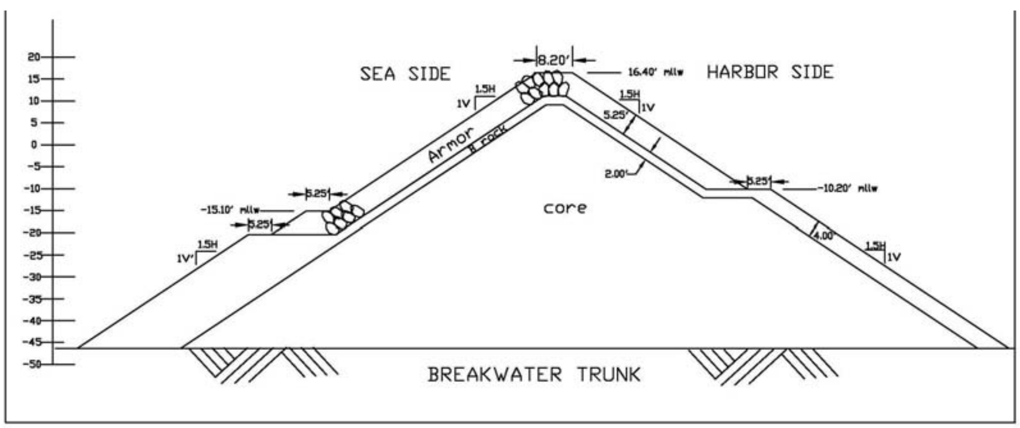

Figure 6. The Breakwater Trunk Cross Section is common to Alternatives 1 and 4.

2.1.3 Alternative 4, Breakwater Gap Closure

Alternative 4 would construct a 315-foot extension to connect the main breakwater and the south breakwater. Plan views of this alternative are shown in figure 7. The cross section of the breakwater extension trunk is illustrated in figure 6. Approximately 9,000 cubic yards of armor stone, 13,000 cubic yards of B rock, and 30,000 cubic yards of core material would be required for this alternative. The armor and B rock on the existing breakwater would be removed where the extension begins. Approximately 3,000 cubic yards of armor stone and 1,100 cubic yards of B rock would be removed at the southern end of the main breakwater and used in construction of the extension. The estimated cost for this alternative is $8,140,000.

Figure 7. Alternative 4 closes the gap between the existing main and south breakwaters – drawing not to scale.

2.1.4 Alternative 14, Breakwater Combination

Alternative 14 would combine all the construction features of alternatives 1, 4 and 15, that is, expand the existing breakwaters and close or reduce gaps with four construction features as follows:

- A 500-foot stub breakwater from Japonski Island would overlap the gap between Japonski Island and the south breakwater and reduce wave energy through this gap;
- A 315-foot-long extension would connect the main breakwater and the south breakwater to reduce wave energy focused through this area from the Gulf of Alaska;
- The north end of the main breakwater would be extended 450 feet at an angle to overlap the north breakwater by 100 feet and reduce wave energy through the main entrance channel;
- The south end of the north breakwater would be extended 60 feet to further reduce entrance channel width and wave energy through it.

Plan views of this option are shown in figure 8. Larger armor stone would be used for the angled extension of the main breakwater at the entrance channel because modeling shows it would be struck by waves traveling down the length of the main breakwater. Core rock height would be reduced in the angled section to accommodate the larger armor rock without raising the breakwater extension higher than the main breakwater.

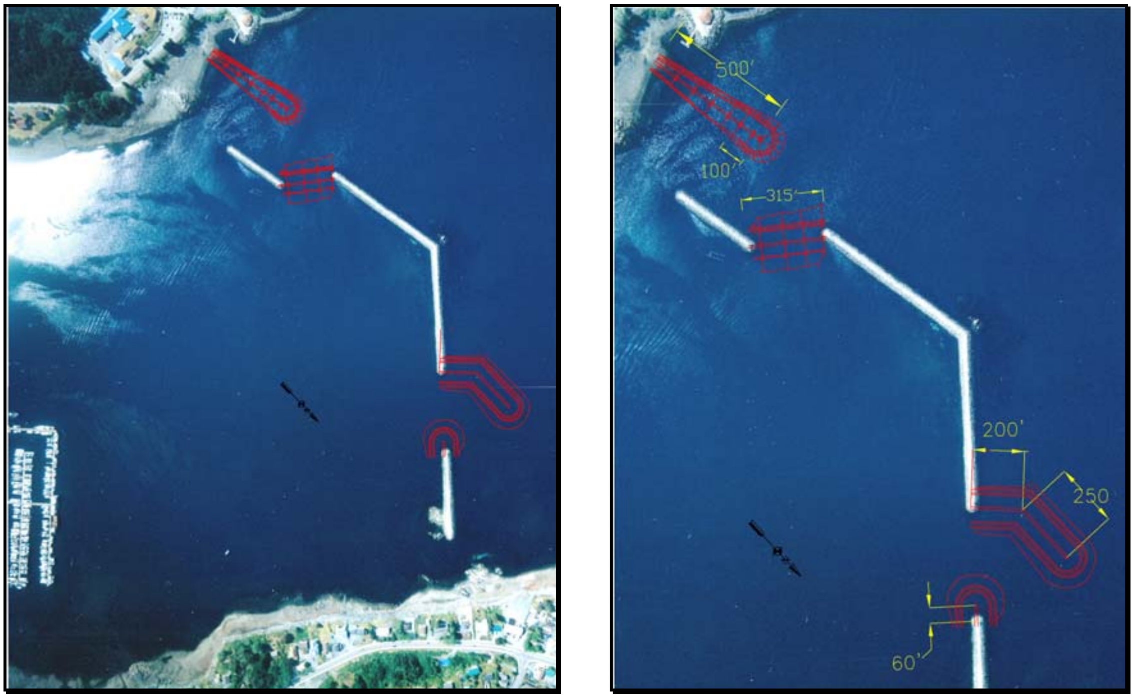

Figure 8. Alternative 14 combines Alternatives 1, 4, and 15 – drawing not to scale.

Approximately 21,000 cubic yards of 4,800-pound armor stone, 16,000 cubic yards of B rock, and 48,000 cubic yards of core material would be used for the angled extension. Approximately 21,000 cubic yards of 2,000-pound armor stone, 28,000 cubic yards of B rock, and 58,000 cubic yards of core material would be required for the remainder of the breakwater modifications. The armor and B rock on the existing breakwater would be removed at the junction of the extension and would be used in construction. The estimated cost for this alternative is $25,529,000.

2.1.5 Alternative 15, Main Breakwater Extension

Alternative 15 would construct an angled extension on the main breakwater and extend the north breakwater to narrow the large gap. The angled extension would be 450 feet long and the stub extension would be 60 feet long. Plan views of this option are shown in figure 9 and a cross section for the angled extension is shown in figure 5. The north breakwater extension cross section is shown in figure 10. A larger wave height was used to size the armor stone for the angled extension because waves travel along the length of this breakwater and would be forced to turn at the extension. Approximately 21,000 cubic yards of armor stone (4,800 pounds), 16,000 cubic yards of B rock, and 48,000 cubic yards of core material would be required for this option. The stub extension would require 5,000 cubic yards of 2,000 pound armor, 5,000 cubic yards of B rock, and 7,000 cubic yards of core material. The armor and B rock on the existing breakwater will be removed where the extension begins. Approximately 3,500 cubic yards of armor and 1,000 cubic yards of B rock would be removed and used for construction of the north breakwater extension. The estimated cost of this alternative is $14,401,000.

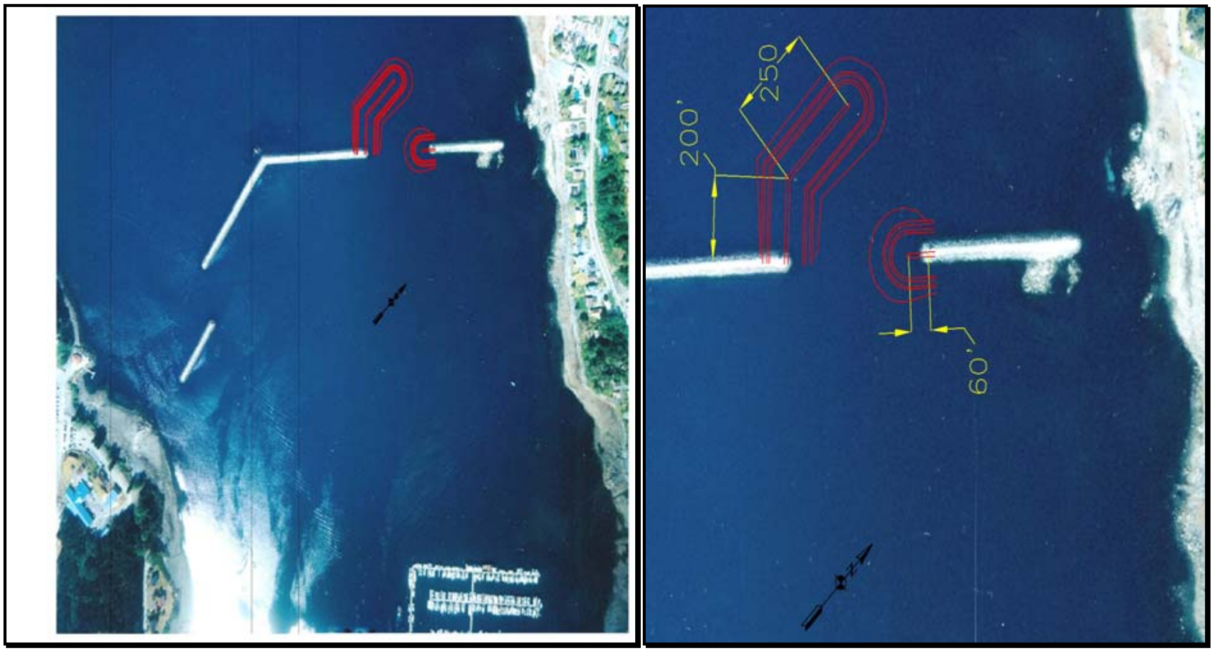

Figure 9. Alternative 15 would provide an angled extension to the main breakwater and a straight extension to the north breakwater, creating a 100 foot overlap – drawing not to scale.

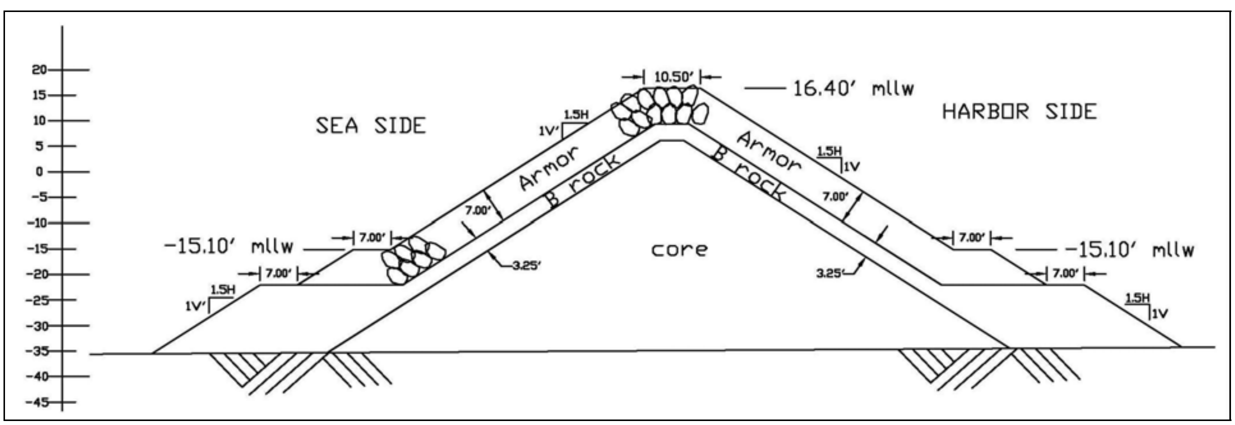

Figure 10. Main Breakwater Extension and North Breakwater Extension Cross Section - Alternative 15.

2.2 Recommended Corrective Action

Oceanographic modeling results indicate that by closing the main/south breakwater gap the wave energy at Eliason Harbor would be reduced by 30 percent to 50 percent. Model tests also show that closing the main/south breakwater gap would significantly reduce wave energy in the southwest harbor area near Japonski Island for all concerned wave periods. The recommended course of action is to select Alternative 4, closing the opening between the main and south breakwaters by adding a similar breakwater segment, as the recommended corrective action. No maintenance dredging is expected to be required.

3.0 AFFECTED ENVIRONMENT

The purpose of this section is to briefly describe the existing environmental conditions of the potentially affected geographic area and focus on those environmental resources potentially susceptible to adverse impacts.

The 1992 Sitka Harbor Final EIS (USACE, 1993) for the original project is incorporated by reference and contains a detailed description of the affected environment prior to the breakwaters being constructed in 1995. Since 1995, more-detailed environmental information about the Sitka Harbor area and its breakwaters has become available. Much of what is available was used to help prepare the Sitka Rocky Gutierrez Airport Improvement Projects Final EIS (FAA, 2009) and other environmental documents. For example, marine wildlife surveys were conducted during the winter 2006 (Oceanus Alaska, 2006). Other fish and wildlife surveys were conducted as part of the Corps' mitigation monitoring plan for the original Channel Rock Breakwaters project, such as Pacific herring spawn deposition surveys (1993-1998), a survey designed to evaluate development of Pacific herring spawning habitat on the armor rock of the new breakwaters, and harbor sediment and water sampling.

Brief synopses of the Sitka area's environmental resources follow.

3.1 Marine Environment

The variety of marine habitat found in the Sitka area ranges from calm protected embayments to high energy, wave-swept exposed coastlines. The vast majority of the Sitka waterfront area is a rocky shoreline. However, the seafloor in the project area contains a mosaic of bottom types including a mixed-soft bottom (mixture of silt, sand, pebbles, cobbles, boulders, and shell) and bedrock outcrops. All these habitats support a wide variety of fish and wildlife species, including those important for commercial, sport, and subsistence uses.

3.1.1 Mammals

The following NMFS-managed marine mammals have been observed in the Sitka Sound area: killer whales, gray whales, harbor porpoise, Dall's porpoise, minke whale, sperm whale, Pacific white-sided dolphin, pygmy sperm whales, humpback whales, fin whales, Steller sea lions, and harbor seals. The only USFWS-managed marine mammal known to occur in the Sitka Harbor area is the northern sea otter. All marine mammals are protected under the federal Marine Mammal Protection Act (MMPA), and selected marine mammals are also protected under the Endangered Species Act (ESA).

Killer Whale: In general, it is likely that transients and resident populations of killer whales use Sitka Sound habitats when seeking foraging opportunities. They are known to cruise the open water portions of Sitka Sound, and transit the eastern, western and middle channels to inner Sitka Sound, probably feeding on king salmon. Although their visits to inner Sitka Sound does not appear to be frequent, the habitats within the project area likely provide important prey or other attributes important for this species.

Gray Whale: This species is not considered a resident of Southeast Alaska, and there is no estimate of abundance for gray whales in the vicinity. On occasion, gray whales frequent Sitka Sound. A gray whale was observed in Whiting Harbor on April 4, 2005, foraging along the edge of a kelp bed and then along the edge of the large eelgrass bed in the western reaches of Whiting Harbor (FAA, 2009). It is likely the whale was targeting Pacific herring, which were schooled for spawning during that period (FAA, 2009).

Harbor Porpoise: Federal Aviation Administration (FAA) reports that during weekly wildlife hazard surveys conducted at the Sitka airport over one year (1998-1999), harbor porpoises were seen frequently, feeding in nearshore waters around the airport. Local residents and tour operators have reported commonly seeing harbor porpoise elsewhere in Sitka Sound, including in the Sitka Channel. There is no information available on the number of harbor porpoise occupying Sitka Sound, but available information suggests that 10 to 20 animals may be distributed in Sitka Sound at any given time (FAA, 2009).

Dall’s Porpoise: Dall’s porpoise more commonly occur in the more exposed areas of Sitka Sound. However, tour boat operators and fishermen anecdotal information suggests that Dall’s porpoise are seen infrequently. FAA (2009) states that there are no confirmed reports of Dall’s porpoise in the Japonski Island area, though they are known to travel through the vicinity.

Harbor Seals: Within the Japonski Island area, which defines the west side of the Corps’ project area, members of the Sitka Tribe of Alaska conveyed that harbor seals stay inside nearby Whiting Harbor from January through spring months and early summer, preparing for bearing pups (FAA, 2009). During winter surveys conducted by FAA (2009), harbor seals were seen as individuals, distributed throughout their study area around Japonski Island, but mostly they were observed close to shore. Harbor seals are also frequently seen swimming in Sitka Channel between the bridge to Japonski Island and the Channel Rock Breakwaters. The nearest haulout to Corps’ project area is at Apple Islands, located 1.6 nautical miles to the northeast and local boaters report that the Apple Islands site is used heavily by mothers and pups earlier in summer (FAA, 2009). Overall, the vicinity around the Corps’ project area provides refuge and foraging habitat for harbor seals similar to that found throughout inner Sitka Sound.

Northern Sea Otter: Sea otters in the Southeast Alaska stock are not listed as “depleted” under the MMPA or listed as “threatened” or “endangered” under the ESA. However, all northern sea otters are listed by the State of Alaska as a species of special concern under their listing program. A Species of Special Concern is any species or subspecies of wildlife or population of mammal native to Alaska that has entered a long-term decline in abundance or is vulnerable to a significant decline due to low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance. In general, northern sea otters are widely distributed in Sitka Sound and commonly occur in the Corps' project area. During FAA (2009) spring surveys around Japonski Island, a total of 45 sea otters were observed; however, several sightings were likely repeat sightings of the same individuals.

Other Marine Mammals: The following marine mammal species have been observed in southeast Alaska and may occur in Sitka Sound on an infrequent to rare basis: minke whale, fin whale, sperm whale, Pacific white-sided dolphin, pygmy sperm whale. Based upon available information, these species are unlikely to rely upon habitats in the project area, but may travel through the vicinity of Sitka (FAA, 2009).

The humpback whale and Steller sea lion (both the eastern distinct and western distinct populations) are protected under the ESA and their status is discussed respectively in sections 3.3.1 and 3.3.2 (Threatened and Endangered Species).

3.1.2 Benthos and Phycology

Prior to the Channel Rock Breakwaters being constructed, the USFWS conducted subtidal dive surveys of the benthic habitat and infaunal habitat within the footprint of the proposed breakwaters. Several habitat types were associated with the Channel Rock Breakwaters area: unconsolidated bottom, bedrock and aquatic bed algal/bedrock. The overall biomass and numbers of individuals collected from the project footprint area was greater than those collected from other areas in the Sitka sound area. Major infauna species collected were polychaete worms, little neck clams, cockle, and butter clams.

Post-construction subtidal surveys of the Channel Rock Breakwaters by the USFWS, both seaward and harbor side, revealed robust stands of algae. The primary difference between the outside and inside of the breakwaters was the presence of perennial kelp (*Macrocystis pyrifera*) outside the harbor, and its near absence inside. Several species were represented although sugar kelp (*Laminaria saccharina*) and fringed sieve kelp (*Agarum fimbriatum*) were dominant and provided the greatest coverage. Sea hair, which dominated the inside of the breakwaters in 1996 and 1997, was largely replaced by larger-bladed species of algae that provided better substrate for herring spawn. Use of the breakwater algae by spawning Pacific herring has been documented in 1996 and 1998 (USFWS 1996, ADF&G 1998). Other marine surveys conducted in the area discovered blue mussels, cockles, butter clams, and horse clams in the rocky, sandy, and muddy intertidal zone, as well as many species of worms, marine snails, chitons, abalone, sea stars, crabs, sea urchins, and octopus, in other coastal habitats (FAA, 2000).

3.1.3 Fishery Resources and Essential Fish Habitat

Many species of fish and shellfish reside in the project area. Chief among them are Pacific salmon and herring, various species of bottomfish, and several species of crab, shrimp, and other shellfish. Many other groups of fish contribute to the Sitka Sound forage base, each of which is represented by many species: rockfishes, greenling, flatfishes, blennies, sculpins, poachers, gunnels, and eelpouts.

Pacific herring is an ecologically and commercially important fish species that occurs abundantly in both the project and surrounding area. Pacific herring typically congregate in large schools at traditional sites along the shore, spawning in shallow vegetated areas in the intertidal and subtidal zones. All its life stages are central to the marine food web. Herring provide an abundant, high energy food source for a wide variety of fishes, mammals, and birds. Herring are also commercially important, and support a roe fishery in Sitka that remains one of the largest and most valuable roe fisheries in Alaska. In 1986, about 25.5 million pounds of seafood were landed in Sitka. In the same year, herring spawning habitat in the immediate project area contributed to a $6 million herring sac roe fishery in Sitka Sound. The Pacific herring (Southeast Alaska distinct population segment) is an ESA candidate species and is discussed in more detail in section 3.3.3 (Threatened and Endangered Species).

Section 305(b)(2) of the Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA) requires all Federal agencies to consult with the Secretary of Commerce on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect essential fish habitat (EFH). EFH is defined in the MSA as "…those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The proposed project is located within an area designated as EFH for two fishery management plans (FMP) — Gulf of Alaska Groundfish and Alaska Stocks of Pacific Salmon. These two FMPs include 23 species or species complexes of groundfish and invertebrate resources and the five Pacific salmon species (Table 1). Most probable species to be found in the project area include salmonids, sculpins, flatfish, rockfish, and forage fish. For a description of the life history stages of these species, refer to the relevant EFH designations in NMFS, 2005a and b. Appendix 2 contains the required EFH assessment, which includes a discussion of the possible effects of the proposed corrective action.

3.1.4 Water Quality and Harbor Circulation

Marine waters in Sitka Sound are classified by the Alaska State Water Quality Standards for a variety of uses, including aquaculture, seafood processing, industrial water supply, water contact and secondary recreation, growth and propagation of fish, shellfish, aquatic life and wildlife, and harvesting for consumption of raw aquatic life. However, Sitka's harbor and Sitka Sound are classified by the Alaska Department of Environmental Coordination (ADEC) as Category 3 waterbodies, which means that sufficient data or information does not exist to determine the water quality standards for any of the aforementioned designated uses.

ADEC records indicate that 38 wastewater discharge permits, representing a wide variety of wastewater sources, have been issued for the Sitka area since 2001. Major dischargers include the CBS Wastewater Treatment Plant, Silver Bay Wastewater Treatment Facility, Sitka Beverage

Table 1. Fish with designated essential fish habitat in the Gulf of Alaska Fishery Management Plan area (FAA, 2009; Appendix 3).

Gulf of Alaska Ground Fish		Alaska Stocks of Pacific Salmon
Skates (Rajidae)	Shortraker rockfish	Chinook salmon
Pacific cod	Northern rockfish	Coho salmon
Walleye Pollock	Dusky rockfish	Pink salmon
Thornyheads	Yellowfin sole,	Chum salmon
Pacific Ocean perch	Arrowtooth flounder	Sockeye salmon
Rougheye rockfish	Rock sole	
Yelloweye rockfish	Alaska plaice	
Rex sole	Sculpins (Cottidae)	
Dover sole	Sharks	
Flathead sole	Forage fish complex	
Sablefish	Squid	
Atka mackerel	Octopus	

Corporation Water Filtration Facility, and Sitka Ferry Terminal Wastewater Treatment Facility (FAA, 2008). The CBS Wastewater Treatment Plant traditionally meets National Pollution Discharge Elimination System (NPDES) permitting requirements (No. AK-002147-4). The CBS has a permit, issued by ADEC under the NPDES (No. AKG-57-1016), to discharge up to 36,000 gallons per day of effluent from a wastewater treatment facility into Silver Bay. The Sitka Beverage Corporation has been authorized (ADEC No. 0112-DB001) to discharge 111,000 gallons per day of non-disinfected, untreated backwash water into Silver Bay from their water filtration facility at the Sawmill Cove Industrial Park. The Alaska Department of Transportation and Public Facilities (ADOT&PF) is permitted (ADEC No. 0212-DB003) to treat up to 2,000 gallons per day of effluent from their facility at the Sitka Ferry Terminal. Two seafood processors are also known to be discharging seafood waste into Sitka Channel: Sitka Sound Seafoods and Seafood Producers Coop. By NPDES permits, both processors' outfall systems must adhere to 1 acre of accumulated waste debris with the grinding size of ½ inch. The threshold is 10 million pounds per year. The Sitka Tribe of Alaska has a Department of Defense contract to remove and dispose of the communication cable, which consists of lead and a hemp sheath coated with creosote.

Prior to the project being constructed, the Corps collected water and sediment samples in 1996 in areas that might be affected by the harbor expansion. The samples were collected to determine baseline water and sediment quality and to give a basis of comparison for future sampling. No water quality or sediment quality criteria were exceeded. PCBs were not found in marine sediments and petroleum hydrocarbons and oil/grease levels were below detection limits of 3 milligrams per liter. The purpose of the Corps' 1997 sampling effort was to determine if there was an effect on water and sediment quality that could adversely impact the herring fishery in the vicinity of Thomsen Harbor. None of the 1997 samples were found to exceed water quality or sediment quality criteria; therefore, it was assumed that the herring fishery in the vicinity of the Channel Rock Breakwaters had not been adversely impacted.

The following is an excerpt from the Sitka Rocky Gutierrez Airport, Airport Improvement Projects Final EIS, which summarizes the overall quality of the marine waters in the area (FAA, 2009):

Water quality in marine waters was recently surveyed by the Environmental Monitoring and Assessment Program, which sampled throughout Southeast Alaska in 2004. Although the final report has not been issued, initial review of the available data confirms other findings and conclusions suggesting that urbanization to date has had little effect on regional water quality.

Between 2004 and 2006, the Corps measured various oceanographic parameters to characterize the project area's hydraulic features. Inside the area protected by the Channel Rock Breakwaters, the maximum significant wave height measured was 6 inches with a period of 11.6 seconds; however, the Harbormaster indicated that the sampling occurred during an unseasonably calm season.

A physical model was constructed at the Corps' Hydraulic and Coastal Laboratory at the Engineer Research and Development Center (ERDC) to determine the amount of wave energy that reaches Eliason Harbor and to aid in the development of alternatives. A 5-foot wave height was selected for the majority of runs, which was the original design wave for the breakwaters. Results of the physical model study are documented in the ERDC report: ERDC/CHL TR-08-2 *Physical Model Study of Wave Action in the New Thomsen Harbor* (i.e., Eliason Harbor), *Sitka, Alaska*.

The overall net circulation in the Sitka Sound area is northwestward, parallel to the coastline and the normal tidal range in the area exchanges about 25 percent of the water on each tide. Regional currents are typically driven by water density differences and weather conditions. Local currents are tidally driven with predicted flood tides (rising tides) generally less strong (0.6 knots maximum) than ebb tides (receding tides) (1.2 knots maximum) through the channels on either end of Japonski Island (FAA, 2009). The extreme tide range is approximately 15 feet and the high tide line is at +12.7 feet.

A qualitative circulation study was performed using the ERDC physical model. The study looked at the circulation associated with a falling tide. Circulation associated with wind or wave activity in addition to the tide was not examined, which resulted in a conservative circulation evaluation. Viewing the recordings in time lapse mode revealed general circulation patterns for the existing breakwater configuration and the project alternatives. Locally, the tidal influx enters the harbor through the breakwater gaps and along the shoreline. Water in the protected area behind the breakwaters circulates in a clockwise fashion and exits back through the breakwater gaps.

3.2 Avifauna

Two documents were used primarily as references to describe the avifauna community using the project area: *Appendix 2 - Marine Wildlife Synthesis,* (FAA, 2009) and *Final Fish and Wildlife Coordination Act Report*, (USFWS, 1989). In broad terms, many species, such as common raven, northwestern crow, and gulls are consistently present across seasons. Shorebirds exhibit some degree of seasonality, with higher numbers occurring during spring migration and reduced numbers in winter months. Long-tailed ducks comprise the greatest relative abundance across all seasons.

The following summarizes the field survey work conducted by the FAA in relation to their Sitka Airport improvements project: (FAA, 2009).

> During the winter 2006, divers (e.g. cormorants, long-tailed ducks, and scoters) dominated nearshore surveys in the Japonski Island/Sitka Harbor area. However, on an individual species basis, the bird assemblage was dominated by *Larus* gulls, long-tailed ducks and pelagic cormorants. The spring-time avifauna of the marine waters in the vicinity of the Sitka airport and harbor areas was dominated by *Larus* gulls, bald eagle, northwestern crow, long-tailed duck, scoter species, pelagic cormorants and songbirds. Alcids dominated the bird assemblages observed in all summer offshore surveys. The gull group was second most abundant, followed by shorebirds; however, on an individual species basis, summertime avifauna assemblage was dominated by marbled murrelets, *Larus* gulls, red-necked phalarope and northwestern crow.

The bald eagle is the only raptor directly associated with the marine environment in the Sitka area; however, merlin and northern harrier have been observed in the Sitka area (FAA, 2009). Bald eagles typically hunt fish in nearshore and open water, snatch alcids, seabirds, and gulls flushed from the water or land, and scavenge carrion washed into the intertidal zones. One bald eagle nest is known to exist on Japonski Island and numerous bald eagles perch in trees overlooking the harbor site.

The USFWS lists marbled murrelets as a species of high concern in Alaska (USFWS, 2006). They are also listed as being of high concern in North America and endangered globally, according to the USFWS Alaska Seabird Information Series. The Queen Charlotte goshawk, peregrine falcon, olive-sided flycatcher, and Townsend’s warbler are listed as special species of concern by ADF&G and also have the potential to exist in the project area.

3.3 Threatened and Endangered Species

The following NMFS-managed ESA species may occur in the project area: Humpback whale (Endangered); Steller sea lion (Threatened eastern population and Endangered western population). The Pacific herring Southeast Alaska Distinct Population Segment (DPS) is a NMFS Candidate species. No USFWS-managed ESA species exist in the project area. A brief summary about each species' presence in the Sitka Sound/harbors area follows; however, a more thorough discussion about the species is contained in the Corps' biological assessment, which is being coordinated with the NMFS.

3.3.1 Humpback whale

Humpback whales were listed as endangered under the ESA in 1970, depleted under the MMPA in 1972, and endangered under the State of Alaska Endangered Species list. This species travels through and forages in Sitka Sound throughout the year but is most abundant in spring and summer months. Local boaters have observed humpback whales in the project area "lounging," or resting in Whiting Harbor, and scratching on the intertidal reefs in Whiting Harbor is referred to by some locals as Seal Rocks (FAA, 2009).

3.3.2 Steller Sea Lion, Eastern and Western Distinct Population Segments

In 1997 the NMFS recognized two DPSs: the western DPS and eastern DPS. The segment of the population west of 144° W longitude was listed as "endangered," while the segment of the population east of this delineation remained listed as "threatened". There is no critical habitat designated within the Corps' project area for the western and eastern populations. However, there is one major eastern Steller sea lion haulout approximately 15 miles southwest of Sitka Harbor at Biorka Island. Eastern Steller sea lions occur in Sitka Sound throughout the year, but are in much higher numbers during the spring herring season. Local fishermen and boaters have reported large groups of foraging sea lions in Whiting Harbor, in Sitka Channel, near Sealing Cove, near Middle Island during the bait fishery, and at other times during winter months. Banded western Steller sea lions have been observed within Southeast Alaska eastern Steller sea lion critical habitat: the Kaiuchali Island haulout and the Biali Rocks rookery. From 2001 to 2006, 274 total sightings of western Steller sea lions were recorded in Southeast Alaska; however, these sightings likely represented 66 individuals repeatedly observed: Of the 66 western animals seen in Southeast Alaska, only two tagged western Steller sea lions have been observed at haulouts near Sitka Sound (FAA, 2009).

3.3.3 Pacific Herring, Southeast Alaska Distinct Population Segment

On April 11, 2008, the NMFS announced (73 FR 19824) that they would be initiating a status review for the Pacific herring Southeast Alaska DPS. Status reviews are comprehensive assessments of a species' biological status and its threats, and are the basis for making determinations as to whether a species warrants listing under the ESA. In Southeast Alaska, at least five major herring populations are identified by managers: Sitka, Auke Bay, Craig-Hydaburg, Deer Island-Etolin Island (near Wrangell), and Ketchikan.

3.4 Subsistence Resources

More than 97 percent of Sitka households use subsistence resources and estimated per capita harvest of subsistence resources is more than 200 pounds (FAA, 2009). Based on subsistence harvest data collected by ADF&G, subsistence collection by Sitka residents includes marine and riverine resources such as salmon, halibut, herring roe, eulachon, rockfish, sea otters, sea lions, harbor seals, seaweeds, and kelp (ADF&G, Alaska Community Profile Database). Herring are also used for personal bait by area residents. Customary and traditional gathering activities in the project area does occur; however, it is limited because the surrounding shoreline is heavily developed with residences and commercial operations, urban runoff and wastewater flows/discharges into the area, the area is heavily used by boats and floatplanes, and more undisturbed and productive areas are accessible outside the influences of the city center.

3.5 Cultural, Historical and Archeological Resources

The Corps conducted cultural resource surveys (CRS) in 1989 in the Sitka project area as part of the Corps' environmental impact statement preparation process for the original Channel Rock Breakwaters project. The CRS reports were provided to the Alaska State Historic Preservation Officer (ASHPO) in the Corps' National Historic Preservation Act of 1966 (16 USC 470), as amended, Section 106 evaluation. FAA (2009) conducted a more-current cultural resource survey of Japonski Island and surrounding area (which coincidentally include the Corps' current project area) as part of their environmental analysis of the Sitka Rocky Gutierrez Airport expansion project.

The FAA discovered several different types of archaeological, historical, and heritage resources within their area of potential effect. The majority of Alaska Heritage Resources Survey (AHRS) sites are associated with a National Register Historic District (NRHD) and National Historic Landmark (NHL) adjacent to the airport. Those resources present in the AHRS database and not associated with the NRHD or NHL are human burials.

Two nationally recognized historical resource complexes are within the immediate vicinity of the Airport.

> Sitka Naval Operating Base and U.S. Army Coastal Defenses National Historic Landmark (AHRS site SIT-079): The NHL is listed under the primary AHRS Site number of SIT-079, with smaller components of the district also listed as SIT-573 and SIT-639.
>
> Fort Ray Historic District: The Fort Ray Historic District appears to have two AHRS site numbers associated with it, SIT-563 and SIT-445. The District encompasses Charcoal and Alice Islands, and includes a number of historic buildings remaining from the Fort Ray Army Garrison.

Inventories for subsurface obstructions by the National Oceanic and Atmospheric Administration (NOAA) and staff members of the Sitka Tribe of Alaska have identified historical resources in the waters immediately surrounding the airport, which include a sunken World War II-Era cargo ship and discarded World War II-Era military equipment (FAA, 2009). The sunken cargo ship is purportedly located in the channel between the end of Runway 11 and Battery Island, and therefore, not in the Corps' project area. No archaeological or historical resources specifically related to traditional, sacred, or customary activities were identified to be present within the Corps' project area that could be directly or indirectly impacted by the Corps' proposed action.

4.0 ENVIRONMENTAL CONSEQUENCES

This section discusses how proposed corrective actions might affect the Sitka area's environmental resources of concern. The environmental consequences of the no-action alternative and each of the four action alternatives (Alternatives 1, 4, 14, 15) considered in more detail are addressed in the sections that follow and are summarized in tables (Appendix 3). For some resources of concern, each of the four action alternatives would create the same type and magnitude of environmental consequences. In those instances, the consequences for all four are addressed together rather than by repeating the same consequences information four times. Collectively and ultimately, the analysis of environmental consequences is used to make a determination of "significance" relative to the degree of environmental impacts and whether or not to prepare an EIS.

"Significance" as used in the National Environmental Policy Act (NEPA) requires considerations of both context and intensity. "Context" means that the significance of an action must be analyzed in several contexts such as the affected region, affected interests, and the locality. "Intensity" refers to the severity of impact, including the degree to which an action may adversely affect an endangered or threatened species or its critical habitat.

The direct effects study area encompasses the footprint of the Channel Rock Breakwaters and the protective marine waters behind them. Within this area, resources that are present could be directly affected by physical disturbance associated with implementation of project alternatives requiring the placement of fill.

The indirect effects study area is larger than the direct effects study area and encompasses those marine areas around Japonski Island where indirect effects such as changes in water flow or boat traffic patterns might occur as a result of improvements to the Channel Rock Breakwaters.

NEPA requires that cumulative effects be evaluated along with the direct and indirect effects of the actions. Cumulative impacts on the environment result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such actions. As with direct and indirect effects, the no-action alternative serves as the baseline against which to evaluate cumulative effects.

Major past projects in vicinity of the Corps' project area include World War II-related construction on Japonski Island, heavy shoreline development related to Sitka's growth, Sitka Rocky Gutierrez Airport construction and development, and the construction of New Thompson Harbor and the Channel Rock Breakwaters. Major current projects include ADOT&PF's filling of the Airport Lagoon and road relocation projects, and airport terminal expansion. Reasonably foreseeable future actions include airport expansion, development of a state park on the Japonski Island causeway, Sitka seaplane base relocation, and mariculture expansions in Whiting Cove.

4.1 Marine Environment

4.1.1 Mammals

The placement of fill material in the gap between the south and main breakwaters would temporarily and indirectly disturb marine mammals in proximity to the site due to construction noise, construction vessel traffic and construction-generated turbidity. Airborne noise would be generated by the operation of heavy equipment, and waterborne noise would be generated by work boats and rock and fill placement. At levels of sound resulting from the work activities, expected to be less than 150 dB re 1 uPa, the primary reaction of marine mammals is likely to be to move away from the work area during the construction period. Similarly, the noise generated by barges and tugs in transit to or from the work area from other locations in Southeast Alaska would be similar to that generated by routine small vessel traffic in the shipping lanes. Low levels of turbidity would be generated by fill and rock placement in the marine environment, causing marine mammals to temporarily avoid the area until such time that the construction-generated plume dissipates to background levels.

All the aforementioned disturbances are associated with each of the alternatives. Alternatives 1, 14, and 15, however, would affect marine mammals more because they involve more in-water construction activities than in-water construction associated with the recommended corrective action (Alternative 4). Overall, the Corps's project would likely cause marine mammals that would otherwise be present in the vicinity to move away from the area temporarily during construction but would not likely produce significant long-term harm to any species.

4.1.2 Benthos and Phycology

Placing fill material on the sea floor as part of breakwater construction is the primary source of impact on the area's marine benthic and algal habitat and communities.

During construction, all the alternatives involve placing new, un-weathered rock from upland sources over existing habitats, thus causing mortality and displacement of a wide variety of existing plants and animals attached to the existing habitat surfaces (e.g. unconsolidated bottom and breakwater armor rock). Algae, sessile invertebrates, and infauna (animals living within the sediments) would be crushed and/or buried. Cavity dwelling motile fish and invertebrates may escape crushing, but many would seek shelter within the cavities in the existing rock structure and would subsequently be buried.

However, the rapid succession of biota colonizing new rock substrata in the Sitka-area marine environment has been well documented. Corps-funded monitoring studies conducted by the ADF&G and USFWS found that macroalgae favored for herring spawning developed more rapidly on the side of breakwaters exposed to open water than on the sheltered side. Studies also revealed that herring spawning occurred on the macroalgae within 2 years of rock placement. Other researchers have shown a generally positive relationship between numbers of herring eggs deposited and the size (i.e. kelp height) and complexity (i.e. number of fronds) of the kelp in the habitat. However, herring also can be fairly indiscriminant in their spawning preference with respect to plant substrate and location. Table 2 provides a comparative summary of the amount of subtidal habitat losses and gains associated with the alternatives.

Table 2. Comparative tabulation of subtidal habitat losses and gains associated with alternatives considered in more detail.

Alternatives considered in more detail.	Surface area of soft-substrate, benthic habitat below mean high water, unavoidably lost by constructing breakwater segment(s).	Surface area of rocky-substrate, breakwater habitat below mean high water, …		
		… unavoidably lost by constructing breakwater segment(s).	… created by constructing breakwater segments(s).	… net loss (-) or gain (+) by constructing breakwater segment(s).
No Action	0 ft² 0 acres	Not applicable	Not applicable	Not applicable
1 Breakwater stub	71,388 ft² 1.63 acres	3,962 ft² 0.09 acres	62,954 ft² 1.44 acres	+58,992 ft² +1.35 acres
4 Recommended Action Breakwater Gap Closure	**24,829 ft² 0.57 acres**	**37,313 ft² 0.86 acres**	**57,092 ft² 1.31 acres**	**+19,779 ft² +0.45 acres**
14 Combining alternatives 1, 4 and 15	212,760 ft² 4.87 acres	76,724 ft² 1.76 acres	257,772 ft² 5.91 acres	+181,048 ft² +4.15 acres
15 Main Breakwater Extension	116,543 ft² 2.67 acres	35,449 ft² 0.81 acres	137,726 ft² 3.16 acres	+102,277 ft² +2.35 acres

Overall, the Corps expects that in areas below approximately +6 feet Mean Lower Low Water (MLLW), algal colonization following one complete growing season should be sufficient to support some of the normal ecological functions of the area, including herring spawning and grazing by a variety of fish and crustaceans.

4.1.3 Fishery Resources and Essential Fish Habitat

All project alternatives would have little direct affect on those mature fish inhabiting the project area, as their mobility allows them to avoid construction activities (e.g. placement of breakwater material and generated turbidity, vessel movements, and underwater construction noise). With the exception of alternatives 1 and 14, no long-shore movements of juvenile fish would be disrupted by constructed breakwaters.

The primary direct impact of the Corps' alternatives on the area's fishery resources is the loss of Pacific herring spawning and EFH. Prior to the construction of the Channel Rock Breakwaters, the USFWS and ADF&G expressed concern that herring spawning habitat would be adversely impacted within the project area. Therefore, beginning in 1993, the Corps, ADF&G, and USFWS monitored spawning activity at the site for a period of 5 years. The surveys covered the time period of preconstruction, construction, and post-construction. The final report for the 5-year study (1993-1998) indicated herring spawn had decreased within the harbor basin created by the new breakwaters as compared with areas surveyed outside the harbor during the same timeframe (ADF&G 1998). However, the report also noted that the breakwaters had become colonized with algae species suitable for herring spawning. Regarding mitigation, the ADF&G and USFWS concluded that the algae growth on the breakwaters was compensating, at least in part, for habitat degraded by the harbor project, and no mitigation was recommended at that time.

In 2005, the Corps and USFWS entered into an agreement to conduct a biological evaluation of the Channel Rock Breakwaters with emphasis on their habitat value as Pacific herring spawning substrate. It was found that after 10 years, the subtidal surface (between -30 feet MLLW and the surface) of all three breakwaters, both seaward and harbor side, supported robust stands of algae (e.g. sugar kelp and fringed sieve kelp) (USFWS, 2005). The primary difference between the outside and inside surfaces of the breakwater appeared to be the presence of perennial kelp (*Macrocystis pyrifera*) outside the harbor and its near absence inside. However, the USFWS concluded that an abundance of suitable herring spawning habitat was available on the harbor side of the breakwaters.

The Corps believes that the corrective action would have a net beneficial environmental effect on Pacific herring and their spawning habitat. Constructing the breakwater to fill in the gap between the south and main breakwaters would eliminate approximately 37,000 square feet of established Pacific herring spawning habitat. However, after construction approximately 59,000 square feet of suitable rocky substrate would be available for kelp and other marine algae species to become established and support spawning Pacific herring.

Per the 1996 amendments to the MSFCMA, the Corps has initialed consultation and coordination with the NMFS regarding the potential effects of the recommended corrective action on EFH. Impacts due to implementation of project alternatives would result in short-term alterations of

EFH for marine species and species such as rockfish, flatfish, gadids, salmonids, and forage fish such as capelin and sand lance as well as for species such as Pacific herring that are important prey for species with designated EFH. The Corps concludes that its Federal action may affect, but is not likely to adversely affect, EFH and EFH-managed species/species complexes for Gulf of Alaska groundfish and Alaska stocks of Pacific salmon. See Appendix 2 for the Corps' EFH assessment.

4.1.4 Water Quality and Harbor Circulation

A physical model was constructed at the Corps' Hydraulics and Coastal Laboratory at the Waterways Experiment Station to: (1) determine the amount of wave energy that reaches Eliason Harbor; (2) study circulation and harbor-flushing patterns; and (3) aid development of alternatives to reduce wave energy and not adversely affect water quality. The physical model was run with 18 different breakwater configurations. Results of the physical model study for the wave generator configured are documented in the Engineering Research and Development Laboratory's report: ERDC/CHL TR-08-2 *Physical Model Study of Wave Action in New Thomsen Harbor, Sitka, Alaska*.

The time lapse videos of the circulation-model-runs were viewed together with biologists from USFWS and NMFS during a meeting in Juneau, Alaska, and with an ADF&G biologist in Sitka, Alaska, in December 2009. It was the general consensus from all who viewed the video that circulation behind each of the project alternatives (i.e. harbor configurations) was at least the same as, if not better than, the circulation modeled for the existing Channel Rock Breakwaters configuration. No alternative appeared to produce "dead zones" where the water did not circulate. It is likely that by closing off or constricting some of the gaps in the breakwater, the circulation was improved since the same volume of water was forced through smaller or fewer openings.

The core material used for breakwater construction is expected to generate an insignificant amount of turbidity when placed in the marine environment, as the core material will not contain organics or an excessive amount of fines. See Appendix 1 for anticipated core material specifications. Except for the short-term, localized turbidity associated with the settling and placement of breakwater material into the marine environment, no adverse impacts to water or sediment quality is expected to occur as a result of the recommended corrective action.

4.2 Avifauna

The primary activities possibly affecting local avian populations within and in proximity to the project site are the to-and-from mobilization of construction equipment, vessels and personnel, and rubble mound breakwater construction. Vessels moving through the area would displace waterfowl and sea ducks within their intended course and boat wake. Vessel lights could become an attractive nuisance causing bird collisions and subsequent injury or death; however, the more potential for environmental impacts associated with vessels would be the effects of petroleum compounds and other hazardous materials spills. The effects of fuel spills on avian populations are well documented, as direct contact and mortality is caused by ingestion during preening as well as hypothermia from matted feathers. The displacement of local avian populations from the project area during construction would be short-term. Overall, the Corps believes that the recommended corrective action would not have a long-term effect on local avian populations. No significant adverse impacts are expected.

4.3 Threatened and Endangered Species

Section 7 of the ESA requires that any action by a federal agency shall ensure that its actions are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of habitat of such species. Because ESA-listed species may be affected by the Corps' proposed project, the Corps prepared a biological assessment to determine whether listed species, special status species, or designated critical habitat are likely to be adversely affected. The following information is from the Corps' biological assessment, whose development is being coordinated with the NMFS.

Project construction activities and the newly constructed breakwater segment would result in short-term alterations to habitat used by Steller sea lions and Pacific herring. However, the results of Corps field studies indicate that within 2 to 5 years following completion of the breakwater segment, the breakwater armor rock would recolonize itself with productive populations of invertebrates and algae that would support spawning Pacific herring. In time, the revegetated breakwater segment would ecologically function similar to the Sitka Harbor shoreline and other already-revegetated Channel Rock Breakwater segments.

Vessel noise and transit associated with construction activities have the potential to cause avoidance, disturbance, or displacement of Steller sea lions and humpback whales from the Sitka Harbor area during peak Pacific herring spawn activities when Steller sea lions and humpback whales feed on staging and spawning adult herring. Therefore, the Corps has proposed to cease in-water construction during peak Pacific herring spawning activities (March 15 and June 1). Construction activities outside this period coincide to periods when a minimum quantity of marine mammals is present. Additionally, speed limits would be imposed on construction vessels moving between the project area and material suppliers to mitigate the danger of vessel-marine mammal collisions.

The Corps believes that its proposed action: (1) would not modify or adversely affect designated critical habitat; and (2) may affect but is not likely to adversely affect humpback whales, Steller sea lions (eastern and western distinct population segment) or Pacific herring (Southeast Alaska distinct population segment).

4.4 Subsistence Resources

The Alaska Native Interest Lands Conservation Act identifies three factors related to subsistence uses as items affected by changes in management activities or land uses: (1) resource distribution and abundance; (2) access to resources; and (3) competition for the use of resources. Subsistence resources, such as marine plants and animals primarily affected by the various alternatives are predominantly food resources collected for primary diet, customary and traditional practices, or to supplement other existing food resources. Many Sitka residents use seaweed, bull kelp, and marine invertebrate shells as fertilizer for gardens.

Placement of fill material on the sea floor to construct breakwaters would affect marine plant and animal habitat. Short-term impacts to these populations would be adverse, as fill material covers existing marine plants and animal habitats. Some loss of subsistence resources (e.g. macroalgae and associated herring spawn) would be expected as material is placed during construction. However, the succession of biota and associated habitat colonizing the new rock surfaces would create additional rocky habitat for herring spawning.

The Corps is unaware of any herring-spawn harvesting on the Channel Rock Breakwaters; however, should it occur, the impacts on that activity would be short term. In conclusion, the Corps believes that there would be no anticipated significant impacts to marine-related subsistence resources or access to and competition for subsistence resources from the corrective action.

4.5 Cultural, Historical and Archeological Resources

During breakwater construction, there could be a short-term impact on customary and traditional practices in the vicinity of project area. Besides being a subsistence activity, herring spawn harvesting is also a cultural characteristic. The Channel Rock Breakwaters themselves are not known as a herring spawn harvesting site; however, harvesting activities in the vicinity of the breakwaters could be temporarily displacement to other locations.

The Alaska State Historic Preservation Officer (ASHPO) concurred with the Corps' initial determination that the original Channel Rock Breakwaters project constructed in 1995 would have no effect on any historic or prehistoric resources in the area. The Corps believes that the recommended corrective action is not expected to impact the historic properties described in Section 3.5 (Cultural, Historical and Archeological Resource), and is coordinating its findings with the ASHPO.

4.6 Environmental Justice and Protection of Children

On February 11, 1994, Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations was issued. The purpose of the order is to avoid the disproportionate placement of Federal actions and policies having adverse environmental, economic, social, or health effects on minority and low-income populations. Construction of the proposed corrective action would have beneficial effects on the Sitka community. No racial, ethnic, age, or other population group would be adversely affected disproportionately.

On April 21, 1997, Executive Order 13045, Protection of Children from Environmental Health and Safety Risks was issued to identify and assess environmental health and safety risks that may disproportionately affect children. The proposed action would affect the community as a whole, and there would be no environmental health or safety risks associated with the action that would disproportionately affect children. All the alternatives considered in detail are located offshore, in proximity to commercially developed areas, and away from homes, schools, and playgrounds. Children would not be put at risk by the proposed corrective action.

5.0 PUBLIC INVOLVEMENT, FEDERAL COMPLIANCE AND AGENCY COORDINATION

5.1 Public Involvement

The original Channel Rock Breakwaters project went through an extensive public involvement and review process: (1) the Sitka community was polled and their needs assessed; (2) local informal meetings were conduct to determine public concerns and presentations were made at Sitka assembly meetings; and (3) a Draft Interim Feasibility Report and Environmental Impact Statement was distributed for a 45-day public review period, followed by a public meeting. However, because of expressed public concerns and after extensive Corps study, Congress directed the Secretary of the Army acting through the Chief of Engineers to design and construct modifications to the original Channel Rock Breakwaters navigation project in Sitka, Alaska, to reduce wave and swell motion in the protected harbors. Specifically, the Corps was directed to correct breakwater design deficiencies by adding to, or extending, the existing breakwaters. After extensive coordination with representatives from the CBS, the Corps prepared the aforementioned DCER.

This EA and draft Finding of No Significant Impact (FONSI) have been prepared relying on previous NEPA-related scoping efforts, public input associated with the original Channel Rocks Breakwater project, and more current correspondence with State and Federal resource agencies. Per the NEPA process and Corps regulations and guidance, the corrective action EA and draft FONSI is subject to a 30-day public review. If requested, a public meeting would be held to discuss project alternatives and solicit public views and opinions.

5.2 Federal Compliance and Agency Coordination

The development and preparation of this EA and draft FONSI have been coordinated with a variety of State and Federal agencies. Both the USFWS and NMFS have provided input under authority of the ESA, MMPA, and Fish and Wildlife Coordination Act. The NMFS also provided essential fish habitat information under the authority of the MSFCMA (Appendix 4). Harbor water quality and circulation issues were coordinated with staff biologists from the USFWS, NMFS and ADF&G. An evaluation to determine consistency with Section 404(b)(1) of the Clean Water Act, which governs discharge of dredged or fill material, has been completed (Appendix 5). All completed breakwater recolonization field studies were designed and conducted in cooperation with the USFWS and ADF&G.

Both the Corps and ASHPO determined that the original, larger-scaled navigation project would have no effect on known historical or prehistoric resources in the Sitka area. The Corps believes that the previous determination is applicable for the proposed corrective action and is coordinating a final determination with the ASHPO.

The ADEC determines compliance with State of Alaska water quality standards under the Section 401 of the Clean Water Act. The Corps determined that the proposed corrective action would not violate State water quality standards. The Corps is coordinating their determination with the ADEC, and if they concur, they would issue a water quality certificate if there is reasonable assurance that the proposed corrective action would meet and maintain the standards.

The Alaska District intends to submit a Consistency Determination (CD) to the Alaska Coastal Management Program (CMP) for their review. This environmental assessment will also accompany the CD as supplemental information. A "conclusive consistency determination" will be issued by the Alaska Division of Coastal and Ocean Management after their review of the Corps CD. The Corps believes that the proposed corrective action would be undertaken in a manner consistent with the Alaska CMP and Sitka coastal management plan.

A checklist of project compliance with relevant Federal, State, and local statutes and regulations is shown in Table 3.

Table 3. Environmental Compliance Checklist

FEDERAL	Compliance
Archeological & Historical Preservation Act of 1974	PC
Clean Air Act	FC
Clean Water Act	PC
Coastal Zone Management Act of 1972 *	PC
Endangered Species Act of 1973	PC
Estuary Protection Act	FC
Federal Water Project Recreation Act	FC
Fish and Wildlife Coordination Act	FC
National Environmental Policy Act *	PC
Land and Water Conservation Fund Act	FC
Marine Protection, Research & Sanctuaries Act of 1972	FC
National Historic Preservation Act of 1972	PC
River and Harbors Act of 1899	FC
Magnuson-Stevens Fishery Conservation & Management Act *	PC
Marine Mammal Protection Act	PC
Bald Eagle Protection Act	FC
Watershed Protection and Flood Preservation Act	FC
Wild & Scenic Rivers Act	N/A
Executive Order 11593, Protection of Cultural Environment	FC
Executive Order 11988, Flood Plain Management	FC
Executive Order 11990, Protection of Wetlands	FC
Executive Order 12898, Environmental Justice	FC
Executive Order 13045, Protection of Children	FC
STATE AND LOCAL	
State Water Quality Certification *	PC
Alaska Coastal Management Program *	PC

PC = Partial compliance, FC = Full compliance
*Full compliance will be attained upon completion of the Public Review process and/or coordination with the responsible agency.

6.0 CONCLUSIONS AND MITIGATION RECOMMENDATIONS

The marine environment in and around Sitka, Alaska supports a wide variety of marine habitat ranging from calm protected embayments to high energy wave-swept exposed coastlines. Much of the developed Sitka waterfront area has a rocky shoreline.

The primary environmental issues associated with the proposed corrective action are essentially identical to those issues expressed by State and Federal agencies about the original Channel Rock Breakwaters project, that is, the project's potential impacts on Pacific herring, water quality and circulation, marine mammals, and Endangered Species Act species. The majority of environmental impacts associated with the recommended action are expected to be direct and of a short-term nature.

The Corps believes that the proposed corrective action would have a net beneficial environmental effect on Pacific herring and their spawning habitat. Constructing the breakwater to fill in the gap between the south and main breakwaters would eliminate approximately 38,000 square feet of established Pacific herring spawning habitat. However, after construction approximately 58,000 square feet of suitable rocky substrate would be available for kelp and other marine algae species to become established and support spawning Pacific herring and the marine mammals that feed upon them.

After reviewing modeled and filmed circulation patterns, State and Federal environmental resource agencies agreed with the Corps' assessment that water quality parameters in the protected waters of the Channel Rock Breakwaters would not be adversely impacted by the different breakwater configurations.

The following NMFS-managed ESA species may occur in the project area: Humpback whale (endangered); Steller sea lion (threatened eastern population and endangered western population); and Pacific herring Southeast Alaska Distinct Population Segment (candidate). No USFWS-managed ESA species exist in the project area. The Corps determined that its proposed action: (1) would not modify or adversely affect designated critical habitat; and (2) may affect but, is not likely to adversely affected humpback whales, Steller sea lions or Pacific herring.

Based upon the project design and the minimal short-term impacts associated with constructing the recommended corrective action, the Corps concludes that its Federal action may affect, but is not likely to adversely affect, EFH and EFH-managed species/species complexes for Gulf of Alaska groundfish and Alaska stocks of Pacific salmon.

As described in the previous sections, both adverse and beneficial environmental consequences would occur as a result of implementing the recommended corrective action. "Mitigation" is the process used to avoid, minimize, and compensate for environmental consequences of an action.

Incorporating the following mitigation measures into the recommended plan would help to ensure that no adverse impacts would occur on local fish and wildlife resources, including ESA-listed species, marine mammals and EFH.

- The proposed action shall cease in-water construction between March 15 and June 1 during peak herring spawn activities, juvenile salmon outmigration and rearing activities, and when Steller sea lion and humpback whale feeding and abundance is expected to be greatest in the project area.

- To minimize the danger to marine mammals from project-related vessels, speed limits (e.g. less than 8 knots) shall be imposed on vessels moving in and around the project area.

- Project-related vessels and barges shall not be permitted to ground themselves on the bottom during low tide periods, unless there is a human safety issue requiring it.

- A construction oil spill prevention plan shall be prepared.

- Breakwater construction shall use core material, B rock and armor stone clean of organic debris and invasive species.

- Project-related vessels shall not travel within 3,000 feet of designated Steller sea lion critical habitat (haulouts or rookeries).

The Corps concludes that the recommended corrective action at the Channel Rock Breakwaters in Sitka, Alaska, is consistent with State and local coastal zone management programs to the maximum extent practicable. The Corps also concludes that the EA supports the conclusion that the navigation improvements do not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, preparing an environmental impact statement is not necessary and signing a FONSI is appropriate.

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APPENDIX 1

RUBBLE MOUND BREAKWATER CONSTRUCTION

APPENDIX 1

RUBBLE MOUND BREAKWATER CONSTRUCTION

Typical rubble mound breakwaters are constructed with a center "core" that is composed of shot rock. This material, termed "core rock", is composed of shot rock typically produced in a quarry using a grizzly (or screen) to meet the rock gradation required in the specifications for a project. Rock gradation requirements vary from project to project, however, a typical breakwater core rock gradation is as follows:

Specified Rock Weight (lbs)	Comment
250	100% by weight of the total quantity of rock must be less than 250 pounds.
33	15% by weight of the total quantity can consist of rock between 33 and 250 pounds. 85% by weight of the total quantity has to consist of rock between 1 and 33 pounds.
1	1% by weight of the total quantity can consist of rock less than 1 pound. 99% by weight of the total quantity has to consist of rock between 1 and 250 pounds.

This generally translates to an average core-rock size being in the 30 to 50 pound range (or 6 to 8 inch average diameter). The maximum size would be about 250 pounds (14 inch average diameter) and the minimum size would be about 1 pound (2 inch average diameter). No more than 1% by weight would be fines. This means essentially no sand, silt, or dirt is allowed in the breakwater core. Special care is taken to ensure that fines are not scooped up in the core-loading process at the quarry and off the barge.

The core material serves as the foundation for the breakwater rubble mound and provides the base for placement of the outer layers of the larger B and armor rock (figure 1). The core is designed to be semi-permeable and capable of dissipating wave energy within the voids spaces between individual stones. The core is usually placed first using a split hull scow (photo 1) or with a skip box and crane off a flat deck barge (photo 2). In some cases, core material is placed using a loader off a flat deck barge or with trucks if land based construction is selected. B rock is placed similarly as core material. Placement of the core rock and B rock is typically finalized using an excavator to shape the rock prism to template (photos 3 and 4). Armor rock is normally "pick and placed" and not dumped on the breakwater's B rock.

Examples of recently constructed rubble mound breakwaters using the above construction methods are: Wrangell Harbor, Seward Harbor, Douglas Harbor, Sitka Channel Rock Breakwaters, Nome Navigation Improvements, King Cove New Harbor, False Pass Harbor, and Unalaska Harbor Phase I.

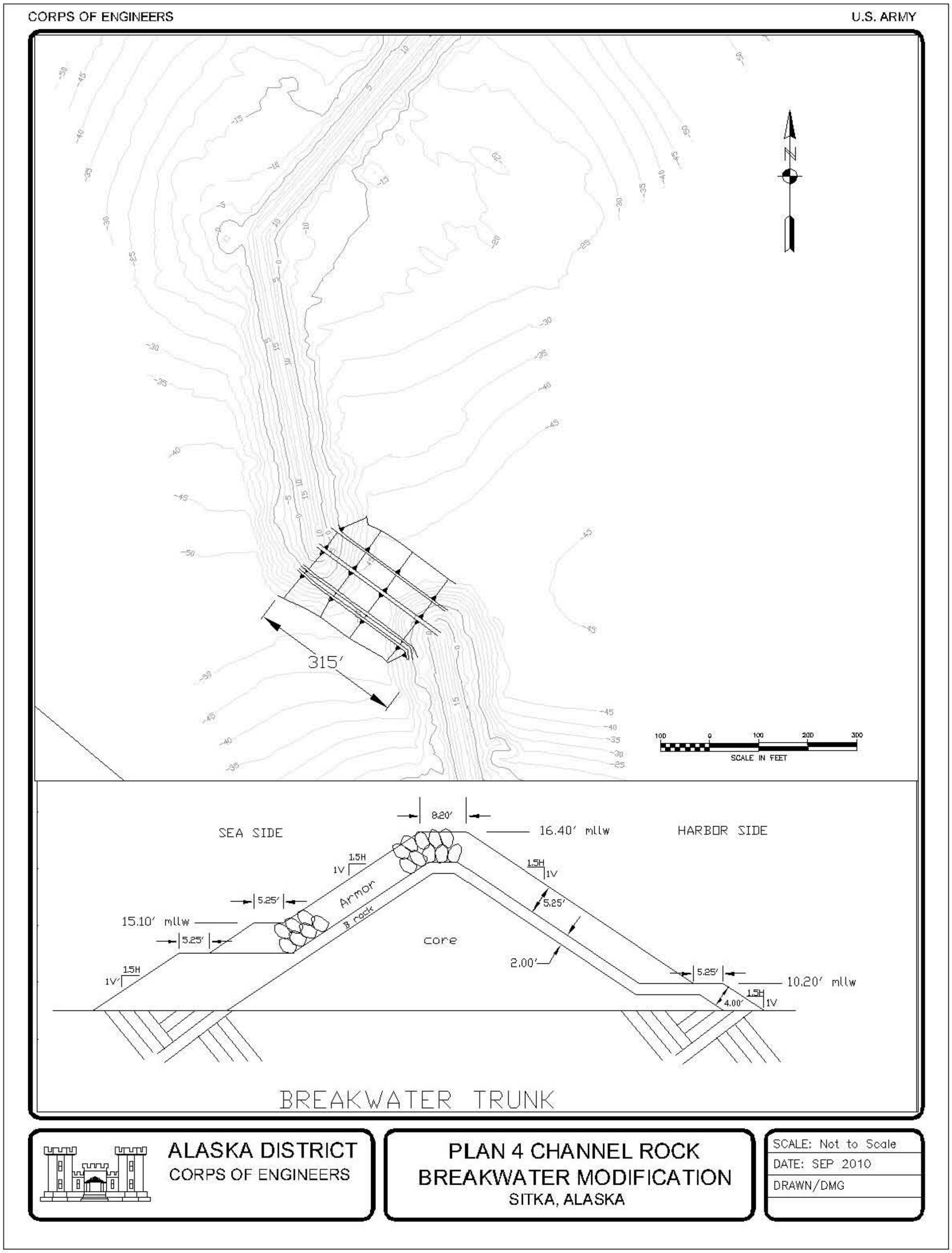

Figure 1. Rubble mound breakwater cross-section of the recommended alternative 4.

Photo 1. Split Hull scow with tug, positioning in preparation for core rock placement at Wrangell Harbor.

Photo 2. Skip box and crane off loading core material at Wrangell Harbor.

Photo 3. Core rock following shaping with excavator at Wrangell Harbor.

Photo 4. Core rock side slope projecting under water toward the toe at Wrangell Harbor.

APPENDIX 2

ESSENTIAL FISH HABITAT ASSESSMENT

Channel Rock Breakwaters

Navigation Improvements

Sitka Harbor, Alaska

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MARCH 2011

ESSENTIAL FISH HABITAT ASSESSMENT

Channel Rock Breakwaters
Navigation Improvements
Sitka Harbor, Alaska

Preface

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act set forth the essential fish habitat (EFH) provision to identify and protect important habitats of federally managed marine and anadromous fish species. Federal agencies, that fund, permit, or undertake activities that may adversely affect EFH, are required to consult with National Marine Fisheries Service (NMFS) regarding the potential effects of their actions on EFH, and respond in writing to NMFS recommendations.

EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. “Waters” include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include aquatic areas historically used by fish where appropriate. ”Substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities.

In an August 24, 2010, letter from the NMFS, the Corps was advised to refer to the Federal Aviation Administration’s (FAA) May 2009 Final Environmental Impact Statement (FEIS) for the Sitka Rocky Gutierrez Airport (http://sitkaeis.com) for current information on the biological resources of the area, as well as analysis of a similar project involving the impact of fill placed into the marine environment. It was further stated that FAA’s FEIS contains extensive and detailed information on EFH that should be directly applicable for use in the Corps’ EFH assessment due to FAA’s project’s geographic proximity to the Channel Rock Breakwaters and similarity of habitats being impacted and created. The Corps’ EFH assessment relies heavily on relevant EFH species life history stage designations (NMFS 2005a and b) and FAA’s EHF assessment (Appendix 4 at http://sitkaeis.com/feis.htm), and incorporates them into this EFH assessment by reference.

Upon completing the Corps’s EFH-coordination with the NMFS, the Corps’ will incorporate its EFH evaluation and findings and NMFS conservation recommendations (if any) into the project’s environmental assessment (in prep).

Project Purpose

The Corps completed construction of the Channel Rock Breakwaters feature of the Sitka Harbor complex in 1995 to provide protection for Thomsen Harbor and to protect additional moorage that would be constructed in the natural anchorage and channel between Sitka and Japonski Island. After the Channel Rock Breakwaters were constructed, harbor users and the city reported that excessive wave and swell motion entering through the breakwater gaps damaged boats and harbor facilities during high tide and swell conditions.

Congress provided the Corps with funding from 2001 through 2003 to study the subject excessive swell in the harbor. In May 2002, the Corps completed a Section 905(b) Analysis which recommended further study. Additional Congressional legislation in 2005 and in 2007 defined the problem and specified the general solution: the damages being experienced are a result of design deficiencies and the design deficiencies should be corrected by adding to, or extending, the existing breakwaters to reduce wave and swell motion. The same Congressional legislation also directed the Secretary of the Army, acting through the Corps' Chief of Engineers, to design and construct the Channel Rock Breakwaters corrective measures.

In response to the Congressional legislation, Corps Headquarters issued consolidated guidance instructing the Corps to prepare a Deficiency Correction Evaluation Report which, among other things: (1) describes the corrective action's impacts on prior environmental concerns and commitments; (2) documents any mitigation requirements resulting from implementing the corrective action; and (3) documents the coordination of the corrective action with applicable Federal and State agencies. In addition to the three aforementioned items, the Corps would evaluate potential alternative corrective actions, consider the environmental and social impacts of the actions, and recommend a plan to alleviate the identified problems.

Project Location

Sitka is in the Southeast Panhandle of Alaska (figure 1), 862 miles northwest of Seattle, 95 miles south southwest of Juneau, the state capitol, and 185 miles northwest of Ketchikan. The city of about 8,600 residents is on the eastern shore of Sitka Sound, a bay on the western coast of Baranof Island in Southeast Alaska. The Sitka Harbor complex is composed of four separable navigation features: Harbor Rock Channel, Crescent Bay Basin, Forest Service Basin, and the Channel Rock Breakwaters. The Channel Rock Breakwaters feature crosses the western channel area of Sitka Sound about 0.6 mile northwest of Eliason Harbor (figure 2), and provides wave protection for Eliason Harbor, Thomsen Harbor, and other shoreline facilities along Sitka Channel (figure 3).

The Sitka coastline is within the Alaska Coastal Management Program, a program for the protection of activities and development in the coastal areas of Alaska. The Sitka Coastal

Figure 1. Sitka Location and Vicinity Maps. Sitka is located on the Southeast Panhandle of Alaska, about midway by air between Seattle, Washington and Anchorage, Alaska.

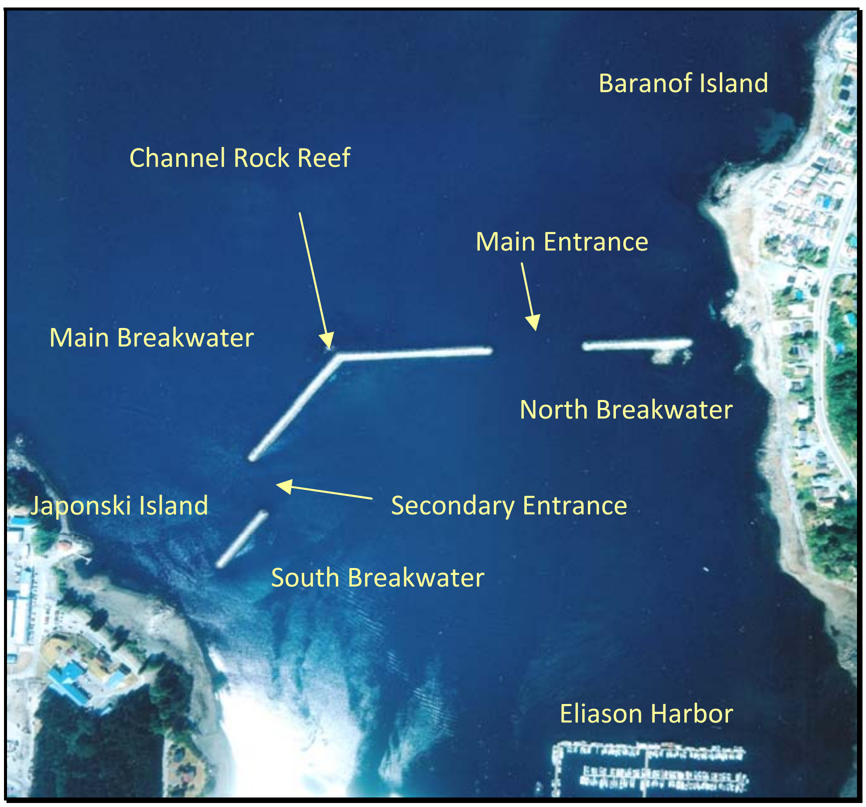

Figure 2. Channel Rock Breakwaters and western anchorage area. North is at the top of the page.

Figure 3. Looking from southwest, showing Channel Rock Breakwaters, Western Anchorage, Thomsen Harbor and Eliason Harbor.

Management District includes the entire 4,710 square miles of coastal area within the political jurisdiction of the City and Borough of Sitka.

Project Description

The proposed corrective action's planning objective is to reduce the existing wave and swell motion behind the Channel Rock Breakwaters in a cost effective manner for the remaining life of the project. The Corps used a cost effective analysis to screen out plans that produced the same output level (i.e. desired results of energy reduction at Eliason Harbor) as another plan, but cost more, or cost either the same amount or more than another plan, but produced less output. The Corps assumed that all rock needed for breakwater construction would be obtained from an existing commercial quarry on Kasiana Island, 2 miles north of the breakwaters and placed into the marine environment using the same traditional ecologically-sound engineering methods used to construct the original Channel Rock Breakwaters is 1995. See Appendix 1 for a description of rubble mound breakwater construction methods and materials. Of the 18 plans screened, only four plans (1, 4, 14, and 15) were determined by the Corps to be cost effective and most responsive to project objectives. Therefore, the four plans were identified as alternatives, developed in more detail, and environmentally evaluated.

Alternative 4, closing the gap between the main and south breakwaters, is the Corps' recommended corrective action, and no maintenance dredging is expected to be required.
The Corps' project would construct a 315-foot extension to connect the main breakwater and the south breakwater. Plan views of this alternative are shown in figure 4. The cross section of the breakwater extension trunk is illustrated in figure 5. Approximately 9,000 cubic yards of armor

Figure 4. Alternative 4 closes the gap between the existing main and south breakwaters – drawing not to scale.

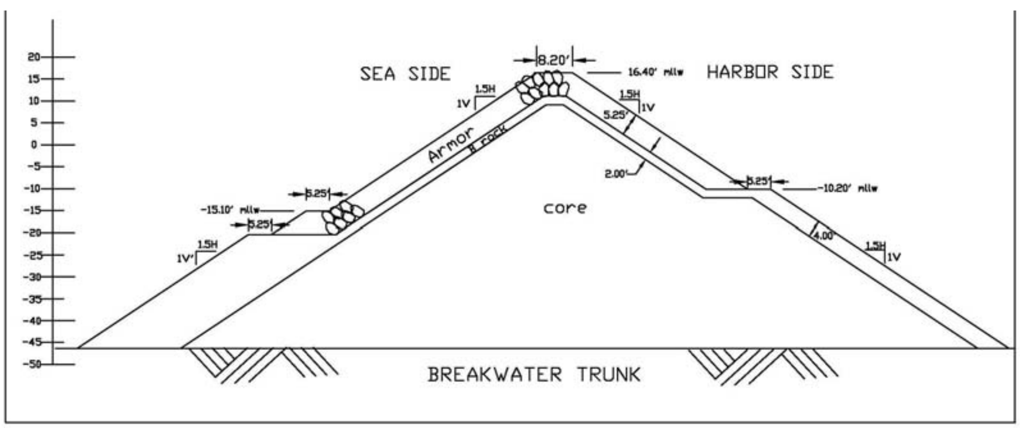

Figure 5. Alternative 4 breakwater trunk cross section.

stone, 13,000 cubic yards of B rock, and 30,000 cubic yards of core material would be required for this alternative. The armor and B rock on the existing breakwater would be removed where the extension begins. Approximately 3,000 cubic yards of armor stone and 1,100 cubic yards of B rock would be removed at the southern end of the main breakwater and used in construction of the extension. The estimated cost for this alternative is $13,311,000.

See Appendix 2 for a description of the three alternatives not chosen as the Corps' recommended plan.

Essential Fish Habitat

NMFS authority to manage EFH is directly related to those species covered under Fishery Management Plans (FMPs) in the United States. The Corps' Channel Rock Breakwaters corrective action is within an area designated as EFH for two FMPs—Gulf of Alaska (GOA) Groundfish and Alaska Stocks of Pacific Salmon. These two FMPs include species or species complexes of groundfish and invertebrate resources and the all Pacific salmon species Table 1. See Appendix 3 for a description of GOA Groundfish resources. No EFH "habitat areas of particular concern" are in the Corps' project area.[1]

Nearshore habitats in proximity to the breakwaters are expected to be used by juvenile salmonids during their early marine life history. According to the Alaska Department of Fish and Game, 31 streams in the Sitka area are used by Chinook, coho, pink, and sockeye salmon. Juvenile salmon from these streams may use the nearshore project area during their spring outmigration, feeding along marine shorelines, gaining size and swimming ability before moving into more offshore waters. Young-of-the-year (all fish less than 1 year old) coho and sockeye salmon may also be found along the shoreline.

Rocky and mixed-soft shorelines provide a prey base of gammarid amphipods, and harpacticoid copepods. Nearshore waters also harbor a myriad of predators on juvenile salmonids, including larger fish (e.g., rockfish and other salmonids), piscivorous birds (e.g., grebes, cormorants, herons), and marine mammals (seals, sea lions, and humpback whales). To avoid these predators, juvenile salmonids benefit from the presence of shoreline complexity (e.g., large wood, rocks, and kelp beds) that provide escape and hiding spaces. Offshore kelp beds in proximity to the breakwaters may provide an abundance of larval fish that are favored prey of juvenile pink and coho salmon. Both juvenile and adult salmon have been known to use kelp beds, but the association has not been well documented.

Dive surveys conducted in support of FAA's FEIS and EFH assessment found 17 taxa of demersal fish in nearshore areas within their project area including several species of sculpin, greenling and lingcod, flatfish, rockfish, tomcod, shiner perch, goby, and wolf eel.

Larval, juvenile, and adult life stages of several rockfish species are expected to occur in and in proximity to the Corps' project area, particularly in the breakwater areas and nearby kelp beds.

[1] http://www.fakr.noaa.gov/habitat/efh/hapc/hapc_ak.pdf

Table 1. Fish with designated essential fish habitat in the Gulf of Alaska Groundfish and Alaska Stocks of Pacific Salmon Fishery Management Plan areas (FAA, 2009; Appendix 3).

Gulf of Alaska Ground Fish		Alaska Stocks of Pacific Salmon
Skates (Rajidae)	Shortraker rockfish	Chinook salmon
Pacific cod	Northern rockfish	Coho salmon
Walleye Pollock	Dusky rockfish	Pink salmon
Thornyheads	Yellowfin sole,	Chum salmon
Pacific ocean perch	Arrowtooth flounder	Sockeye salmon
Rougheye rockfish	Rock sole	
Yelloweye rockfish	Alaska plaice	
Rex sole	Sculpins (Cottidae)	
Dover sole	Sharks	
Flathead sole	Forage fish complex	
Sablefish	Squid	
Atka mackerel	Octopus	

The aforementioned dive surveys observed four species of rockfish not included in the Gulf of Alaska Groundfish EFH list; however, their presence indicates that suitable habitats for the EFH rockfish species may be present.

Similarly, larval, juvenile, and adult life stages of several flatfish species are expected to occur in the HPC. FAA's dive surveys commonly observed several species of flatfish on soft and mixed bottom habitats and these observations suggest that EFH species of flatfish may be present in the project area, particularly common species such as yellowfin sole and rock sole.

Several taxa of EFH sculpin were commonly observed by FAA divers in both rocky and mixed bottom habitats in their project area. Therefore, all life stages of sculpin are likely present. Although not observed during FAA's dive surveys, EFH forage species such as eulachon, capelin, and Pacific sand lance, are also known to be abundant in the Sitka area.

Pacific herring are not included in the Gulf of Alaska Groundfish FMP and hence are not an EFH species; however, they serve an important ecological role within Sitka Sound. Pacific herring provide an abundant, high energy food source for a wide variety of fishes, mammals, and birds. Herring are also commercially important and support a roe fishery in Sitka that remains one of the largest and most valuable roe fisheries in Alaska.

All stages of herring are found in the HPC and are central to the area's marine food web. The largest herring stock in Southeast Alaska migrates to Sitka Sound each spring for an annual spawning event, spanning several days to several weeks from mid-March to late-April. Based on ADFG surveys over the last 30 years, herring spawning areas have been highly variable, but observed on marine vegetation around the perimeter of the Sitka Airport. These areas include the Channel Rock Breakwaters. Herring spawn from the intertidal zone down to about −40 feet MLLW, targeting areas with substantial macroalgae concentrations. Egg deposition occurs on all species of kelp in the Sitka area, particularly *Macrocystis* and *Saccharina*, but herring also use eelgrass, *Fucus*, coralline algae, red algae, and hard rocky substrates.

Assessment of Project Effects on Essential Fish Habitat

The Corps' assessment of its project on EFH mirrors the approach and findings of FAA's Sitka Airport improvements EFH assessment (FAA, 2009), as the FAA project is adjacent to the Corps' project area and includes similar features, such as fill placed in the marine nearshore environment and construction activities.

The types of impacts that would possibly affect EFH species/species complexes (five Pacific salmon species, the sculpin complex, and several species of flatfish, rockfish, and forage fish) known or highly likely to occur within the project area are separated into short-term and long-term impacts.

Short-term impacts include: (1) water quality impacts in the form of increased levels of turbidity resulting from fill and rock placement and oil/grease releases from work vessels and equipment; (2) noise disturbance from operation of heavy equipment, cranes, or barges and from rock or pile installation; and (3) disturbance from increased construction-related work boat traffic in the project area and along supply routes.

Long-term impacts include: (1) the loss and conversion of marine habitat resulting from the placement of rock and fill into the marine environment, and (2) water quality impacts from altering harbor circulation and flushing patterns.

Short-Term Impacts

<u>Water Quality</u>

The core material used for breakwater construction is expected to generate an insignificant amount of turbidity when placed in the marine environment, as the core material will not contain organics or an excessive amount of fines. See Appendix 1 for anticipated core material specifications. Any turbidity would be temporary, occur only in the immediate vicinity of active rock placement, and dissipate rapidly by tidal mixing.

Juvenile salmon have been shown to avoid areas of high turbidities (Servizi 1988), although they may seek out areas of moderate turbidity (10 to 80 NTU), presumably as refuge against predation (Cyrus and Blaber 1987a and 1987b). Feeding efficiency of juveniles is impaired by turbidities in excess of 70 NTU, well below sublethal stress levels (Bisson and Bilby 1982). Reduced preference by adult salmon homing to spawning areas has been demonstrated where turbidities exceed 30 NTU (20 mg/L suspended sediments). However, Chinook salmon exposed to 650 mg/L of suspended volcanic ash were still able to find their natal water (Whitman et al. 1982).

Based on these data, it is unlikely that the short-term (measured in hours based on tidal exchange frequency) and localized elevated turbidities generated by the proposed action would directly affect EFH juvenile or adult salmonids and EFH groundfish, such as flatfish, sculpins, and rockfish that may be present. Potential impacts would be further minimized by conducting all in-water work within approved regulatory work windows that would avoid major periods of juvenile salmon outmigration.

Except for the short-term, localized turbidity associated with the settling and placement of breakwater material into the marine environment, no adverse impacts to water or sediment quality is expected to occur as a result of the recommended corrective action.

<u>Waterborne Noise</u>

Waterborne noise would result from construction activities, such as the noise generated directly by work vessels (propulsion, power generators, on-board cranes, etc.) or by activities conducted by those vessels (e.g., dumping of breakwater core fill material and placement of breakwater armor rock).

Underwater noise or sound pressure from construction activities can have a variety of impacts on marine biota, especially fish and marine mammals. The most adverse impacts are associated with activities like underwater explosions and impact pile driving that produce a sharp sound through the water column (Hastings and Popper, 2005). However, in-water activities associated with the Corps' recommended corrective action (e.g., work vessel traffic and operation and placement of rock and fill into the marine environment) do not have the potential to generate the type and intensity of sound pressures that would result in adverse impacts to fish. At levels of sound resulting from the work activities anticipated, the primary reaction of EFH fish species/species complexes is expected to be simply a movement away from the work area. These affects would be further minimized by restricting in-water work to periods when few juvenile salmonids are in the area. Groundfish species such as flatfish, rockfish, and sculpins can be present year-round, so they may move out of the area during the construction period as well.

Construction-related Work Boat Traffic

Constructing the Corps's proposed project would heavily involve the delivery of breakwater materials (e.g., fill, riprap, and armor rock) to the site by sea-going vessels – most likely tug and barge combinations. For EFH fish, interactions with tug and barge traffic would be relatively benign, consisting of the animals simply moving away from the vessels as they transit back and forth. Vessels and barges would not be permitted to ground themselves on the bottom during low tide periods, thus no destruction or alteration of bottom habitats that constitute EFH for several pelagic and groundfish would occur.

Long-Term Impacts

Loss and Conversion of Marine Habitat

Rock and fill placement associated with the Corps' recommended corrective action would impact approximately 1.43 acres of EFH, 0.86 acre of which is existing rock fill material and 0.57 acre is mixed soft bottom substrate (table 2). Once covered with similar rock, there would be a net gain of approximately 0.45 acre of rocky substrate. When recolonized, the armor rock would provide approximately 1.31 acres of similar nearshore habitats for EFH species. This conversion would shift those areas from EFH for flatfish species to EFH for rockfish and sculpin species. This shift would also increase the amount of rocky EFH possibly used by juvenile salmonids during out-migration periods.

The succession of biota colonizing new or newly bare rock substrata in the intertidal marine environment is documented in numerous studies throughout the world (Carr and Amaral 1981, Underwood 2000, Lewis *et al*. 2002).

Prior to the construction of the Channel Rock Breakwaters in 1995, the U.S. Fish and Wildlife Service (USFWS) and Alaska Department of Fish and Game (ADF&G) expressed concern that herring spawning habitat would be adversely impacted within the project area. Therefore, beginning in 1993, the Corps, ADF&G and USFWS monitored spawning activity at the site for a period of 5 years. The surveys covered the time period of preconstruction, construction, and post-construction.

Post-construction subtidal surveys of the Channel Rock Breakwaters by the USFWS, both seaward and harbor-side, revealed robust stands of algae. The primary difference between the outside and inside of the breakwaters was the presence of perennial kelp (*Macrocystis pyrifera*) outside the harbor and its near absence inside. Several species were represented, although sugar kelp (*Laminaria saccharina*) and fringed sieve kelp (*Agarum fimbriatum*) were dominant and provided the greatest coverage. Sea hair, which dominated the inside of the breakwaters in 1996 and 1997, was largely replaced by larger-bladed species of algae that provided better substrate for herring spawn and EFH-related species/species complexes.

The final report for the 5-year study (1993-1998) indicated the breakwaters had become colonized with algae species suitable for herring spawning, Pacific herring had spawned on the

Table 2. Comparative tabulation of subtidal habitat losses and gains associated with alternatives considered in more detail.

Alternatives considered in more detail.	Surface area of mixed soft-bottom substrate below mean high water, unavoidably lost by constructing breakwater segment(s).	Surface area of rocky-substrate, breakwater habitat below mean high water, …		
		… unavoidably lost by constructing breakwater segment(s).	… created by constructing breakwater segments(s).	… net loss (-) or gain (+) by constructing breakwater segment(s).
No Action	0 ft² 0 acres	Not applicable	Not applicable	Not applicable
1 Breakwater stub	71,388 ft² 1.63 acres	3,962 ft² 0.09 acres	62,954 ft² 1.44 acres	+58,992 ft² +1.35 acres
4 Recommended Action Breakwater Gap Closure	**24,829 ft² 0.57 acres**	**37,313 ft² 0.86 acres**	**57,092 ft² 1.31 acres**	**+19,779 ft² +0.45 acres**
14 Combining alternatives 1, 4 and 15	212,760 ft² 4.87 acres	76,724 ft² 1.76 acres	257,772 ft² 5.91 acres	+181,048 ft² +4.15 acres
15 Main Breakwater Extension	116,543 ft² 2.67 acres	35,449 ft² 0.81 acres	137,726 ft² 3.16 acres	+102,277 ft² +2.35 acres

breakwaters in 1996 and 1998, and the herring spawn had decreased within the harbor basin created by the new breakwaters as compared with areas surveyed outside the harbor during the same timeframe (USFWS 1996, ADF&G 1998). Regarding mitigation, the ADF&G and USFWS concluded that the algae growth on the breakwaters was compensating, at least in part, for habitat degraded by the harbor project, and no mitigation was recommended at that time.

In 2005, the Corps and USFWS entered into an agreement to conduct a biological evaluation of the Channel Rock Breakwaters with emphasis on their habitat value as Pacific herring spawning substrate. It was found that after 10 years, the subtidal surface (between -30 feet MLLW and the surface) of all three breakwaters, both seaward and harbor side, supported robust stands of algae (e.g. sugar kelp and fringed sieve kelp) (USFWS, 2005). Again, the primary difference between the outside and inside surfaces of the breakwater appeared to be the presence of perennial kelp (*Macrocystis pyrifera*) outside the harbor and its near absence inside. However, the USFWS concluded that an abundance of suitable herring spawning habitat was available on the harbor side of the breakwaters. Overall, the Corps expects that in areas below approximately +6 feet MLLW, algal colonization following one complete growing season should be sufficient to support some of the normal ecological functions of the area, including herring spawning and grazing by a variety of fish and crustaceans.

More current marine surveys conducted in the area discovered blue mussels, cockles, butter clams, and horse clams in the rocky, sandy, and muddy intertidal zone, as well as many species of worms, marine snails, chitons, abalone, sea stars, crabs, sea urchins, and octopus, in other coastal habitats (FAA, 2009). Rocks moved from the construction area by waves or gravity and landing on soft sediments would provide points of attachment for plants and provide shelter for invertebrates and fish. Sediments around the base of such rocks would become favored burrow sites for infauna.

EFH species that commonly use subtidal mixed-soft bottom areas are the EFH flatfish complex and possibly some gadids (cod). These species would be permanently displaced from the breakwater footprint to areas beyond the toe of new armor rock. Given the small area of soft-bottomed habitat (0.57 acre) converted to hard bottomed habitat, relative to the large amount of adjacent similar habitat, no long-term adverse population-related impacts area expected.

Water Quality

A physical model was constructed at the Corps' Hydraulics and Coastal Laboratory at the Waterways Experiment Station to: (1) determine the amount of wave energy that reaches Eliason Harbor; (2) study circulation and harbor-flushing patterns; and (3) aid development of alternatives to reduce wave energy and not adversely affect water quality. The physical model was run with 18 different breakwater configurations. Results of the physical model study for the wave generator configured are documented in the Engineering Research and Development Laboratory's report: ERDC/CHL TR-08-2 *Physical Model Study of Wave Action in New Thomsen Harbor, Sitka, Alaska*.

The time lapse videos of the circulation-model-runs were viewed together with biologists from USFWS and NMFS during a meeting in Juneau, Alaska, and with an ADF&G biologist in Sitka, Alaska, in December 2009. It was the general consensus from all who viewed the video that circulation behind each of the project alternatives (i.e. harbor configurations) was at least the same as, if not better than, the circulation modeled for the existing Channel Rock Breakwaters configuration. No alternative appeared to produce “dead zones” where the water did not circulate. It is likely that by closing off or constricting some of the gaps in the breakwaters, the circulation was improved since the same volume of water was forced through smaller or fewer openings.

Except for the previously discussed short term, localized turbidity associated with the placement of breakwater material into the marine environment, no adverse impacts to water or sediment quality, EFH, and EFH-related species/species complexes are expected to occur as a result of the recommended corrective action.

Mitigation Measures

As described in the previous sections, both adverse and beneficial environmental consequences would occur as a result of implementing the recommended corrective action. “Mitigation” is the process used to avoid, minimize, and compensate for environmental consequences of an action. Incorporating the following mitigation measures and conservation measures into the recommended corrective action will help to assure that no significant adverse impacts would occur to EFH and EFH-managed species/species complexes and other fish and wildlife resources in the project area.

- The proposed action shall cease in-water construction between March 15 and June 1 during peak herring spawn activities, juvenile salmon outmigration and rearing activities, and when Steller sea lion and humpback whale feeding and abundance is expected to be greatest in the project area.

- To minimize the danger to marine mammals from project-related vessels, speed limits (albeit undefined at this time) shall be imposed on vessels moving between the project area and material suppliers.

- Vessels and barges shall not be permitted to ground themselves on the bottom during low tide periods, unless there is a human safety issue requiring it.

- A construction oil spill prevention plan shall be prepared.

- Breakwater construction shall use core material, B rock and armor stone clean of organic debris and invasive species.

- Transit vessels shall not travel within 3,000 feet of designated Steller sea lion critical habitat (haulouts or rookeries).

Conclusions and Determination of Effect

The project actions described above have the potential to affect the EFH for several Gulf of Alaska groundfish species (e.g., rockfish, sculpin, and flatfish) and for Alaska stocks of Pacific salmon, both in the short- and long-term. Short-term effects in the form of avoidance because of noise disturbances, boat traffic and turbidity would be intermittent and low level. Long-term effects would cause the alteration, loss and gain of marine habitat and affect circulation patterns.

Rock and fill placement associated with the Corps' recommended corrective action would affect approximately 1.43 acres of EFH, 0.86 acre of which is existing rock fill material and 0.57 acre is mixed soft bottom substrate. Once covered with similar rock there would be a net gain of approximately 0.45 acre of rocky substrate. Within 1 to 2 years following completion of construction, the new breakwater segment is expected to be recolonized by productive populations of invertebrates and algae that would support ecological functions similar to those now provided by the original breakwaters. When recolonized, the new armor rock would provide approximately 1.31 acres of similar nearshore habitats for EFH species. This conversion would shift those areas from EFH for flatfish species to EFH for rockfish and sculpin species. This shift would also increase the amount of rocky EFH habitat used by juvenile salmonids during out-migration periods.

Constructing the breakwater to fill in the gap between the south and main breakwaters would eliminate approximately 37,000 square feet of established Pacific herring spawning habitat. However, the recommended corrective action would also have a net beneficial environmental effect on Pacific herring, as after construction approximately 57,000 square feet of suitable rocky substrate would be available for kelp and other marine algae species to become established and support spawning Pacific herring.

The potential effects of turbidity would be intermittent and low level. No adverse impacts related to circulation and harbor-flushing is expected. Year-round resident EFH species such as rockfish, flatfish, and sculpins would likely respond by temporarily moving out of work areas during construction.

The Corps' recommended correction action would likely be constructed over a period of months and within an anticipated in-water work window. Seasonal work restrictions would minimize any impacts to out-migrating juvenile salmonids and to spawning herring by prohibiting work in open waters, between approximately March 15 and June 1. Work would be allowed in marine waters from June 1 to March 14, to avoid herring spawning activities. The actual start and finish of the spring timing window may shift to accommodate earlier or later herring spawns.

Potential impacts to EFH and EFH-managed species/species complexes are likely to be highly localized, temporary, and minimal, and not reduce the overall value of EFH in Sitka Sound. The aforementioned mitigation measures will be proscribed to offset the potential impacts of the Corps' corrective action at the Channel Rock Breakwaters. Therefore, the Corps concludes that its Federal action may affect, but is not likely to adversely affect, EFH and EFH-managed species/species complexes for Gulf of Alaska groundfish and Alaska stocks of Pacific salmon.

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APPENDIX 1

RUBBLE MOUND BREAKWATER CONSTRUCTION

Typical rubble mound breakwaters are constructed with a center "core" that is composed of shot rock. This material, termed "core rock", is composed of shot rock typically produced in a quarry using a grizzly (or screen) to meet the rock gradation required in the specifications for a project. Rock gradation requirements vary from project to project, however, a typical breakwater core rock gradation is as follows:

Specified Rock Weight (lbs)	Comment
250	100% by weight of the total quantity of rock must be less than 250 pounds.
33	15% by weight of the total quantity can consist of rock between 33 and 250 pounds. 85% by weight of the total quantity has to consist of rock between 1 and 33 pounds.
1	1% by weight of the total quantity can consist of rock less than 1 pound. 99% by weight of the total quantity has to consist of rock between 1 and 250 pounds.

This generally translates to an average core-rock size being in the 30 to 50 pound range (or 6 to 8 inch average diameter). The maximum size would be about 250 pounds (14 inch average diameter) and the minimum size would be about 1 pound (2 inch average diameter). No more than 1% by weight would be fines. This means essentially no sand, silt, or dirt is allowed in the breakwater core. Special care is taken to ensure that fines are not scooped up in the core-loading process at the quarry and off the barge.

The core material serves as the foundation for the breakwater rubble mound and provides the base for placement of the outer layers of the larger B and armor rock (figure 1). The core is designed to be semi-permeable and capable of dissipating wave energy within the voids spaces between individual stones. The core is usually placed first using a split hull scow (photo 1) or with a skip box and crane off a flat deck barge (photo 2). In some cases, core material is placed using a loader off a flat deck barge or with trucks if land based construction is selected. B rock is placed similarly as core material. Placement of the core rock and B rock is typically finalized using an excavator to shape the rock prism to template (photos 3 and 4). Armor rock is normally "pick and placed" and not dumped on the breakwater's B rock.

Examples of recently constructed rubble mound breakwaters using the above construction methods are: Wrangell Harbor, Seward Harbor, Douglas Harbor, Sitka Channel Rock Breakwaters, Nome Navigation Improvements, King Cove New Harbor, False Pass Harbor, and Unalaska Harbor Phase I.

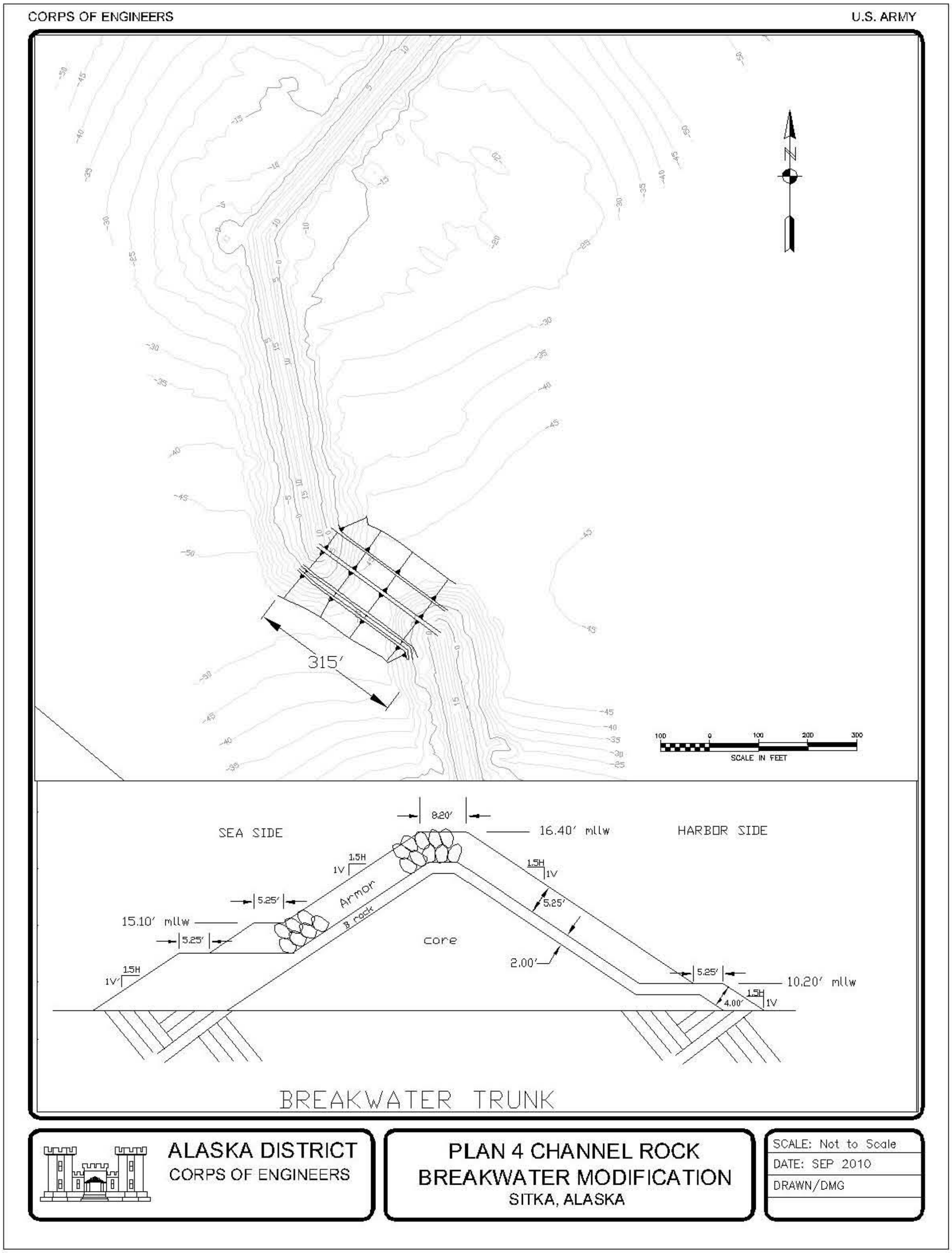

Figure 1. Rubble mound breakwater cross-section of the recommended alternative 4.

Photo 1. Split Hull scow with tug, positioning in preparation for core rock placement at Wrangell Harbor.

Photo 2. Skip box and crane off loading core material at Wrangell Harbor.

Photo 3. Core rock following shaping with excavator at Wrangell Harbor.

Photo 4. Core rock side slope projecting under water toward the toe at Wrangell Harbor.

APPENDIX 2

Description of Alternatives Not Chosen as the Corps' Recommended Plan for the Channel Rock Breakwaters Project In Sitka, Alaska

No-Action Alternative

No project design changes or construction is associated with the No-Action alternative. Existing Channel Rock Breakwaters features would remain in place and unaltered. No cost is associated with the No-Action alternative.

Alternative 1, Japonski Island Breakwater

Alternative 1 would involve constructing a 500-foot-long stub breakwater from Japonski Island to provide a 100-foot overlap of the existing south breakwater. Plan views of this alternative are shown in figure 1, the cross section for the head of the breakwater in figure 2, and the cross section for the trunk of the breakwater in figure 3. Armor rock for this option is 2,000-pound. Approximately 7,000 cubic yards of armor stone, 10,000 cubic yards of B rock, and 21,000 cubic yards of core material will be required for this alternative. The estimated cost of this alternative is $11,168,000.

Figure 1. Alternative 1, stub breakwater, would extend from the Japonski Island shore northward to form a 100-foot overlap with the south breakwater–drawings not to scale.

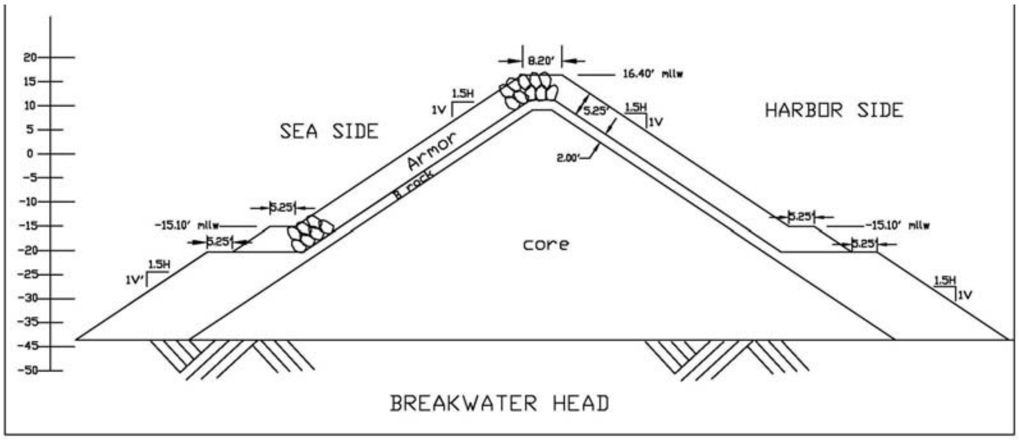

Figure 2. The Breakwater Head Cross Section is common to Alternatives 1 and 15.

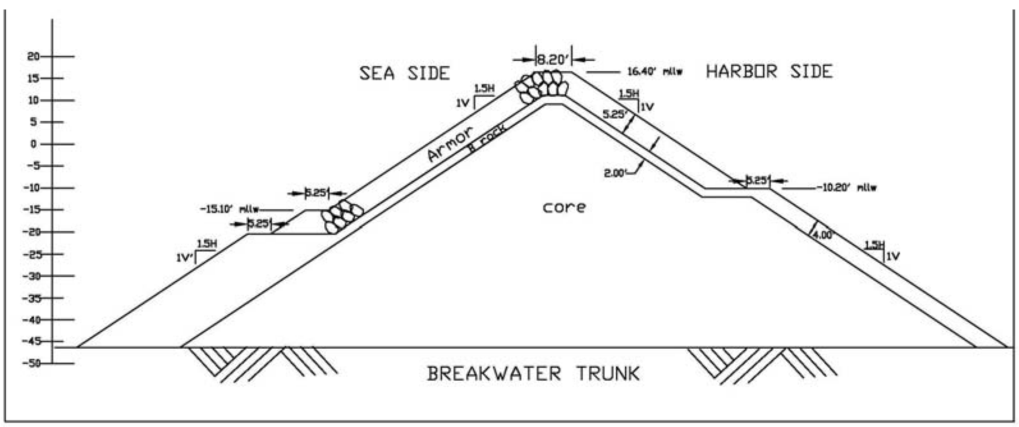

Figure 3. The Breakwater Trunk Cross Section is common to Alternatives 1 and 4.

Alternative 14, Breakwater Combination

Alternative 14 would combine all the construction features of alternatives 1, 4 and 15, that is, expand the existing breakwaters and close or reduce gaps with four construction features as follows:

- A 500-foot stub breakwater from Japonski Island would overlap the gap between Japonski Island and the south breakwater and reduce wave energy through this gap;

- A 315-foot-long extension would connect the main breakwater and the south breakwater to reduce wave energy focused through this area from the Gulf of Alaska;
- The north end of the main breakwater would be extended 450 feet at an angle to overlap the north breakwater by 100 feet and reduce wave energy through the main entrance channel;
- The south end of the north breakwater would be extended 60 feet to further reduce entrance channel width and wave energy through it.

Plan views of this option are shown in figure 4. Larger armor stone would be used for the angled extension of the main breakwater at the entrance channel because modeling shows it would be struck by waves traveling down the length of the main breakwater. Core rock height would be reduced in the angled section to accommodate the larger armor rock without raising the breakwater extension higher than the main breakwater.

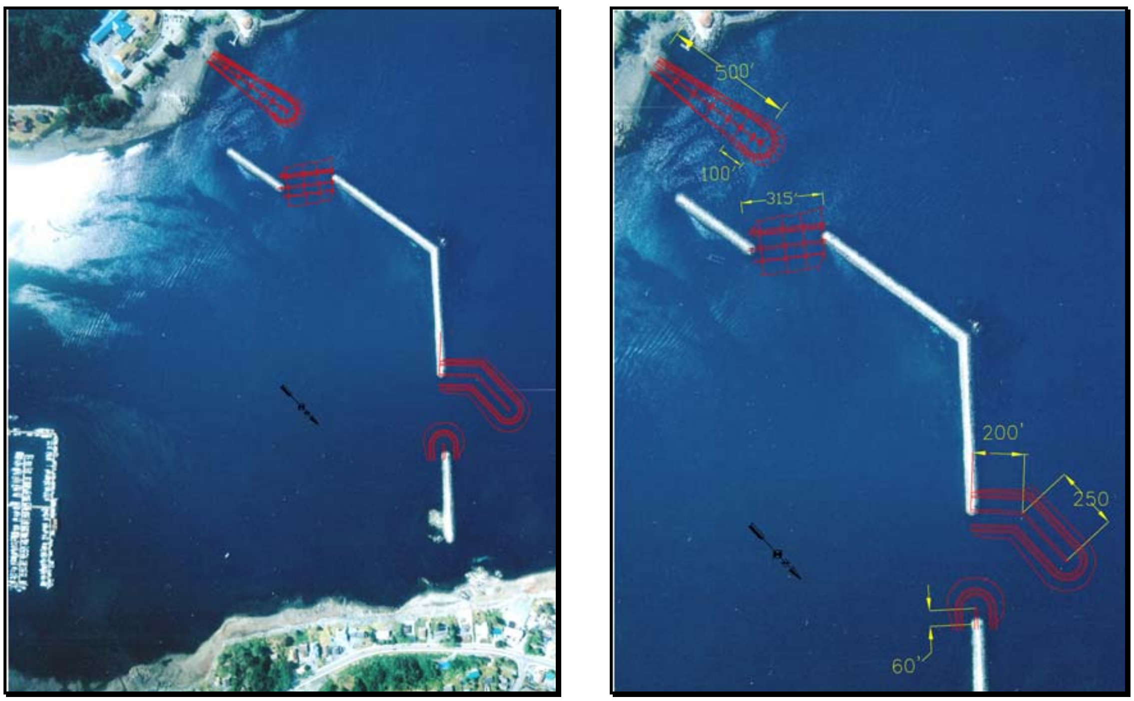

Figure 4. Alternative 14 combines Alternatives 1, 4, and 15 – drawing not to scale.

Approximately 21,000 cubic yards of 4,800-pound armor stone, 16,000 cubic yards of B rock, and 48,000 cubic yards of core material would be used for the angled extension. Approximately 21,000 cubic yards of 2,000-pound armor stone, 28,000 cubic yards of B rock, and 58,000 cubic yards of core material would be required for the remainder of the breakwater modifications. The armor and B rock on the existing breakwater would be removed at the junction of the extension and would be used in construction. The estimated cost for this alternative is $29,829,000.

Alternative 15, Main Breakwater Extension

Alternative 15 would construct an angled extension on the main breakwater and extend the north breakwater to narrow the large gap. The angled extension would be 450 feet long and the stub extension would be 60 feet long. Plan views of this option are shown in figure 5 and a cross section for the angled extension is shown in figure 6. The north breakwater extension cross section is shown in figure 2. A larger wave height was used to size the armor stone for the angled extension because waves travel along the length of this breakwater and would be forced to turn at the extension. Approximately 21,000 cubic yards of armor stone (4,800 pounds), 16,000 cubic yards of B rock, and 48,000 cubic yards of core material would be required for this option. The stub extension would require 5,000 cubic yards of armor (2,000 pounds), 5,000 cubic yards of B rock, and 7,000 cubic yards of core material. The armor and B rock on the existing breakwater will be removed where the extension begins. Approximately 3,500 cubic yards of armor and 1,000 cubic yards of B rock would be removed and used for construction of the north breakwater extension. The estimated cost of this alternative is $19,555,000.

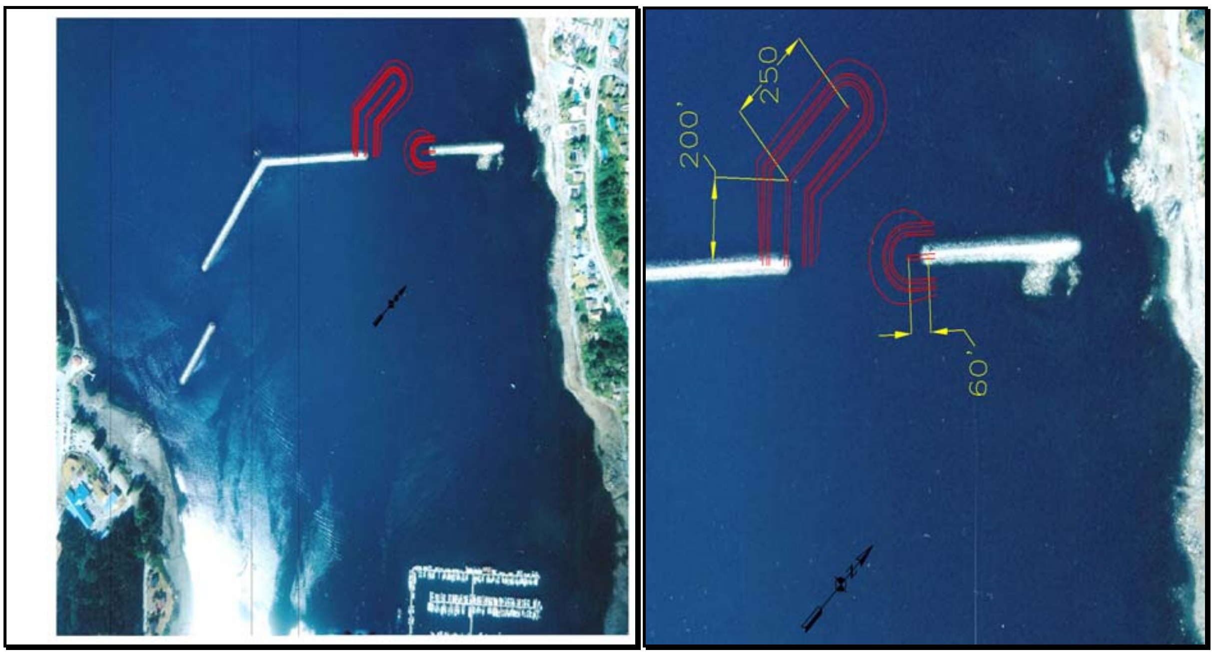

Figure 5. Alternative 15 would provide an angled extension to the main breakwater and a straight extension to the north breakwater, creating a 100 foot overlap – drawing not to scale.

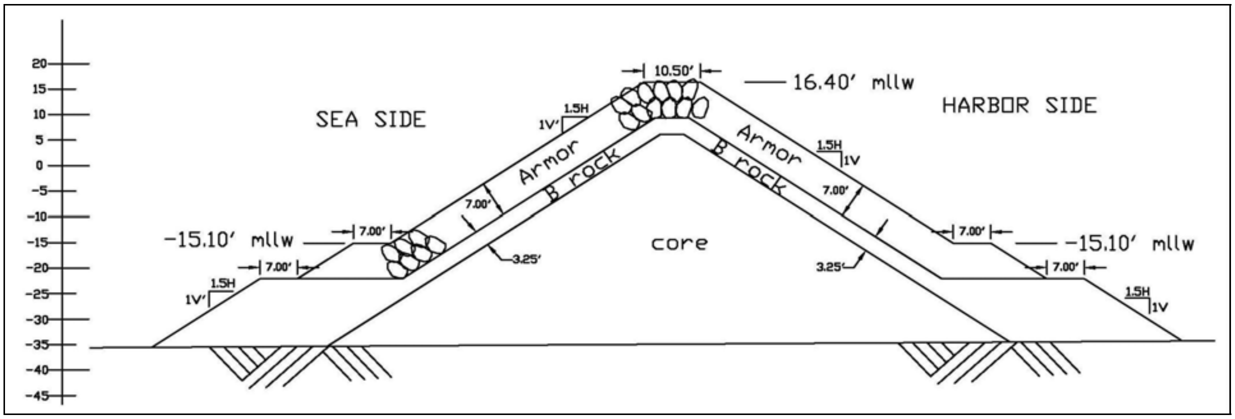

Figure 6. Main Breakwater Extension and North Breakwater Extension Cross Section - Alternative 15.

APPENDIX 3

Description of Essential Fish Habitat for the Groundfish Resources of the Gulf of Alaska Region[2]

Walleye Pollock

Eggs
EFH for walleye pollock eggs is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m), upper slope (200 to 500 m), and intermediate slope (500 to 1,000 m) throughout the GOA.

Larvae
EFH for larval walleye pollock is the general distribution area for this life stage, located in epipelagic waters along the entire shelf (0 to 200 m), upper slope (200 to 500 m), and intermediate slope (500 to 1,000 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Limited information exists to describe walleye pollock early juvenile larval general distribution.

Late Juveniles
EFH for late juvenile walleye pollock is the general distribution area for this life stage, located in the lower and middle portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf along the throughout the GOA. No known preference for substrates exist.

Adults
EFH for adult walleye pollock is the general distribution area for this life stage, located in the lower and middle portion of the water column along the entire shelf (0 to 200) and slope (200 to 1,000 m) throughout the GOA. No known preference for substrates exist.

Pacific Cod

Eggs
EFH for Pacific cod eggs is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and upper (200 to 500 m) slope throughout the GOA wherever there are soft substrates consisting of mud and sand.

Larvae
EFH for larval Pacific cod is the general distribution area for this life stage, located in pelagic waters along the inner (0 to 50 m) and middle (50 to 100 m) shelf throughout the GOA wherever there are soft substrates consisting of mud and sand.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

[2] http://sharpfin.nmfs.noaa.gov/website/efh_mapper/newinv/efh_inventory.html

Late Juveniles
EFH for late juvenile Pacific cod is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are soft substrates consisting of sand, mud, sandy mud, and muddy sand.

Adults
EFH for adult Pacific cod is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the GOA wherever there are soft substrates consisting of sand, mud, sandy mud, muddy sand, and gravel.

<u>Yellowfin Sole</u>

Eggs
EFH for yellowfin sole eggs is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and upper (200 to 500 m) slope throughout the GOA.

Larvae
EFH for larval yellowfin sole is the general distribution area for this life stage, located in pelagic waters along the shelf (0 to 200 m) and upper slope (200 to 500 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile yellowfin sole is the general distribution area for this life stage, located in the lower portion of the water column within nearshore bays and along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the GOA wherever there are soft substrates consisting mainly of sand.

Adults
EFH for adult yellowfin sole is the general distribution area for this life stage, located in the lower portion of the water column within nearshore bays and along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the GOA wherever there are soft substrates consisting mainly of sand.

<u>Arrowtooth Flounder</u>

Eggs—No EFH Description Determined
Insufficient information is available.

Larvae
EFH for larval arrowtooth flounder is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and slope (200 to 3,000 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile arrowtooth flounder is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf and upper slope (200 to 500 m) throughout the GOA wherever there are softer substrates consisting of gravel, sand, and mud.

Adults
EFH for adult arrowtooth flounder is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50), middle (50 to 100 m), and outer (100 to 200 m) shelf and upper slope (200 to 500 m) throughout the GOA wherever there are softer substrates consisting of gravel, sand, and mud.

Rock Sole

Eggs—No EFH Description Determined
Insufficient information is available.

Larvae
EFH for larval rock sole is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and upper slope (200 to 1,000 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile rock sole is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are softer substrates consisting of sand, gravel, and cobble.

Adults
EFH for adult rock sole is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are softer substrates consisting of sand, gravel, and cobble.

Alaska Plaice

Eggs
EFH for Alaska plaice eggs is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and upper slope (200 to 500 m) throughout the GOA in the spring.

Larvae
EFH for larval Alaska plaice is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and upper slope (200 to 500 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile Alaska plaice is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are softer substrates consisting of sand and mud.

Adults
EFH for adult Alaska plaice is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are softer substrates consisting of sand and mud.

Rex Sole

Eggs
EFH for rex sole eggs is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and upper slope (200 to 500 m) throughout the GOA in the spring.

Larvae
EFH for larval rex sole is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and upper slope (200 to 500 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for juvenile rex sole is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the GOA wherever there are substrates consisting of gravel, sand, and mud.

Adults
EFH for adult rex sole is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the GOA wherever there are substrates consisting of gravel, sand, and mud.

Dover Sole

Eggs
EFH for Dover sole eggs is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and slope (200 to 3,000 m) throughout the GOA.

Larvae
EFH for larval Dover sole is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and slope (200 to 3,000 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile Dover sole is the general distribution area for this life stage, located in the lower portion of the water column along the middle (50 to 100 m), and outer (100 to 200 m) shelf and upper slope (200 to 500 m) throughout the GOA wherever there are substrates consisting of sand and mud.

Adults
EFH for adult Dover sole is the general distribution area for this life stage, located in the lower portion of the water column along the middle (50 to 100 m), and outer (100 to 200 m) shelf and upper slope (200 to 500 m) throughout the GOA wherever there are substrates consisting of sand and mud.

Flathead Sole

Eggs
EFH for flathead sole eggs is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and slope (200 to 3,000 m) throughout the GOA.

Larvae
EFH for larval flathead sole is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and slope (200 to 3,000 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for juvenile flathead sole is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the GOA wherever there are softer substrates consisting of sand and mud.

Adults
EFH for adult flathead sole is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the GOA wherever there are softer substrates consisting of sand and mud.

Sablefish

Eggs
EFH for sablefish eggs is the general distribution area for this life stage, located in deeper waters along the slope (200 to 3,000 m) throughout the GOA.

Larvae
EFH for larval sablefish is the general distribution area for this life stage, located in epipelagic waters along the middle shelf (50 to 100 m), outer shelf (100 to 200 m), and slope (200 to 3,000 m) throughout the GOA..

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile sablefish is the general distribution area for this life stage, located in the lower portion of the water column, varied habitats, generally softer substrates, and deep shelf gulleys along the slope (200 to 1,000 m) throughout the GOA.

Adults
EFH for adult sablefish is the general distribution area for this life stage, located in the lower portion of the water column, varied habitats, generally softer substrates, and deep shelf gulleys along the slope (200 to 1,000 m) throughout the GOA.

Pacific Ocean Perch

Eggs—No EFH Description Determined
Insufficient information is available.

Larvae
EFH for larval Pacific Ocean perch is the general distribution area for this life stage, located in the middle to lower portion of the water column along the inner shelf (0 to 50 m), middle shelf (50 to 100 m), outer shelf (100 to 200 m), and upper slope (200 to 500 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile Pacific Ocean perch is the general distribution area for this life stage, located in the middle to lower portion of the water column along the inner shelf (0 to 50 m), middle shelf (50 to 100 m), outer shelf (100 to 200 m), and upper slope (200 to 500 m) throughout the GOA wherever there are substrates consisting of cobble, gravel, mud, sandy mud, or muddy sand.

Adults
EFH for adult Pacific Ocean perch is the general distribution area for this life stage, located in the lower portion of the water column along the outer shelf (100 to 200 m) and upper slope (200 to 500 m) throughout the GOA wherever there are substrates consisting of cobble, gravel, mud, sandy mud, or muddy sand.

Shortraker and Rougheye Rockfish

Eggs—No EFH Description Determined
Insufficient information is available.

Larvae
EFH for larval shortraker and rougheye rockfish is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and slope (200 to 3,000 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles—No EFH Description Determined
Insufficient information is available.

Adults
EFH for adult shortraker and rougheye rockfish is the general distribution area for this life stage, located in the lower portion of the water column along the outer shelf (100 to 200 m) and upper slope (200 to 500 m) regions throughout the GOA wherever there are substrates consisting of mud, sand, sandy mud, muddy sand, rock, cobble, and gravel.

Northern Rockfish

Eggs—No EFH Description Determined
Insufficient information is available.

Larvae
EFH for larval northern rockfish is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and slope (200 to 3,000 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles—No EFH Description Determined
Insufficient information is available.

Adults
EFH for adult northern rockfish is the general distribution area for this life stage, located in the middle and lower portions of the water column along the outer slope (100 to 200 m) and upper slope (200 to 500 m) throughout the GOA wherever there are substrates of cobble and rock.

Thornyhead Rockfish

Eggs—No EFH Description Determined
Insufficient information is available.

Larvae
EFH for larval thornyhead rockfish is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and slope (200 to 3,000 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile Thornyhead rockfish is the general distribution area for this life stage, located in the lower portion of the water column along the middle and outer shelf (50 to 200 m) and upper to lower slope (200 to 1,000 m) throughout the GOA wherever there are substrates of mud, sand, rock, sandy mud, muddy sand, cobble, and gravel.

Adults
EFH for adult Thornyhead rockfish is the general distribution area for this life stage, located in the lower portion of the water column along the middle and outer shelf (50 to 200 m) and upper to lower slope (200 to 1,000 m) throughout the GOA wherever there are substrates of mud, sand, rock, sandy mud, muddy sand, cobble, and gravel.

Yelloweye Rockfish

Eggs—No EFH Description Determined
Insufficient information is available.

Larvae
EFH for larval yelloweye rockfish is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and slope (200 to 3,000 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile Yelloweye rockfish is the general distribution area for this life stage, located in the lower portion of the water column within bays and island passages and along the inner (0 to 50 m), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the GOA wherever there are substrates of rock and in areas of vertical relief, such as crevices, overhangs, vertical walls, coral, and larger sponges.

Adults
EFH for adult Yelloweye rockfish is the general distribution area for this life stage, located in the lower portion of the water column within bays and island passages and along the inner shelf (0 to 50 m), middle shelf (50 to 100 m), outer shelf (100 to 200 m) and upper slope (200 to 500 m) throughout the GOA wherever there are substrates of rock and in areas of vertical relief, such as crevices, overhangs, vertical walls, coral, and larger sponges.

Dusky Rockfish

Eggs—No EFH Description Determined
Insufficient information is available.

Larvae
EFH for larval dusky rockfish is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and slope (200 to 3,000 m) throughout the GOA.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles—No EFH Description Determined
Insufficient information is available.

Adults
EFH for adult Dusky rockfish is the general distribution area for this life stage, located in the middle and lower portions of the water column along the outer shelf (100 to 200 m) and upper slope (200 to 500 m) throughout the GOA wherever there are substrates of cobble, rock, and gravel.

Atka Mackerel

Eggs—No EFH Description Determined
Insufficient information is available.

Larvae
EFH for larval Atka mackerel is the general distribution area for this life stage, located in epipelagic waters along the shelf (0 to 200 m), upper slope (200 to 500 m), and intermediate slope (500 to 1,000 m) throughout the GOA.

Early Juveniles —No EFH Description Determined
Insufficient information is available.

Late Juveniles—No EFH Description Determined
Insufficient information is available.

Adults
EFH for adult Atka mackerel is the general distribution area for this life stage, located in the entire water column, from sea surface to the sea floor, along the inner (0 to 50 m), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the GOA wherever there are substrates of gravel and rock and in vegetated areas of kelp

Sculpins

Eggs—No EFH Description Determined
Insufficient information is available.

Larvae—No EFH Description Determined
Insufficient information is available.

Juveniles
EFH for juvenile sculpins is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), outer shelf (100 to 200 m) and portions of the upper slope (200 to 500 m) throughout the GOA wherever there are substrates of rock, sand, mud, cobble, and sandy mud.

Adults
EFH for adult sculpins is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), outer shelf (100 to 200 m) and portions of the upper slope (200 to 500 m) throughout the GOA wherever there are substrates of rock, sand, mud, cobble, and sandy mud.

Skates

Eggs—No EFH Description Determined
Insufficient information is available.

Larvae—No EFH Description Determined
Insufficient information is available.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles—No EFH Description Determined
Insufficient information is available.

Adults
EFH for adult skates is the general distribution area for this life stage, located in the lower portion of the water column on the shelf (0 to 200 m) and the upper slope (200 to 500 m) throughout the GOA wherever there are of substrates of mud, sand, gravel, and rock.

Sharks

Eggs—No EFH Description Determined
Insufficient information is available.

Larvae—No EFH Description Determined
Insufficient information is available.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles—No EFH Description Determined
Insufficient information is available.

Adults—No EFH Description Determined
Insufficient information is available.

Forage Fish Complex—Eulachon, Capelin, Sand Lance, Sand Fish, Euphausiids, Myctophids, Pholids, Gonostomatids, etc.

Eggs—No EFH Description Determined
Insufficient information is available.

Larvae—No EFH Description Determined
Insufficient information is available.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles—No EFH Description Determined
Insufficient information is available.

Adults. No EFH Description Determined
Insufficient information is available.

Squid

Eggs—No EFH Description Determined
Insufficient information is available.

Young Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for older juvenile squid is the general distribution area for this life stage, located in the entire water column, from the sea surface to sea floor, along the inner (0 to 50 m), middle (50 to 100 m), and outer (200 to 500 m) shelf and the entire slope (500 to 1,000 m) throughout the GOA.

Adults
EFH for adult squid is the general distribution area for this life stage, located in the entire water column, from the sea surface to sea floor, along the inner (0 to 50 m), middle (50 to 100 m), and outer (200 to 500 m) shelf and the entire slope (500 to 1,000 m) throughout the GOA.

Octopus

Eggs—No EFH Description Determined
Insufficient information is available.

Young Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles—No EFH Description Determined
Insufficient information is available.

Adults. No EFH Description Determined
Insufficient information is available.

APPENDIX 3

COMPARATIVE GENERAL SUMMARY
OF POSSIBLE ENVIRONMENTAL IMPACTS
ASSOCIATED WITH THE
CHANNEL ROCKS BREAKWATER CORRECTIVE ACTION
ALTERNATIVES CONSIDERED
IN GREATER DETAIL

Resources of Primary Concern	No Action Alternative	Alternative 1 Japonski Island Breakwater	**Alternative 4** **Breakwater Gap Closed** **Recommended Corrective Action**	Alternative 14 Breakwater Combination (Alternatives 1, 4 and 15)	Alternative 15 Main Breakwater Extension
1. Marine Mammals	No breakwater construction-related impacts on marine mammals would occur. Ongoing harbor and shoreline development activities would continue to impact marine mammal populations using the project area.	A <1 year construction season would have impacts similar to those associated with Alternative 4, the recommended plan. No significant adverse impacts expected.	A <1 year construction season would result in a temporary disturbance of ambient noise, increased suspended sediment conditions & cause marine mammals near the construction site to temporarily move away from the area. No significant adverse impacts expected.	A 2-year construction season would have each year, impacts similar to those associated with Alternative 4, the recommended plan. No significant adverse impacts expected.	A <1 year construction season would have impacts similar to those associated with Alternative 4, the recommended plan. No significant adverse impacts expected.
2. Benthos and Phycology	No breakwater construction-related impacts on benthos and phycology would occur. Benthic and associated algal communities would continue to be affected by harbor and shoreline development activities requiring intertidal/subtidal fill.	71,388 ft² of soft bottom habitat unavoidable lost and a net gain of 58,992 ft² of rocky substrate habitat created. No significant adverse impacts expected.	24,829 ft² of soft bottom habitat unavoidably lost and a net gain of 19,779 ft² of rocky substrate habitat created. No significant adverse impacts expected.	212,760 ft² of soft bottom habitat unavoidably lost and a net gain of 181,048 ft² of rocky substrate habitat created. No significant adverse impacts expected.	116,543 ft² of soft bottom habitat unavoidably lost and a net gain of 102,277 ft² of rocky substrate habitat created. No significant adverse impacts expected.

Resources of Primary Concern	No Action	Alternative 1 Japonski Island Breakwater	**Alternative 4** **Breakwater Gap Closed** **Recommended Corrective Action**	Alternative 14 Breakwater Combination (Alternatives 1, 4 and 15)	Alternative 15 Main Breakwater Extension
3. Fishery Resources & Essential Fish Habitat (EFH)	No breakwater construction-related impacts on fishery resources and EFH would occur. Fish communities and EFH would continue to be affected by harbor and shoreline development activities requiring intertidal & subtidal fill.	Impacts would be similar to those associated with Alternative 4, the recommended plan; however, a net gain of 58,992 ft^2 of Pacific herring spawning habitat would be produced. No significant adverse impacts expected.	Temporary displacement of fish communities during construction. Benthic habitat used by EFH-species for feeding and rearing unavoidably lost by breakwater construction; however, a net gain of 19,779 ft^2 of Pacific herring spawning habitat would be produced. No significant adverse impacts expected.	Impacts would be similar to those associated with Alternative 4, the recommended plan; however, a net gain of 181,048 ft^2 of Pacific herring spawning habitat would be produced. No significant adverse impacts expected.	Impacts would be similar to those associated with Alternative 4, the recommended plan; however, a net gain of 102,277 ft^2 of Pacific herring spawning habitat would be produced. No significant adverse impacts expected.
4. Water quality and circulation	No breakwater construction-related impacts on water quality and circulation would occur. Urban runoff and permitted wastewater discharges would continue. Water circulation in the harbor remains sufficient to prevent degradation in local water quality.	Impacts would be similar to those associated with Alternative 4, the recommended plan. No significant adverse impacts expected.	Modeled circulation behind each of the alternatives was at least the same as or, in most cases, better than the circulation modeled for the existing breakwater configuration. No alternative appeared to produce water quality/circulation “dead zones”. No significant adverse impacts expected.	Impacts would be similar to those associated with Alternative 4, the recommended plan. No significant adverse impacts expected.	Impacts would be similar to those associated with Alternative 4, the recommended plan. No significant adverse impacts expected.

Resources of Primary Concern	No Action	Alternative 1 Japonski Island Breakwater	**Alternative 4** **Breakwater Gap Closed** **Recommended Corrective Action**	Alternative 14 Breakwater Combination (Alternatives 1, 4 and 15)	Alternative 15 Main Breakwater Extension
5. Avians	No breakwater construction-related impacts on avian populations would occur. Local avian populations would continue to use the project area and be affected by ongoing vessel traffic and other harbor and shoreline development activities.	Impacts would be similar to those associated with Alternative 4, the recommended plan. No significant adverse impacts expected.	No long-term effects on local avian populations. Short-term displacement from project area during construction (i.e. noise and human disturbance). No significant adverse impacts expected.	Impacts would be similar to those associated with Alternative 4, the recommended plan. No significant adverse impacts expected.	Impacts would be similar to those associated with Alternative 4, the recommended plan. No significant adverse impacts expected.
6. Endangered &Threatened Species	No breakwater construction-related impacts on endangered and threatened species would occur. Future shoreline/in-water developments might have the potential to affect subject resources and their habitat.	Impacts identical to those associated with Alternative 4, the recommended action.	Vessel noise and transit associated with construction activities have the potential to cause avoidance, disturbance, or displacement of Steller sea lions and humpback whales from the Sitka Harbor area during peak Pacific herring spawning activities. The Corps determined that its proposed action: (1) would not modify or adversely affect designated critical habitat; and (2) may affect but, is not likely to adversely affected humpback whales, Steller sea lions or Pacific herring.	Impacts identical to those associated with Alternative 4, the recommended action.	Impacts identical to those associated with Alternative 4, the recommended action.

Resources of Primary Concern	No Action	Alternative 1 Japonski Island Breakwater	**Alternative 4** **Breakwater Gap Closed** **Recommended Corrective Action**	Alternative 14 Breakwater Combination (Alternatives 1, 4 and 15)	Alternative 15 Main Breakwater Extension
7. Subsistence Resources	No breakwater construction-related impacts on subsistence resources would occur. Existing local herring and herring egg harvesting would continue unabated.	Short term impact on herring and herring egg harvesting. No terrestrial impacts.	Short term impact on herring and herring egg harvesting. No terrestrial impacts.	Short term impact on herring and herring egg harvesting. No terrestrial impacts.	Short term impact on herring and herring egg harvesting. No terrestrial impacts.
8. Cultural, Historical & Archaeological Resources	No breakwater construction-related impacts on cultural, historical and archaeological resources would occur. Local shoreline and terrestrial developments might have the potential to affect said resources.	No impacts on customary & traditional practices or historical/archaeological features.	No impacts on customary & traditional practices or historical/archaeological features.	No impacts on customary & traditional practices or historical/archaeological features.	No impacts on customary & traditional practices or historical/archaeological features.

Resources of Primary Concern	No Action	Alternative 1 Japonski Island Breakwater	**Alternative 4** **Breakwater Gap Closed** **Recommended Corrective Action**	Alternative 14 Breakwater Combination (Alternatives 1, 4 and 15)	Alternative 15 Main Breakwater Extension
9. Direct Impacts	No marine benthic habitat would be affected by fill activities. No temporary degradation of water quality. No short term displacement of fish and avian communities and marine mammals from using the construction site. Local coastal developments would have the potential to directly affect the nearshore marine environment.	Direct impacts identical to those associated with Alternative 4, the recommended action.	Marine benthic habitat (soft bottom and rocky substrate) unavoidably lost by fill activities. Temporary degradation of water quality during construction. Short term displacement of fish and avian communities and marine mammals from using the construction site.	Direct impacts identical to those associated with Alternative 4, the recommended action.	Direct impacts identical to those associated with Alternative 4, the recommended action.
10. Indirect Impacts	Users of the harbor would continue to experience adverse oceanographic conditions resulting in vessel damage and conditional use of the harbor facilities.	Constructed breakwater would, when revegetated with marine algae, create of 58,992 ft² Pacific herring spawning habitat and provide additional habitat for seabirds.	Constructed breakwater would, when revegetated with marine algae, create 19,779 ft² of Pacific herring spawning habitat and provide additional habitat for seabirds.	Constructed breakwater would, when revegetated with marine algae, create 181,048 ft² of Pacific herring spawning habitat and provide additional habitat for seabirds.	Constructed breakwater would, when revegetated with marine algae, create 102,277 ft² of Pacific herring spawning habitat and provide additional habitat for seabirds.

Resources of Primary Concern	No Action	Alternative 1 Japonski Island Breakwater	**Alternative 4** **Breakwater Gap Closed** **Recommended Corrective Action**	Alternative 14 Breakwater Combination (Alternatives 1, 4 and 15)	Alternative 15 Main Breakwater Extension
11. Cumulative Impacts	The perturbations associated with breakwater construction would not contribute to the cumulative impacts occurring in the Sitka-area marine environment. Coastal development, including seaplane base relocation, mariculture expansion, and harbor expansion and increased use is likely. Proposed improvements to Sitka's airport include intertidal fill.	Identical conclusion to Alternative 4, the recommended action.	The amount of fill required to close the breakwater gap represents a minor incremental change relative to those intertidal/subtidal fills that have already been experienced in the area. The recommended action, in concert with past, present, and foreseeable actions are not likely to have any significant cumulative impact on the Sitka area's fish, wildlife and human resources.	Identical conclusion to Alternative 4, the recommended action.	Identical conclusion to Alternative 4, the recommended action.
12. Environmental Justice	Federal agencies would continue to be required to determine the possible impacts of their development activities on minority and low-income populations.	No disproportionally high or adverse human health or environmental effects on minority and low-income populations.	No disproportionally high or adverse human health or environmental effects on minority and low-income populations.	No disproportionally high or adverse human health or environmental effects on minority and low-income populations.	No disproportionally high or adverse human health or environmental effects on minority and low-income populations.

APPENDIX 4

COORDINATION CORRESPONDENCE

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
JBER, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Civil Works - Environmental Resources Section

James W. Balsiger, Ph.D.
Administrator, Alaska Region
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

FEB 24 2011

ATTN: Ms. Aleria Jensen

Dear Dr. Balsiger:

In accordance with Section 7 of the Endangered Species Act (ESA), the Alaska District, U.S. Army Corps of Engineers (Corps) has prepared the enclosed Biological Assessment (BA) of the potential influence the Channel Rock Breakwaters navigation improvement project at Sitka Harbor, Alaska, could have on listed species and their critical habitat. The Corps' proposed project would correct breakwater design deficiencies by adding to, or extending, the existing breakwaters to reduce wave and swell motion. A final environmental impact statement (FEIS) and BA for the original Channel Rock Breakwaters navigation project was prepared in 1992.

The Corps initiated Section 7 consultation on its proposed action by submitting a letter, dated August 3, 2010, to the National Marine Fisheries Service (NMFS) requesting a revised threatened and endangered species list. In an August 24, 2010, letter from the NMFS, the Corps was informed that the following species may occur in the Corps' project area: Steller sea lion, eastern population (Threatened); Steller sea lion, western population (Endangered); Humpback whale (Endangered); and Pacific Herring (Candidate). The Corps was also informed that no critical habitat for listed species is designated within the Corps' proposed project area, and was advised to refer to the Federal Aviation Administration's May 2009 FEIS for the Sitka Rocky Gutierrez Airport (http://sitkaeis.com) for current information on the biological resources of the area, as well as analysis of a similar project involving the impact of fill placed into the marine environment.

The Corps is requesting your review and concurrence of its BA and determinations. If you need additional information about the Corps' proposed project or have questions about our assessment, please contact me at (907) 753-2690 or via email at Michael.9.Salyer@usace.army.mil

Sincerely,

Michael R. Salyer

Michael R. Salyer
Chief, Environmental Resources Section

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
JBER, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Environmental Resources Section

FEB 17 2011

James W. Balsiger, Ph.D.
Administrator, Alaska Region
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

ATTN: Ms. Linda Shaw

Dear Dr. Balsiger:

The Alaska District, U.S. Army Corps of Engineers (Corps) has been directed by Congressional legislation to design and construct modifications to the Channel Rock Breakwaters navigation project at Sitka Harbor, Alaska to correct design deficiencies by adding to, or extending, the existing breakwaters to reduce wave and swell motion. An environmental impact statement for the original Channel Rock Breakwaters navigation project was prepared in 1992.

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) set forth the essential fish habitat (EFH) provision to identify and protect important habitats of federally managed marine and anadromous fish species. Federal agencies that fund, permit, or undertake activities that may adversely affect EFH are required to consult with the National Marine Fisheries Service (NMFS) regarding the potential effects of their actions on EFH.

The Corps initiated EFH coordination with the NMFS by submitting an August 3, 2010, letter requesting EFH and threatened and endangered species information. In an August 24, 2010, letter from the NMFS, the Corps was advised to refer to the Federal Aviation Administration's (FAA) May 2009 Final Environmental Impact Statement (FEIS) for the Sitka Rocky Gutierrez Airport (http://sitkaeis.com) for current information on the biological resources of the area, as well as analysis of a similar project involving the impact of fill placed into the marine environment. It was further stated that FAA's FEIS contains extensive and detailed information on EFH that should be directly applicable for use in the Corps' EFH assessment due to FAA's project's geographic proximity to the Channel Rock Breakwaters and similarity of habitats being impacted and created.

Per the MSFCMA, the Corps is submitting to your office an EFH evaluation of the Corps' proposed modifications of the Channel Rock Breakwaters project (enclosure). The Corps' EFH assessment relies heavily on relevant EFH species life history stage designations[1] [2] and FAA's EFH assessment[3] and incorporates them into this EFH assessment by reference.

The Corps believes that potential impacts to EFH and EFH-managed species/species complexes are likely to be highly localized, temporary, and minimal, and would not reduce the overall value of EFH in Sitka Sound. Mitigation measures would be prescribed to offset the potential impacts of the Corps' corrective action at the Channel Rock Breakwaters. Therefore, the Corps has concluded that its Federal action may affect, but is not likely to adversely affect, EFH and EFH-managed species/species complexes for Gulf of Alaska groundfish and Alaska stocks of Pacific salmon.

The Corps understands that the NMFS is required to provide EFH conservation recommendations for actions that would adversely affect EFH, and that the Corps must provide a detailed response to NMFS in writing within 30 days after receiving EFH conservation recommendations. If you need more information about the Corps' proposed project or have questions about our evaluation, please contact Mr. Wayne Crayton at 753-2656 or via email at Wayne.M.Crayton@usace.army.mil.

Sincerely,

Michael R. Salyer

Michael R. Salyer
Chief, Environmental Resources Section

enclosure

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[1] NMFS, 2005. Essential Fish Habitat Assessment Report for the Groundfish Resources of the Gulf of Alaska Region. Appendix F.1. NMFS, NMFS Alaska Region, Juneau, Alaska.

[2] NMFS, 2005. Essential Fish Habitat Assessment Report for the Salmon Fisheries in the EEZ off the Coast of Alaska. Appendix F.5. NMFS, NMFS Alaska Region, Juneau, Alaska.

[3] Appendix 4 at http://sitkaeis.com/feis.htm

From:	Richard_Enriquez@fws.gov
To:	Crayton, Wayne POA
Subject:	Section 7 Email Response: Sitka Harbor Channel Rock Breakwater
Date:	Monday, November 01, 2010 4:10:21 PM

Wayne:

This responds to the request for information on potential impacts to threatened or endangered species under the U.S. Fish and Wildlife Service jurisdiction resulting from the construction modifications to the Sitka Harbor Breakwater navigation project.

There are no species listed under the Endangered Species Act as threatened or endangered within the jurisdiction of the Fish and Wildlife Service in Southeast Alaska. One candidate species, the Kittlitz's murrelet, uses marine waters from Thomas Bay near Petersburg, north through coastal western Alaska. This species feeds near tidewater glaciers and in areas affected by glacial streams and rivers, and typically nests in rocky, recently de-glaciated landscapes. We expect the proposed breakwater extension project to have no effect on the species.

Your log number for this consultation is 71440-2011-SL-0006.
If you have any questions, please contact me by reply email, or at (907) 780-1162. No further comments are offered

Richard Enriquez
Conservation Planning Assistance Biologist
Juneau Fish and Wildlife Field Office
Juneau, AK 99801-7100

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
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August 24, 2010

Micheal R. Sayler
Chief, Environmental Resources Section
U.S. Army Engineer District, Alaska
P.O. Box 6898
Elmendorf AFB, Alaska 99506-0898

ATTN: Mr. Wayne Crayton

RE: Sitka Harbor Channel Breakwater Navigation Project Environmental Assessment

Dear Mr. Sayler:

The National Marine Fisheries Service (NMFS) has reviewed your letter indicating your intent to prepare an environmental assessment (EA) for the referenced project. The Corps' preliminary proposed action would involve constructing a 315-foot extension to connect the main breakwater and the south breakwater of the Channel Rock Breakwater.

The proposed action includes:

- The use of 9,000 cubic yards of armor stone, 13,000 cubic yards of intermediate-sized rock (B rock), and 30,000 cubic yards of armor stone to construct the extension.

- Approximately 3,000 cubic yards of armor stone and 1,100 cubic yards of B rock would be removed at the southern end of the main breakwater and used in construction of the extension.

- The Corps does not expect any maintenance dredging to be required for the project.

- A qualitative circulation study, using a physical model of Thomsen Harbor at the Corps' Environmental Research and Development Center-Waterways Experiment Station, indicated that the recommended plan would not degrade the area's water quality or harbor circulation.

- Following construction, instrumentation would be installed both inside and outside the harbor to monitor wave and swell conditions throughout the harbor, particularly at the docks and floats in Eliason Harbor. The data collected, combined with hydraulic studies will be used to determine the next appropriate measures if the project action is insufficient to reduce energy entering Sitka Harbor.

You requested specifically the following information:

- Any more current information about the biological resources of the area;

- Any preliminary recommendations concerning the potential impacts the proposed project might have on the area's Essential Fish Habitat (EFH); and

- A revised species list, as mandated by Section 7 of the Endangered Species Act (ESA).

For more current information on biological resources of the area, as well as analysis of a similar project involving the impact of fill placed into the marine environment, please refer to the May, 2009 Final Environmental Impact Statement (FEIS) for the Sitka Rocky Gutierrez Airport, available at www.sitkaeis.com. The FEIS contains extensive and detailed information on EFH that should be directly applicable for use in the Sitka Harbor Channel Breakwater Navigation Project Environmental Assessment due to the close geographic proximity of the Sitka Airport to the Channel Breakwaters and similarity of habitats being impacted and created. An evaluation of the relative loss and gain of EFH using the Habitat Equivalency Analysis was done for this project and is being used to determine an appropriate level of monitoring and mitigation

The proposed action would alter EFH by converting deep bottom and open water habitat to rocky intertidal and subtidal habitat. The rocky surfaces will provide some new habitat, but time delay is to be expected before the newly created rocky intertidal and subtidal surfaces are colonized and become fully functional as fish habitat.

Given the potential that this project may adversely affect Essential Fish Habitat, NMFS requests that the Corps prepare an EFH assessment. Mandatory contents of the EFH assessment are: a description of the action; an analysis of the potential adverse effects of the action on EFH and the managed species; the federal action agency's conclusions regarding the effects of the action on EFH; and proposed mitigation, if applicable (50 CFR 600.920(e)). Additional guidance on EFH consultation can be found at: www.alaskafisheries.noaa.gov/habitat/efh.htm. Upon review of the EFH assessment NMFS will provide EFH Conservation Recommendations to avoid, minimize, or mitigate for any adverse actions of the proposed project on EFH. The Corps then must respond to those recommendations in writing, and if the Corps disagrees with NMFS recommendations, must explain why.

With respect to the ESA, our data indicate that the following species may occur in the project area:

1. Steller sea lion, eastern population   Threatened

2. Steller sea lion, western population   Endangered (individuals from the western population have been observed on rookeries in Southeast Alaska)

3. Humpback Whale   Endangered

4. Pacific herring   Candidate

There is no critical habitat for listed species designated within the proposed project area. Several Steller sea lion critical habitat sites are located near Sitka, namely Biali Rock and Biorka Island. We do not anticipate that these sites will be directly impacted by the project, but individual animals which use these habitats may be found in the project area.

If you have any questions regarding EFH, please contact Linda Shaw at 907-586-7510 or Linda.shaw@noaa.gov. If you have any questions regarding the ESA, you may contact Aleria Jensen at 907-586-7248 or Aleria.Jensen@noaa.gov.

Sincerely,

for Robert D. Mecum

James W. Balsiger, Ph.D.
Administrator, Alaska Region

cc: USFWS, Juneau, Richard Enriquez
EPA, Juneau, Chris Meade
ADF&G, Juneau, Jackie Timothy

CORPS Sitka Harbor Channel Breakwater Navigation Project 8-18-10 LRS

APPENDIX 5

EVALUATION UNDER
SECTION 404(b)(1) CLEAN WATER ACT 40 CFR PART 230

NAVIGATION DEFICIENCY CORRECTIVE ACTION
CHANNEL ROCK BREAKWATERS
SITKA HARBOR, ALASKA

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SITKA HARBOR, ALASKA

I. Project Description

The U.S. Army Corps of Engineers Alaska District (Corps), along with the City and Borough of Sitka, its non-Federal sponsor, completed construction of the Channel Rock Breakwaters feature of the Sitka Harbor complex in 1995 to provide protection for Thomsen Harbor and to protect additional moorage that would be constructed in the natural anchorage and channel between Sitka and Japonski Island. After the Channel Rock Breakwaters were constructed, harbor users and the city reported that excessive wave energy entering through the breakwater gaps adversely affected harbor use and damaged boats and harbor facilities during unusual tide and swell conditions. Congress provided the Corps with funding from 2001 through 2003 to study the excessive swell in the harbor. Additional Congressional legislation in 2005 and in 2007 defined the problem and specified the general solution, that is, the damages being experienced resulted from design deficiencies and the design deficiencies should be corrected by adding to, or extending, the existing breakwaters to reduce wave and swell motion. The same Congressional legislation also directed the Secretary of the Army acting through the Corps' Chief of Engineers to design and construct the Channel Rock Breakwaters corrective measures.

The selected corrective measure would construct a 315-foot extension to connect the main breakwater and the south breakwater. Plan views of this alternative are shown in figure 1. The cross section of the breakwater extension trunk is illustrated in figure 2. Approximately 9,000 cubic yards of armor stone, 13,000 cubic yards of B rock, and 30,000 cubic yards of core material would be required. The armor and B rock on the existing breakwater would be removed where the extension begins. Approximately 3,000 cubic yards of armor stone and 1,100 cubic yards of B rock would be removed at the southern end of the main breakwater and used in construction of the extension.

[1] Corps of Engineers ER 1105-2-100 requires that a public notice be issued, offering the public an opportunity to review the Section 404(b)(1) evaluation. The environmental assessment and unsigned Finding of No Significant Impact public notice will reference Appendix 5 and request comments on the subject Section 404(b)(1) evaluation .

Figure 1. The recommended corrective action closes the gap between the existing main and south breakwaters – drawing not to scale.

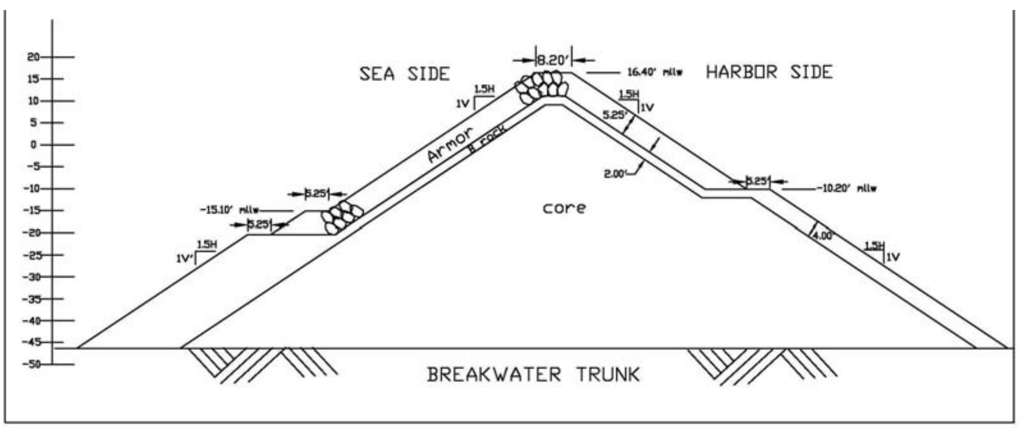

Figure 2. The recommended corrective action's breakwater trunk cross section.

II. Factual Determinations

A. Physical Substrate Determinations

Most of the recommended corrective action area is unconsolidated (fine to coarse substrate) bottom with selected areas of bedrock and aquatic bed algal/bedrock habitat. No significant amount of sediment exists in the project area.

B. Water Circulation, Fluctuations and Salinity Determinations

A physical model was constructed at the Corps' Hydraulic and Coastal Laboratory at the Engineer Research and Development Center (ERDC) to determine the amount of wave energy that reaches Eliason Harbor and to aid in the development of alternatives. A 5-foot wave height was selected for the majority of runs, which was the original design wave for the breakwaters. Results of the physical model study are documented in the ERDC report: ERDC/CHL TR-08-2 *Physical Model Study of Wave Action in the New Thomsen Harbor* (i.e., Eliason Harbor)*, Sitka, Alaska*.

The overall net circulation in the Sitka Sound area is northwestward, parallel to the coastline and the normal tidal range in the area exchanges about 25 percent of the water on each tide. Regional currents are typically driven by water density differences and weather conditions. Local currents are tidally driven with predicted flood tides (rising tides) generally less strong (0.6 knots maximum) than ebb tides (receding tides) (1.2 knots maximum) through the channels on either end of Japonski Island. The extreme tide range is approximately 15 feet and the high tide line is at +12.7 feet.

A qualitative circulation study was performed using the ERDC physical model. The study looked at the circulation associated with a falling tide. Circulation associated with wind or wave activity in addition to the tide was not examined, which resulted in a conservative circulation evaluation. Viewing the recordings in time lapse mode revealed general circulation patterns for the existing breakwater configuration and the project alternatives. Locally, the tidal influx enters the harbor through the breakwater gaps and along the shoreline. Water in the protected area behind the breakwaters circulates in a clockwise fashion and exits back through the breakwater gaps.

Salinity determinations are not applicable for this action as the corrective action would not affect the area's salinity concentrations.

C. Suspended Particulate/Turbidity Determinations

An increase in suspended sediment load and turbidity would be expected during and immediately following periods of work. Due to the size and type of material used to construct the breakwater [see Appendix 1(Rubble Mound Breakwater Construction) in the project's environmental assessment], significant plumes would not be expected to occur. Should small plumes occur, they would be localized and short-lived. Based upon an analysis of the forces acting on the disposal of the breakwater material as it is placed below the water surface, most material would be directly deposited over approximately 5,000 square feet of sea bottom; however, fines would be displaced over a larger area. Concentrations would not be expected to approach lethal dosages for aquatic species known to occur in the area.

D. Contaminant Determinations

The proposed construction project would not be associated with any contaminated materials. Sediment samples were collected, tested, and determined not to be contaminated.

E. Aquatic Ecosystems and Organism Determinations

The variety of marine habitat found within the Sitka area ranges from calm protected embayments to high energy wave-swept exposed coastlines. Much of the Sitka waterfront area has a rocky shoreline. The seafloor in the project area contains a mosaic of bottom types including a mixed-soft bottom (mixture of silt, sand, pebbles, cobbles, boulders, and shell) and bedrock outcrops. All these habitats support a wide variety of fish and wildlife species, including those important for commercial, sport, and subsistence uses.

The following National Marine Fisheries Service-managed marine mammals have been observed in the Sitka Sound area: killer whales, gray whales, harbor porpoise, Dall's porpoise, minke whale, sperm whale, Pacific white-sided dolphin, pygmy sperm whales, humpback whales, fin whales, Steller sea lions, and harbor seals. The only U.S. Fish and Wildlife Service (USFWS)-managed marine mammal known to occur in the Sitka Harbor area is the northern sea otter. All marine mammals are protected under the Federal Marine Mammal Protection Act and select marine mammals are also protected under the Endangered Species Act (ESA).

The following marine mammal species have been observed in Southeast Alaska and may occur in Sitka Sound on an infrequent to rare basis: minke whale, fin whale, sperm whale, Pacific white-sided dolphin, and pygmy sperm whale. Based upon available information, these species are unlikely to rely upon habitats in the project area, but may travel through the vicinity of Sitka. The humpback whale and Steller sea lion (both the eastern distinct and western distinct populations) are protected under the ESA.

Prior to the Channel Rock Breakwaters being constructed, the USFWS conducted subtidal dive surveys of the benthic habitat and infaunal habitat within the footprint of the proposed breakwaters. Several habitat types were associated with the Channel Rock Breakwaters area: unconsolidated bottom, bedrock, and aquatic bed algal/bedrock. The overall biomass and numbers of individuals collected from the project footprint area was greater than those collected from other areas in the Sitka sound area. Major infauna species collected were polychaete worms, little neck clams, and cockle and butter clams.

Post-construction subtidal surveys of the Channel Rock Breakwaters by the USFWS, both seaward and harbor side, revealed robust stands of algae. Use of the breakwater algae by spawning Pacific herring was documented in 1996 and 1998. Other marine surveys conducted in the area discovered blue mussels, cockles, butter clams, and horse clams in the rocky, sandy, and muddy intertidal zone, as well as many species of worms, marine snails, chitons, abalone, sea stars, crabs, sea urchins, and octopus in other coastal habitats.

Many species of fish and shellfish reside in the project area. Chief among them are Pacific salmon and herring, various species of bottomfish, and several species of crab, shrimp, and other shellfish. Many other groups of fish contribute to the Sitka Sound forage base, each of which is represented by many species: rockfishes, greenling, flatfishes, blennies, sculpins, poachers, gunnels, and eelpouts. Pacific herring is a very ecologically and commercially important fish species that abundantly occurs in the Corps' project area and surrounding area. The Pacific herring (Southeast Alaska distinct population segment) is an ESA candidate species.

F. Proposed Disposal Site Determinations

No dredging is associated with the recommended corrective action. Some rock material, however, would be removed from the ends of two existing breakwaters in order to fill the gap and tie into the existing breakwater system. Construction operations associated with filling the breakwater gap would have only a temporary effect on the water column. The proposed action would comply with applicable water quality standards and would have no appreciable detrimental effects on municipal and private water supplies, recreational and commercial fisheries, water-related recreation, or aesthetics.

G. and H. Determination of Cumulative & Secondary Effects on the Aquatic Ecosystem

The amount of fill required to close the breakwater gap represents a minor incremental change relative to those major intertidal/subtidal fills that have already been experienced in the area. Coastal development, including relocating a seaplane base, mariculture expansion, and harbor expansion and increased vessel use is likely. Proposed improvements to Sitka's airport are known to include intertidal fill. The recommended corrective action would, when revegetated with marine algae, create 19,779 ft^2 of Pacific herring spawning habitat and provide additional habitat for seabirds. In conclusion, the recommended corrective action, in concert with past, present, and foreseeable actions is not likely to have any significant cumulative or secondary impact on the Sitka area's fish, wildlife, and human resources.

III. Findings of Compliance or Non-Compliance with the Restrictions on Discharge

A. Adaptation of the Section 404 (b)(1) Guidelines to this Evaluation

The proposed project complies with the requirements set forth in the Environmental Protection Agency's Guidelines for Specification of Disposal Sites for Dredged or Fill Material, and no adaptations of the guidelines were made relative to this evaluation.

B. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem

The proposed corrective action's planning objective is to reduce the existing wave and swell motion behind the Channel Rock Breakwaters in a cost effective manner for the remaining life of the project. The Corps used a cost effective analysis to screen out plans that produced the same output level (i.e. desired results of energy reduction at Eliason Harbor) as another plan, but cost more, or cost either the same amount or more than another plan, but produced less output. The Corps assumed that all rock needed for breakwater construction would be obtained from an existing commercial quarry on Kasiana Island, 2 miles north of the breakwaters. Of the 18 plans screened, only four plans (1, 4, 14, and 15) were determined by the Corps to be cost effective and most responsive to project objectives. Therefore, the four plans were identified as alternatives, developed in more detail, and environmentally evaluated.

The corrective action, as proposed, is the least damaging practicable alternative after taking into consideration the area's fish and wildlife resources, project costs, existing technology, and logistics in light of the overall project purpose.

C. Compliance with Applicable State Water Quality Standards

The proposed project would not be expected to have an appreciable adverse effect on water supplies, recreation, growth and propagation of fish, shellfish and other aquatic life, or wildlife. It would not be expected to introduce petroleum hydrocarbons, radioactive materials, residues, or other pollutants into the waters of Sitka Sound. A temporary increase in turbidity would result locally from construction activities. The project would comply with State water quality standards.

D. Compliance with Applicable Toxic Effluent Standards or Prohibition under Section 307 of the Clean Water Act

No toxic effluents that would affect water quality parameters are associated with the proposed project. Therefore, the project complies with toxic effluent standards of Section 307 of the Clean Water Act.

E. Compliance with Endangered Species Act of 1973

Project construction activities and the newly constructed breakwater segment would result in short-term alterations to habitat used by Steller sea lions and Pacific herring. However, the results of Corps field studies indicate that within 2 to 5 years following completion of the breakwater segment, the breakwater armor rock would re-colonize itself with productive populations of invertebrates and algae that would support spawning Pacific herring. In time, the revegetated breakwater segment would ecologically function similar to the Sitka Harbor shoreline and other already-revegetated Channel Rock Breakwater segments.

Vessel noise and transit associated with construction activities have the potential to cause avoidance, disturbance, or displacement of Steller sea lions and humpback whales from the Sitka Harbor area during peak Pacific herring spawn activities when Steller sea lions and humpback whales feed on staging and spawning adult herring. Therefore, the Corps has proposed to cease in-water construction during peak Pacific herring spawning activities (between March 15 and June 1). Construction activities outside this period coincide with periods when a minimum quantity of marine mammals is present. Additionally, speed limits would be imposed on construction vessels moving between the project area and material suppliers to mitigate the danger of vessel-marine mammal collisions.

The Corps believes that its proposed action: (1) would not modify or adversely affect designated critical habitat; and (2) may affect but, is not likely to adversely affected humpback whales, Steller sea lions (eastern and western distinct population segment) or Pacific herring (Southeast Alaska distinct population segment).

F. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972.

No marine sanctuaries designated by the subject act exist in or adjacent to the Corps' project area.

G. Evaluation of Extent of Degradation of the Waters of the United States

There are no municipal or private water supplies or freshwater waterbodies in the area that could be negatively affected by the proposed project. There would be no significant adverse impacts to plankton, fish, shellfish, wildlife, and/or special aquatic sites in the project area.

H. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Environment.

Incorporating the following mitigation measures and conservation measures into the recommended corrective action would help to ensure that no significant adverse impacts would occur.

- The proposed action shall cease in-water construction between March 15 and June 1 during peak herring spawn activities, juvenile salmon outmigration and rearing activities, and when Steller sea lion and humpback whale feeding and abundance is expected to be greatest in the project area.

- To minimize the danger to marine mammals from project-related vessels, speed limits (albeit undefined at this time) shall be imposed on vessels moving between the project area and material suppliers.

- Vessels and barges shall not be permitted to ground themselves on the bottom during low tide periods, unless there is a human safety issue requiring it.

- A construction oil spill prevention plan shall be prepared.

- Breakwater construction shall use core material, B rock and armor stone clean of organic debris and invasive species.

- Transit vessels shall not travel within 3,000 feet of designated Steller sea lion critical habitat (haulouts or rookeries).

I. On the basis of the Guidelines, the Proposed Site for the Discharge of Fill Material is:

☐ (1) Specified as complying with the requirements of these guideline; or,

■ (2) Specified as complying with the requirements of these guidelines, with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects on the aquatic ecosystem; or,

☐ (3) Specified as failing to comply with the requirements of these guidelines.

FINDING OF COMPLIANCE
FOR
NAVIGATION DEFICIENCY CORRECTIVE ACTION
CHANNEL ROCK BREAKWATERS
SITKA HARBOR, ALASKA

1. No Significant adaptations of the Section 404(b)(1) guidelines were made relative to this evaluation.

2. Four construction alternatives requiring fill material to construct breakwaters were evaluated. None of the fill material sites would have resulted in significant alteration of water circulation patterns. No construction alternatives would have any long term adverse impacts on nektonic resources in the Sitka Harbor area; however, fill material would adversely impact benthic resources within the fill material footprint. The breakwater fill material would provide additional subtidal and intertidal rocky habitat for herring to spawn upon.

3. The recommended fill material site would not violate any applicable State of Alaska water quality standards with the exception of the short term and localized impacts on turbidity. The fill operation will not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

4. Proposed fill activities will not harm any threatened and endangered species or their critical habitat.

5. Proposed fill activities associated with breakwater construction will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and other wildlife will not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreation, aesthetic and economic values will not occur.

6. Appropriate measures to minimize potential adverse impacts include the following:

- The proposed action shall cease in-water construction between March 15 and June 1 during peak herring spawn activities, juvenile salmon outmigration and rearing activities, and when Steller sea lion and humpback whale feeding and abundance is expected to be greatest in the project area.

- To minimize the danger to marine mammals from project-related vessels, speed limits (albeit undefined at this time) shall be imposed on vessels moving between the project area and material suppliers.

- Vessels and barges shall not be permitted to ground themselves on the bottom during low tide periods, unless there is a human safety issue requiring it.

- A construction oil spill prevention plan shall be prepared.

- Breakwater construction shall use core material, B rock and armor stone clean of organic debris and invasive species.

- Transit vessels shall not travel within 3,000 feet of designated Steller sea lion critical habitat (haulouts or rookeries).

7. On the basis of the guidelines, the proposed action for the placement of fill material is specified as complying with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects to the aquatic ecosystem.