US Army Corps of Engineers®
Alaska District

DRAFT Integrated Feasibility Report and Environmental Assessment

Homer Navigation Improvements
Homer, Alaska

May 2026

Integrated Feasibility Report and Environmental Assessment

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Homer, Alaska
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Prepared By:

U.S. Army Corps of Engineers
Alaska District

May 2026

EXECUTIVE SUMMARY

This report details the findings of the Homer Navigation Improvements Feasibility Study, conducted by the U.S. Army Corps of Engineers (USACE) in partnership with the non-Federal sponsor (NFS), the City of Homer, Alaska.

Homer Port & Harbor, hereafter referred to as Homer Harbor, is a critical regional hub for commercial fishing, marine transportation, and freight distribution to 50 non-road-connected communities across Alaska. Demand for moorage has continued to grow since the harbor was first constructed. Homer Harbor presently experiences severe overcrowding, forcing vessels to raft up to five deep. This narrows the harbor channels which degrades navigational safety, causes significant delays that can have cascading effects across the region, and increases the occurrence of fires, collisions, and falls, which have resulted in injuries to harbor users and significant taxation of harbor resources in mitigation efforts.

The harbor's entrance channel configuration and limited depth also restrict access for larger vessels. Without Federal action, these safety and capacity issues are projected to worsen as demand for moorage continues to grow, further straining the harbor's infrastructure and negatively impacting the regional economies that depend on it. Large vessels regularly experience delays of 1 to 3 hours and occasionally even delays that can last multiple days when crew of a neighboring rafted vessel is not immediately available.

Homer is the economic center of the southern Kenai Peninsula and is located 227 miles south of Anchorage on the southwestern Kenai Peninsula (ES Figure 1). It is accessible via air, road, and water year-round. Originally a rudimentary harbor basin built by local residents, USACE constructed improvements to the harbor in 1961–1962 under the River and Harbor Act of 1958 (Cook Inlet Navigation Improvements) and then reconstructed the harbor after the 1964 Good Friday Earthquake in 1965. The City of Homer and State of Alaska further extended the harbor in 1968 and 1969. By 1984, the harbor fleet had outgrown the available capacity, and a major harbor expansion project was initiated. USACE expanded the harbor basin from 16.5 acres to the 50-acre footprint that is still in use today. The harbor has 876 reserve slips and approximately 6,000 feet of transient moorage space.

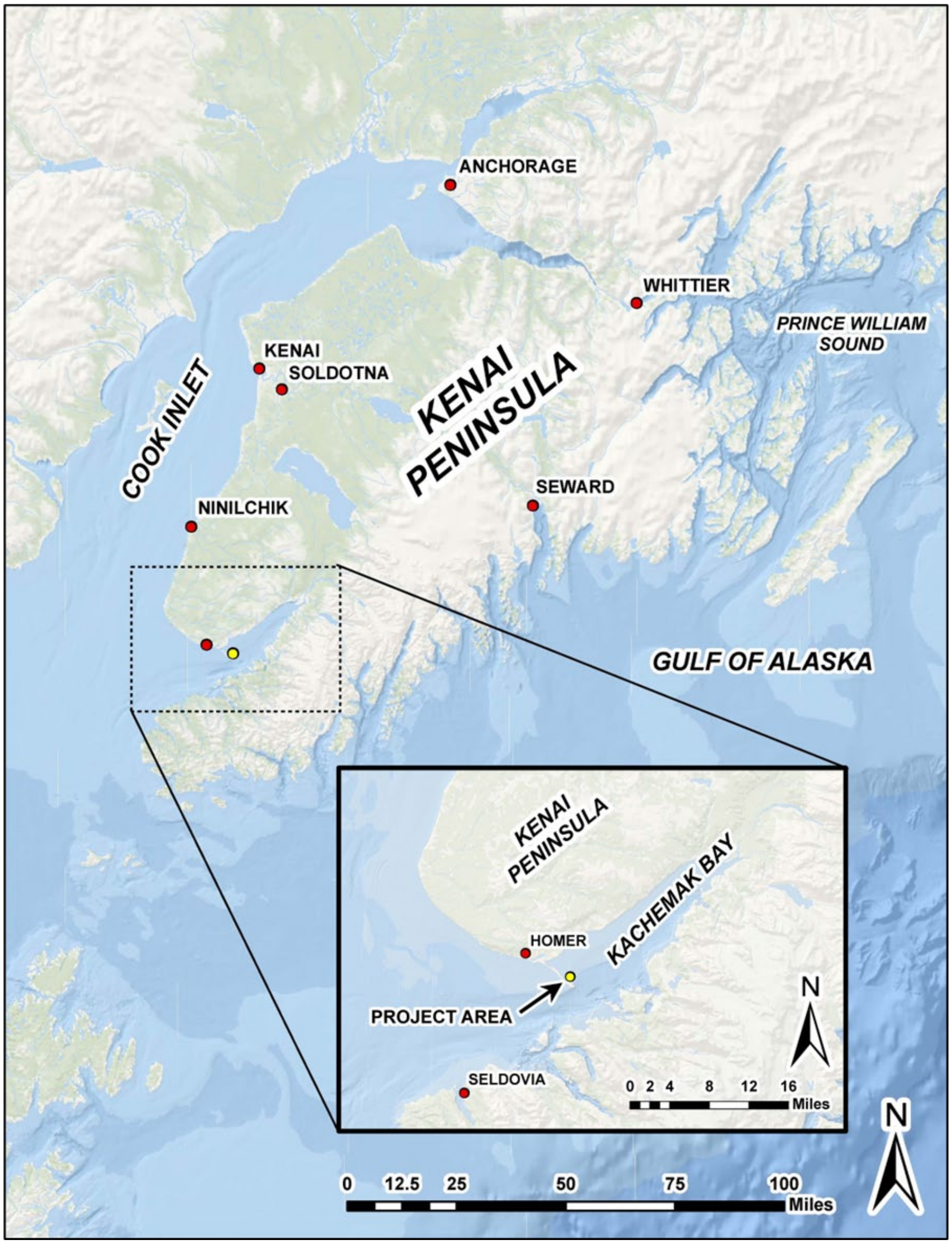
The Homer Navigational Improvements Integrated Feasibility Report and Environmental Assessment (IFR/EA) investigates the technical and economic feasibility of alleviating the navigation inefficiencies experienced by users of Homer Harbor and is authorized by Section 204 of the Flood Control Act of 1948 which states in part:

> *The Secretary of the Army is hereby authorized and directed to cause preliminary examinations and surveys for flood controls and allied purposes [. . .] to be made under the direction of the Chief of Engineers, in drainage areas of the United States and Territorial possessions, which include the following named localities: [. . .] Harbors and Rivers in Alaska, with a view to determining the advisability of improvements in the interest of navigation, flood control, hydroelectric power, and related water uses.*

The plan formulation process was conducted in accordance with USACE planning guidance, involving an iterative and collaborative effort to identify a comprehensive solution. The process involved extensive public, agency, and stakeholder engagement, including a multi-day public Planning Charrette. A focused array of alternatives was developed, scaled to address different levels of need:

- **No Action Alternative**
- **Alternative 1a: Large Transient Vessel Harbor.** Accommodates the current large transient vessel fleet
- **Alternative 1b: Transient Vessel Harbor.** Accommodates the entire current transient fleet
- **Alternative 2: Transient and Waitlisted Vessels Harbor.** Accommodates the transient fleet and all vessels on the current moorage waitlist
- **Alternative 3: Transient, Waitlisted, and Project Vessels Harbor.** Accommodates the transient fleet, the waitlist, and projected fleet growth over 20 years

ES Figure 1. Project Area



All alternatives are evaluated against the No Action Alternative to verify that federal action is preferable from an economic and environmental standpoint. The alternatives were evaluated using two economic analyses to identify a Tentatively Selected Plan (TSP):

- National Economic Development (NED) Analysis
- Cost effectiveness / incremental cost analysis (CE/ICA) for other social effects (OSE)

No alternative plan reasonably maximized NED benefits or resulted in a benefit-cost-ratio (BCR) above 1, indicating that a plan could not be selected on the merits of the NED analysis alone. Section 2006 of WRDA 2007, Remote and Subsistence Harbors, as amended by Section 1147 of WRDA 2024 (Section 2006) allows the Secretary of the Army to recommend a project without the need to demonstrate that the project is justified solely by NED benefits if the project is located in Alaska and over 80% of the goods transported through the harbor would be consumed within the United States. Homer Harbor meets these requirements.

In considering the justification, the CE/ICA used benefits related to the following benefit categories authorized for consideration under Section 2006, as amended:

> *(1) Public health and safety of the local community and communities that are located in the region to be served by the project and that will rely on the project, including access to facilities designed to protect public health and safety*
>
> *(2) Access to natural resources for subsistence purposes*
>
> *(3) Local and regional economic opportunities*
>
> *(4) Welfare of the regional population to be served by the project*
>
> *(5) Social and cultural value to the local community and communities that are located in the region to be served by the project and that will rely on the project*

Plan comparison and selection was guided by the March 2026 implementation guidance for Section 1147, "the selection of a plan shall utilize and be supported by a [. . .] CE/ICA," and studies must "identify the least cost alternative that minimally meets the requirements of long-term community viability." The guidance states further that, "if this alternative is not the recommended plan, then explicit incremental justification shall be provided."

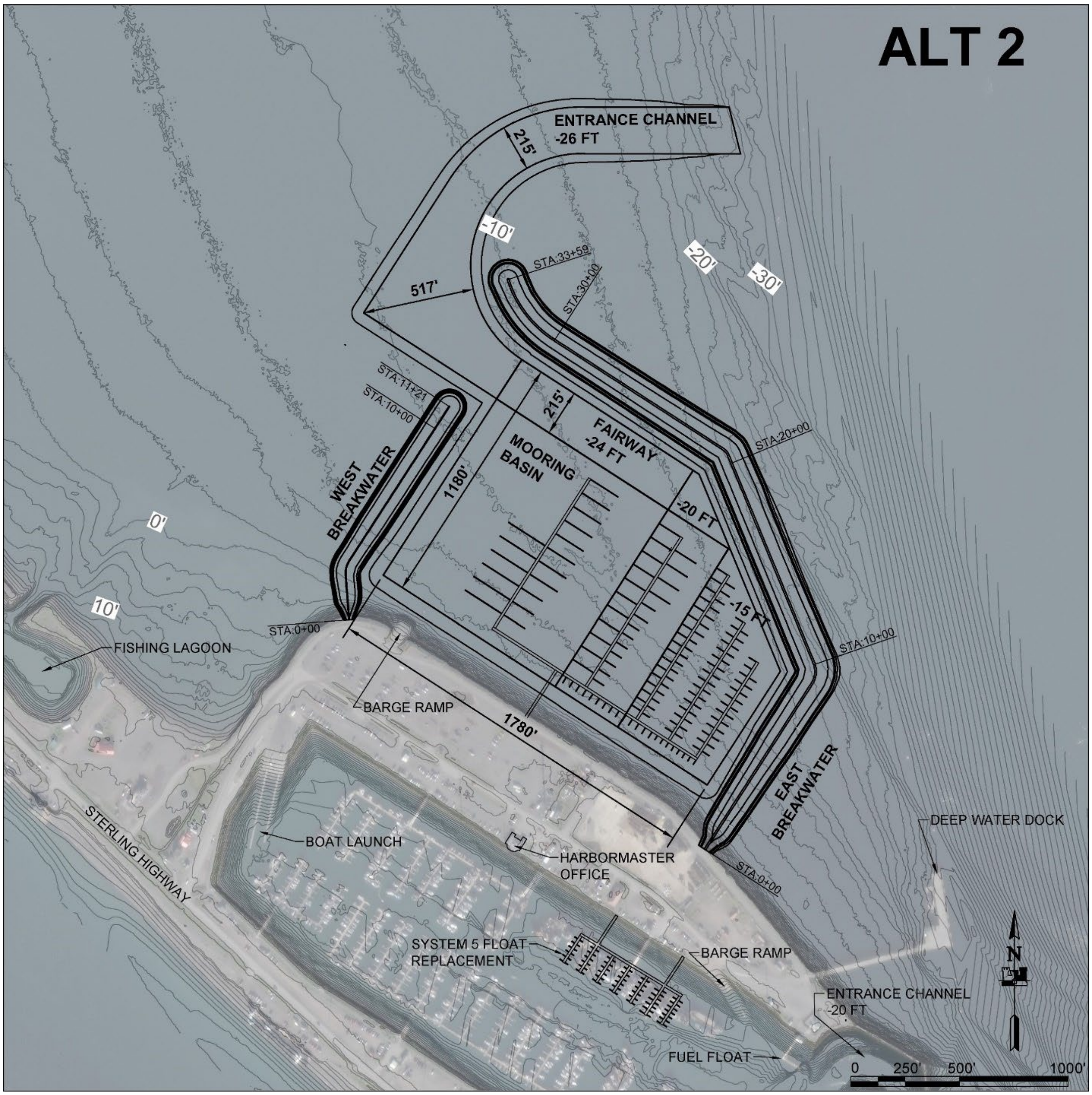
Alternative 3 was identified as the "Best Buy" plan, meaning that it has the lowest cost per benefit unit among the four action alternatives. However, this does not automatically imply that Alternative 3 is the least cost plan which minimally meets the requirements of long-term community viability. Indeed, Alternative 3 is the most expensive alternative, at an estimated total economic cost of over $720 million. Because the other three alternatives were all found to be cost effective, they could all be considered for recommendation under the CE/ICA.

While Alternative 1a is the least cost plan, the Project Delivery Team (PDT) determined that it did not minimally meet the requirements of long-term community viability since it did not adequately address the problems facing the harbor. Alternatives 1b and 2 were then considered for recommendation.

Of the two, Alternative 1b is the lower cost plan; however Alternative 2 has the lower cost per benefit unit. To determine which plan minimally meets the requirements of long-term community viability, the PDT considered the historical context of the Homer Harbor and the cycles of increased demand and harbor expansion. Since its original construction in the early 1960s, the harbor has been expanded four times: once by the City of Homer and the State of Alaska, and three times by USACE. Since its last expansion, USACE conducted an earlier feasibility study and a Planning Assistance to States (PAS) technical assistance effort to gather data to consider further expansion. This historical context demonstrates a pattern of expansions which the harbor goes on to outgrow, requiring the repetition of analysis and the continued commitment of local and Federal resources.

The primary difference between Alternatives 1b and 2 is that Alternative 2 is intended to accommodate waitlisted vessels not accommodated in Alternative 1b. These vessels are not part of forecasted future growth; they are a current reality. Additionally, while Alternative 2 has a total project cost of just over $31 million more than 1b, most of the cost difference comes from additional Local Service Facilities (LSF) features and are borne by the NFS. The Federal cost difference is approximately $10 million. In consideration of the limited increase in Federal cost and the historical pattern of Federal studies and expansions required in Homer Harbor, Alternative 2 was determined to “minimally meet requirements of long-term community viability” and was identified as the TSP

ES Figure 2. Tentatively Selected Plan



The TSP includes the following features:

East and West Rubble-mound Breakwaters: The breakwaters would enclose a basin allowing for a fairway for harbor transit and a 37-acre mooring area. The breakwater sections total approximately 4,500 feet and have crests constructed to an elevation of +30 feet mean lower low water (MLLW).

Dredging: General navigation dredging includes a 215-foot-wide entrance channel to a depth of -26 feet MLLW and an adjoining fairway and mooring area to -24 feet MLLW. Dredging of the mooring basin includes depths of -24, -20, and -15 feet MLLW and is a local service of the NFS at no cost to the Federal government. Dredged quantities are 497,340 cubic yards for the entrance channel and fairway and 814,461 cubic yards for the moorage basin.

Local Service Facilities: Supporting LSFs for the harbor include a new float system for the expanded basin (complete with gangways, finger floats, and electrical utilities) and the construction of a new fuel dock. The System 5 float in the current harbor would be removed and replaced with a new float system providing moorage for 40 vessels at 24 feet in length and 132 vessels at 32 feet in length.

The TSP would have adverse impacts to the environment. However, pursuant to 33 U.S.C. 2283(d)(1)(B), USACE has determined that the adverse impact on fish and wildlife resources would be insignificant; therefore, a formal compensatory mitigation plan is not required. Effects to the environment were avoided and minimized to the maximum extent practicable through informed design and would be further mitigated through the implementation of required mitigations and best management practices described in this IFR/EA. USACE would continue to coordinate with natural resource agencies and stakeholders throughout the Preliminary Engineering and Design (PED) Phase to ensure environmental compliance is maintained. USACE would hold a workshop in the PED Phase to develop an Ecological Survey and Monitoring Plan with stakeholders. The purpose of the plan would be to evaluate recovery and assess actual impacts against analysis conducted under the feasibility study. Monitoring would extend up to 5 years post-construction.

Project costs are represented as “Project First Costs,” which are the monetary outlay of constructing the project, brought to the effective price level (Fiscal Year 2026 dollars) and does not include inflation. This financial cost is different than the economic cost used in BCRs for alternative comparison. Economic costs include all of the opportunity costs, both explicit such as Operations, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R), and implicit interest during construction (IDC). The estimated project first cost of the TSP not including LSF is $402,124,000. The Federal portion is $360,626,000 and the NFS portion is $40,212,000 with an additional $89,952,000 in LSF costs. The NFS must also pay an additional 10% of the total cost of GNF less the cost of lands, easements, rights-of-way, relocations, and disposal sites, (LERRD) with interest over a period not to exceed 30 years. The additional 10% is estimated to be $38,556,000. The TSP’s BCR is 0.77.

Residual Cost Risks include breakwater settlement and maintenance dredging costs. The analysis indicates that the design must incorporate ground improvement to accelerate the anticipated settlement from the underlying soils. To ensure the breakwater crest elevation and required freeboard are maintained, staged construction must be performed, and a corresponding volume of surcharge material (such as quarry spall) must be placed. This material quantity, required to compensate for the anticipated settlement, is not currently included in the project cost estimate. Because the costs associated with settlement are not currently captured in preliminary cost estimates and the potential cost is substantial, this risk is rated high. Once a final cost estimate is produced to include settlement, the risk would drop to moderate. The current project cost estimate assumes an annual maintenance dredging volume of approximately 17,000 cubic yards for all alternatives. This preliminary figure was derived by scaling the historical dredging rate of the existing harbor to the larger area of the proposed entrance channel, where most shoaling is expected to occur. A refined estimate would be developed for the TSP using the BOUSS-2D sediment transport model. However, a risk remains that the actual dredging volume would differ from both the preliminary estimate and the future model prediction. This risk is currently moderate. Once the BOUSS-2D sediment transport model is complete and the cost estimate is updated to reflect the results this risk would drop to low.

The project is situated in Kachemak Bay, a State of Alaska Critical Habitat Area known for its rich biological productivity. The project area provides habitat for numerous species, including protected species like the Endangered Species Act (ESA) listed Cook Inlet beluga whale, Steller sea lion, and humpback whale and the threatened Steller's eider. The primary unavoidable adverse impact of the TSP is the permanent conversion of approximately 68 acres of marine benthic habitat to deep-water and structural (breakwater) habitat. Consultations under Section 7 of the ESA, Magnuson-Stevens Fishery Conservation and Management Act (MSA), Clean Water Act (CWA), and Section 106 of the National Historic Preservation Act (NHPA) are ongoing.

Engineering design maturity will reach 35% by the conclusion of the Feasibility Study. Design from 35% to 100% is expected to be completed over a subsequent 2-year period. Construction is expected to be phased over 3 years of 6–8-month construction seasons. In-water work is expected to occur during the summer months due to frequent winter storms. For this project, the construction season is assumed to start in early April and end in late October.

LIST OF ACRONYMS AND ABBREVIATIONS

AAC........................ Alaska Administrative Code

AAEQ .... Average Annual Equivalent

ACS........................ American Community Survey

ADCP .... Acoustic Doppler Current Profiler

ADEC .... Alaska Department of Environmental Conservation

ADF&G................... Alaska Department of Fish and Game

ADMEF................... Alaska Dredged Material Evaluation Framework

ADOT&PF .... Alaska Department of Transportation

AEP........................ Annual Exceedance Probability

AHRS .... Alaska Heritage Resources Survey

AIS .... Automatic Identification System

ANILCA .... Alaska National Interest Lands Conservation Act

APE........................ Area of Potential Effect

AS .... Alaska Statute

AQI......................... Air Quality Index

ATONs .... Aids to Navigation

AVD........................ Avoided Vessel Delay

BCR........................ Benefit-Cost Ratio

BEI .... Business Expansion Impacts

BGEPA................... Bald and Golden Eagle Protection Act

BMPs...................... Best Management Practices

BOEM..................... Bureau of Ocean Energy Management

CAA........................ Clean Air Act

CBU........................ Community Benefit Units

CE/ICA .... Cost Effectiveness / Incremental Cost Analysis

CERCLA................. Comprehensive Environmental Response, Compensation, and Liability Act

CFR........................ Code of Federal Regulations

CIBW...................... Cook Inlet Beluga Whale

CPBI....................... China Poot Bay Impacts

CWA....................... Clean Water Act

CY .... Cubic Yards

DA .... Department of the Army

dB .... Decibel

dBA .... A-weighted decibel

DMMP .... Dredged Material Management Plan

DoD .... Department of Defense

DPS .... Distinct Population Segment

DWDS .... Deep Water Disposal Site

EDRR .... Early Detection and Rapid Response

EFH .... Essential Fish Habitat

EGM .... Engineering Guidance Memorandum

EIS .... Environmental Impact Statement

EO .... Executive Order

ER .... Engineer Regulation

ERDC .... Engineer Research and Development Center

ESA .... Endangered Species Act

ESWG .... Environmental Stakeholder Working Group

FEMA .... Federal Emergency Management Agency

FIRM .... Flood Insurance Rate Map

FOE .... Finding of Effect

FONSI .... Finding of No Significant Impact

FR .... Federal Register

FTE .... Full-Time Equivalent

FWCA .... Fish and Wildlife Coordination Act

FWOP .... Future-Without-Project

FWP .... Future-With-Project

GHG .... Greenhouse Gas

GNF .... General Navigation Features

HABs .... Harmful Algal Blooms

HSI .... Habitat Suitability Index

HTRW .... Hazardous, Toxic or Radioactive Waste

HU .... Habitat Units

IBA .... Important Bird Areas

IDC .... Interest During Construction

IFR/EA.................... Integrated Feasibility Report and Environmental Assessment

IPaC .... Information, Planning, and Conservation System

IPCC........................ Intergovernmental Panel on Climate Change

IWR .... Institute for Water Resources

KBB .... Kachemak Bay Birders

KBCHA.................... Kachemak Bay Critical Habitat Area

KBRR .... Kachemak Bay Research Reserve

KBSGI .... Kachemak Bay Set Gillnet Impacts

KPB .... Kenai Peninsula Borough

LERRD .... Lands, Easements, Rights-of-Way, Relocations, and Disposal sites

LOA .... Length Over All

LRO .... Local and Regional Opportunities

LSF .... Local Service Facilities

MBTA .... Migratory Bird Treaty Act

MHHW..................... Mean Higher High Water

MLLW .... Mean Lower Low Water

MMPA .... Marine Mammal Protection Act

MSA .... Magnuson-Stevens Fishery Conservation and Management Act

MSL .... Mean Sea Level

MTI .... Marine Trades Impacts

MTL .... Mean Tide Level

NAAQS.................... National Ambient Air Quality Standards

NCCOS .... National Centers for Coastal Ocean Science

NED .... National Economic Development

NEPA .... National Environmental Policy Act

NFIP .... National Flood Insurance Program

NFS .... Non-Federal Sponsor

NHPA .... National Historic Preservation Act

NISA .... National Invasive Species Act

NMFS .... National Marine Fisheries Service

NOAA .... National Oceanic and Atmospheric Administration

NOS .... National Ocean Service

NRC .... National Research Council

NRHP .... National Register of Historic Places

NTU .... Nephelometric Turbidity Units

NWI .... National Wetland Inventory

OMRR&R .... Operations, Maintenance, Repair, Replacement, and Rehabilitation

OSE .... Other Social Effects

P&G .... Principles and Guidelines

PAS .... Planning Assistance to States

PDT .... Plan Development Team

PED .... Preliminary Engineering and Design

PL .... Public Law

POA .... Alaska District (USACE)

PR&G .... Principles, Requirements, and Guidelines

PSO .... Protected Species Observer

PSP .... Paralytic Shellfish Poisoning

RECONS .... Regional Economic System

RED .... Regional Economic Development

ROM .... Rough Order of Magnitude

RSLC .... Relative Sea Level Change

SAV .... Submerged Aquatic Vegetation

SFHA .... Special Flood Hazard Areas

SHPO .... State Historic Preservation Office

SLC .... Sea Level Change

SPCC .... Spill Prevention, Control and Countermeasure

SSV .... Sound Source Verification

TSP .... Tentatively Selected Plan

U.S. .... United States

UDV .... Unit Day Values

USACE .... U.S. Army Corps of Engineers

USCG .... U.S. Coast Guard

USFWS .... U.S. Fish and Wildlife Service

WCC .... Waterborne Commerce Center

WQC .... Water Quality Certification

WQS .... Water Quality Standards

WR .... Welfare of the Region

WRDA .... Water Resources Development Act

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1.0 INTRODUCTION

1.1 Introduction

This Homer Navigation Improvements, AK, Integrated Feasibility Report and Environmental Assessment (IFR/EA) documents the United States Army Corps of Engineers (USACE) study planning and decision process for recommended navigation improvements at Homer, Alaska and compliance with the National Environmental Policy Act (NEPA).

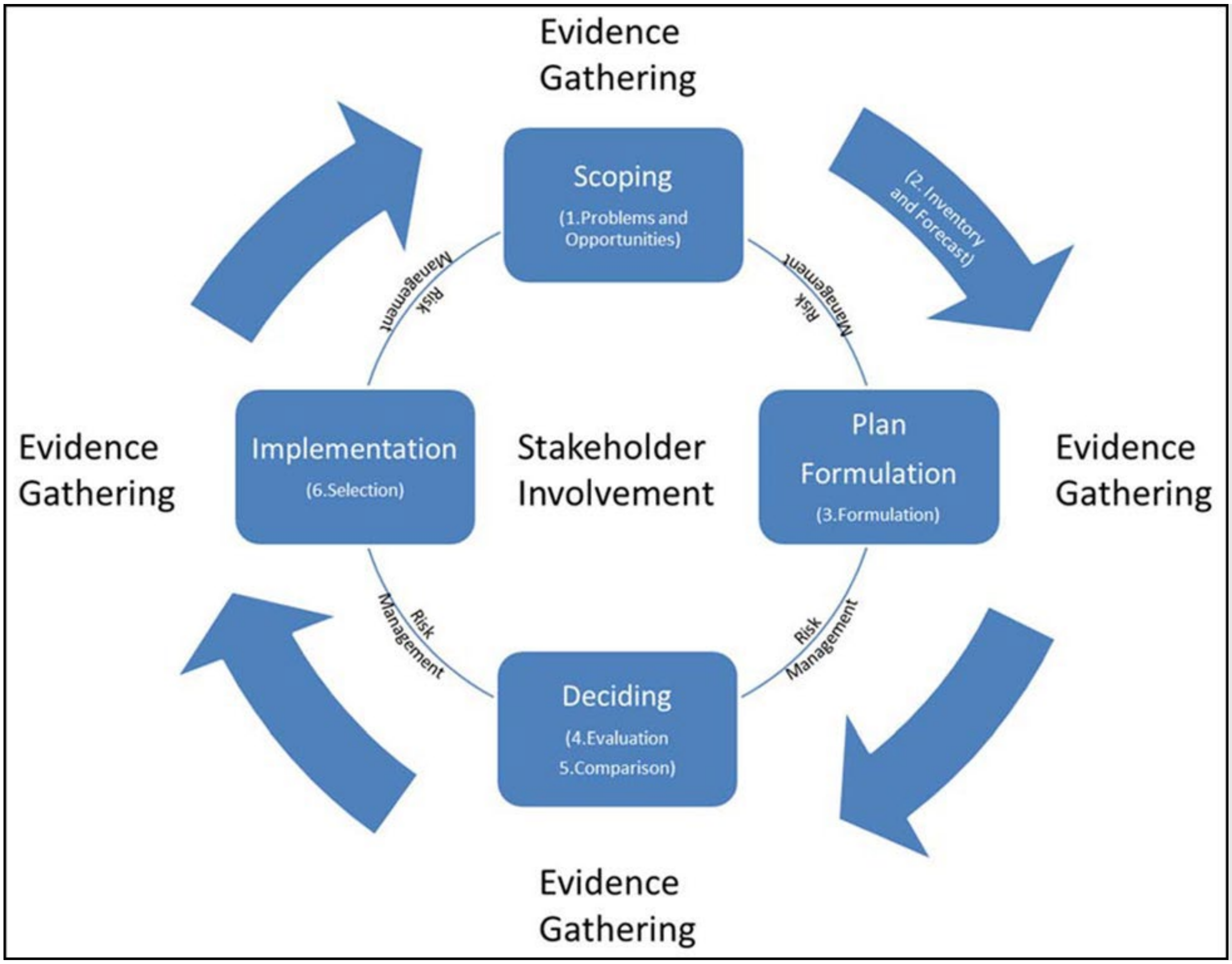
The feasibility study was conducted by USACE Alaska District (POA) in partnership with the City of Homer as the cost-sharing non-Federal sponsor (NFS). The focus of this study is to identify a feasible solution that provides safe, reliable and efficient waterborne transportation systems and moorage to support Homer's current and future fleet.

1.2 USACE Planning Process

The USACE Civil Works planning process follows a standard approach to identifying and evaluating possible water resource solutions to ensure potential federal projects comply with applicable laws and guidance. The 1983 *Economic and Environmental Principles and Guidelines for Water and Related Land Implementation Studies* (Principles and Guidelines, or P&G) provide guiding principles for the USACE planning process. The 2013 *Principles, Requirements, and Guidelines* (PR&G) supersedes the 1983 P&G, though both are used to guide the planning process. Both *Engineer Regulation (ER) 1105-2-103 Policy for Conducting Civil Works Studies* and the *Planning Manual Part II: Risk-Informed Planning* lay out an iterative planning process used for all USACE Civil Works studies in developing and evaluating alternative plans (Institute for Water Resources 2017).

The iterative six-step USACE planning process is outlined in *ER 1105-2-103* and was modified by the *Planning Manual Part II* into a risk-informed planning process (Figure 1-1). The six steps are denoted on the figure and include identifying water resource problems and opportunities (Step 1), inventory and forecast of existing and future conditions (Step 2), plan formulation (Step 3), plan evaluation (Step 4) and comparison (Step 5), and finally plan selection (Step 6), with evidence gathering, risk management, and stakeholder involvement taking place throughout the process. The Homer IFR/EA follows the framework of the USACE planning process.

Figure 1-1. USACE risk-informed planning process (from IWR 2017)



1.3 Study Authority

This feasibility study is authorized by Section 204 of the Flood Control Act of 1948 which authorizes a study of the feasibility for the development of navigation improvements in various harbors and rivers In Alaska. Section 204, as amended states:

> *The Secretary of the Army is hereby authorized and directed to cause preliminary examinations and surveys for flood controls and allied purposes [. . .] to be made under the direction of the Chief of Engineers, in drainage areas of the United States and Territorial possessions, which include the following named localities: [. . .] Harbors and Rivers in Alaska, with a view to determining the advisability of improvements in the interest of navigation, flood control, hydroelectric power, and related water uses.*

1.3.1 Remote and Subsistence Harbors Authority

This study also utilized the authority of Section 2006 of the Water Resources Development Act (WRDA) 2007, Remote and Subsistence Harbors, as amended by Section 1147 of WRDA 2024 (Section 2006), which states:

> *The Secretary [of the Army] may recommend a project without the need to demonstrate that the project is justified solely by national economic development benefits if […] the project would be located in the State of Hawaii or Alaska […] and over 80 percent of the goods transported through the harbor would be consumed within the United States.*

The use of this authority is appropriate, as Homer is located in Alaska and more than 80% of the goods transported through the harbor are consumed within the United States (U.S.).

1.3.1.1 Remote and Subsistence Harbors Justification

Data on goods shipped through Homer is available from the harbor records, and from the Waterborne Commerce Center (WCC). Inside the harbor, freight can be moved on the Fish Dock and on the barge ramp. Outside the harbor, freight can be moved on the Deep Water and Pioneer Docks, which are used by especially deep draft vessels, or vessels too long to navigate the harbor entrance. The harbor's records track freight moved on the internal dock, while the WCC data tracks goods moved on the external docks.

Table 1-1 shows wharfage for Homer's internal dock broken out into the general categories of seafood, fuel, and cargo/other. In general, seafood is brought into Homer by commercial fishing vessels and tenders and is either consumed locally in Homer's restaurants or is sent to Anchorage or Seattle. Fuel, which makes up the majority of cargo tracked by the port, is relied upon by rural Alaskan communities, where it is used to power generators to heat homes, provide electricity, and operate skiffs, four-wheelers, and snowmachines used in subsistence hunting and fishing activities. The last category, Cargo/Other, is very broad and may include anything from household cleaners or replacement machinery parts, to refrigerators, lumber, or shelf-stable food. Table 1-1 provides the average tonnage from 2015 to 2023 and also provides the tonnage for 2023 alone to allow for comparison of recent movements to the average.

Table 1-1. Homer Wharfage in Tons (rounded), 2023 and Average 2015–2023

	Seafood	Cargo/Other	Fuel	Total
Average 2015–2023	3,300	14,000	336,000	353,000
2023	5,400	58,000	322,000	385,000

Source: Data provided by Homer Harbor staff, June 2024

The majority of goods moved on the internal dock are consumed within the State of Alaska, and the rest are shipped to other parts of the U.S. Seafood brought into the harbor is either sold directly to local restaurants, or trucked to Anchorage and shipped to the contiguous U.S. Some miscellaneous cargo brought into Homer is trucked to Seward and Kenai, but the majority are transshipped to regional Alaskan communities. Fuel brought into Homer is also transshipped to regional communities. Table 1-2 shows the total goods in tons reported by the WCC as exports from Homer, and of those goods, the total tons that were exported internationally. The table provides the average tonnage from 2015 to 2022 and also provides the tonnage for 2022 alone, to allow for comparison of a recent year to the average; 2022 was used because it is the most recent data available from the WCC.

Table 1-2. WCC Exports (tons, rounded), 2022 and Average 2015–2022

	Tons Exported Domestically	Tons Exported from Homer Internationally	Total Tons Exported from Homer
Average 2015–2022	2,000	35,000	**37,000**
2022	1,000	28,000	**29,000**

Source: Waterborne Commerce Center, April 2025

Table 1-3 shows the total goods shipped through Homer and compares foreign and domestic exports. This table shows that less than 10% of goods transported through the harbor are consumed outside the U.S. Because the WCC does not have 2023 data available, the average value is used to estimate the total export value for 2023.

Table 1-3. Homer Foreign Exports as Percent of Total Exports (tons, rounded), 2023 and Average 2015–2023

Year Range	Annual Port-Reported Wharfage	WCC Data* Total Exports	Homer Total Exports	WCC† Data, Foreign Exports	Percentage Not Used in U.S.
Average 2015–2023	353,000	37,000	390,000	35,000	9%
2023	385,000	37,000*	422,000	35,000*	8%

Source: Port and WCC Data, April 2025.
*WCC data is from 2022
†2023 data not available, average value used

Because over 80% of goods transported through the Homer Port & Harbor, hereafter referred to as Homer Harbor, are consumed within the U.S. and because the project would be located in Alaska, the Section 2006 Authority can be applied to this study.

Per Section 2006, while determining whether to recommend a project that meets the above criteria, the Secretary will consider the benefits of the project to these resources:

> *(1) public health and safety of the local community and communities that are located in the region to be served by the project and that will rely on the project, including access to facilities designed to protect public health and safety*
>
> *(2) access to natural resources for subsistence purposes*
>
> *(3) local and regional economic opportunities*
>
> *(4) welfare of the regional population to be served by the project*
>
> *(5) social and cultural value to the local community and communities that are located in the region to be served by the project and that will rely on the project*

Sections 4.8.4.4 and 6.1 and Appendix C discusses the Section 2006 justification, and plan selection in detail.

1.4 Study Scope

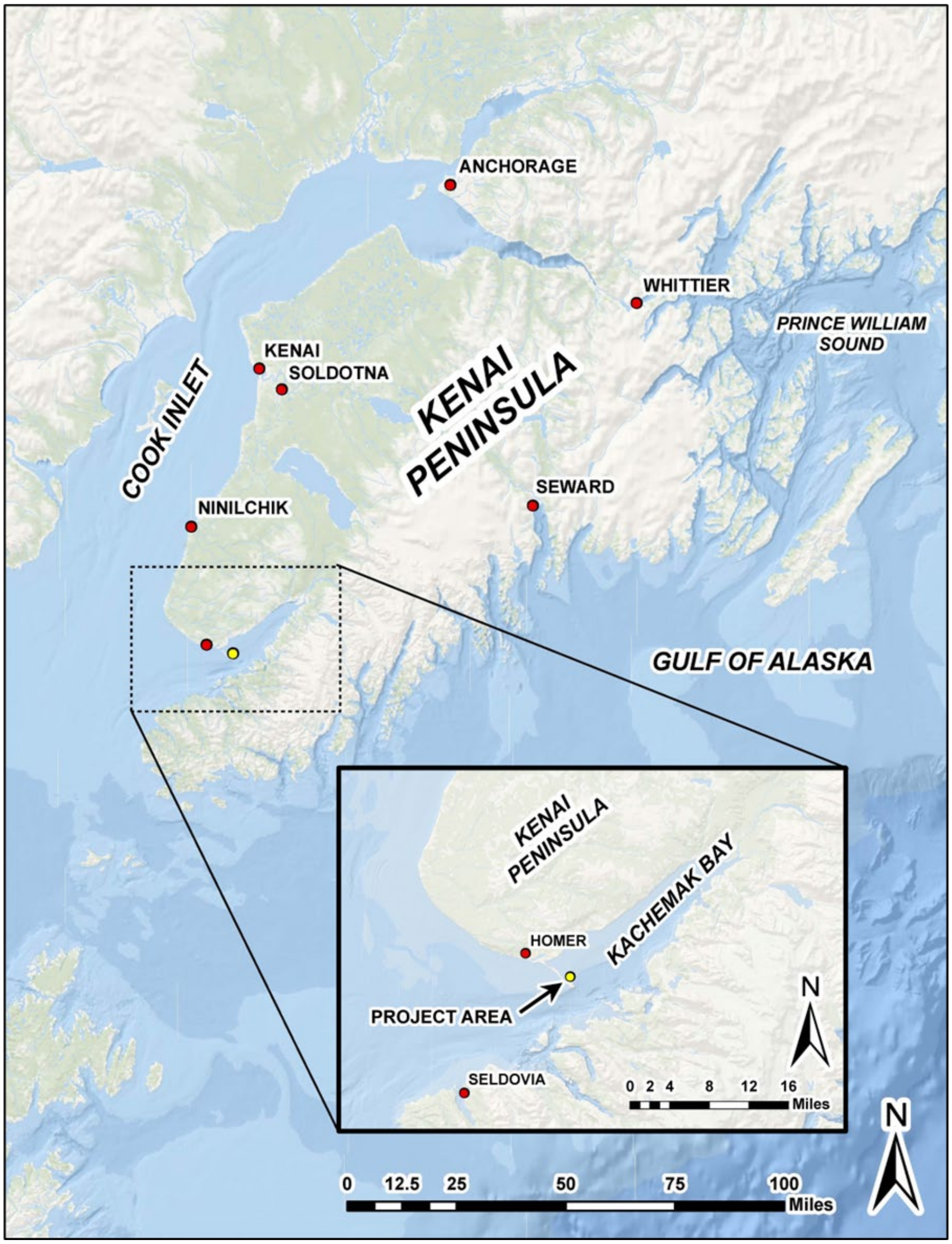
This study examines the feasibility and potential environmental effects of proposed navigation improvement alternative plans at Homer Harbor. The study resulted in an IFR/EA, which evaluates alternative plans based on economic, engineering, environmental, and cultural resource factors under the various authorities and guidelines referenced in Section 1.3. Under Section 204 authority, the alternative plans were evaluated for Federal interest based on NED benefits; however, the Section 2006 authority allows for selection of a project without demonstrating that the improvements are justified solely by NED benefits. Per the Implementation Guidance for Section 2006, plan selection can be supported by a cost-effectiveness/incremental cost analysis (CE/ICA) in the Other Social Effects account.

1.5 Study Area

The study area for this project is generally defined as the area within which significant project impacts occur, including the origins and destinations of vessels likely to use the port or waterway in delivering products to communities off the road system. This description of the study area may be interpreted differently by various disciplines involved in the study. For example, environmental and cultural professionals may consider a more focused area during the study, when compared to economic analysis, which considers impacts to communities around the state.

Figure 1-2. Study Area

Figure 1-3. Homer and the Kenai Peninsula



Homer Harbor is part of the City of Homer, which is located on the north shore of Kachemak Bay on the southwestern edge of the Kenai Peninsula in Alaska (Figure 1-3). At the southernmost point of the Sterling Highway, approximately 59° 38’ north latitude and 151° 33’ west longitude, it is 227 miles south of Anchorage by road. Homer is in the Homer Recording District and had an estimated population of 5,585 as of 2025. It is accessible via air, road, and water year-round and is the economic center of the southern Kenai Peninsula. It is the southernmost town on Alaska’s contiguous highway system and is part of the Alaska Marine Highway, a ferry service that operates along the southcentral coast of the state. The Port of Homer is located at the end of the Homer Spit (Figure 1-4), a narrow promontory of land demarcating Kachemak Bay from Cook Inlet.

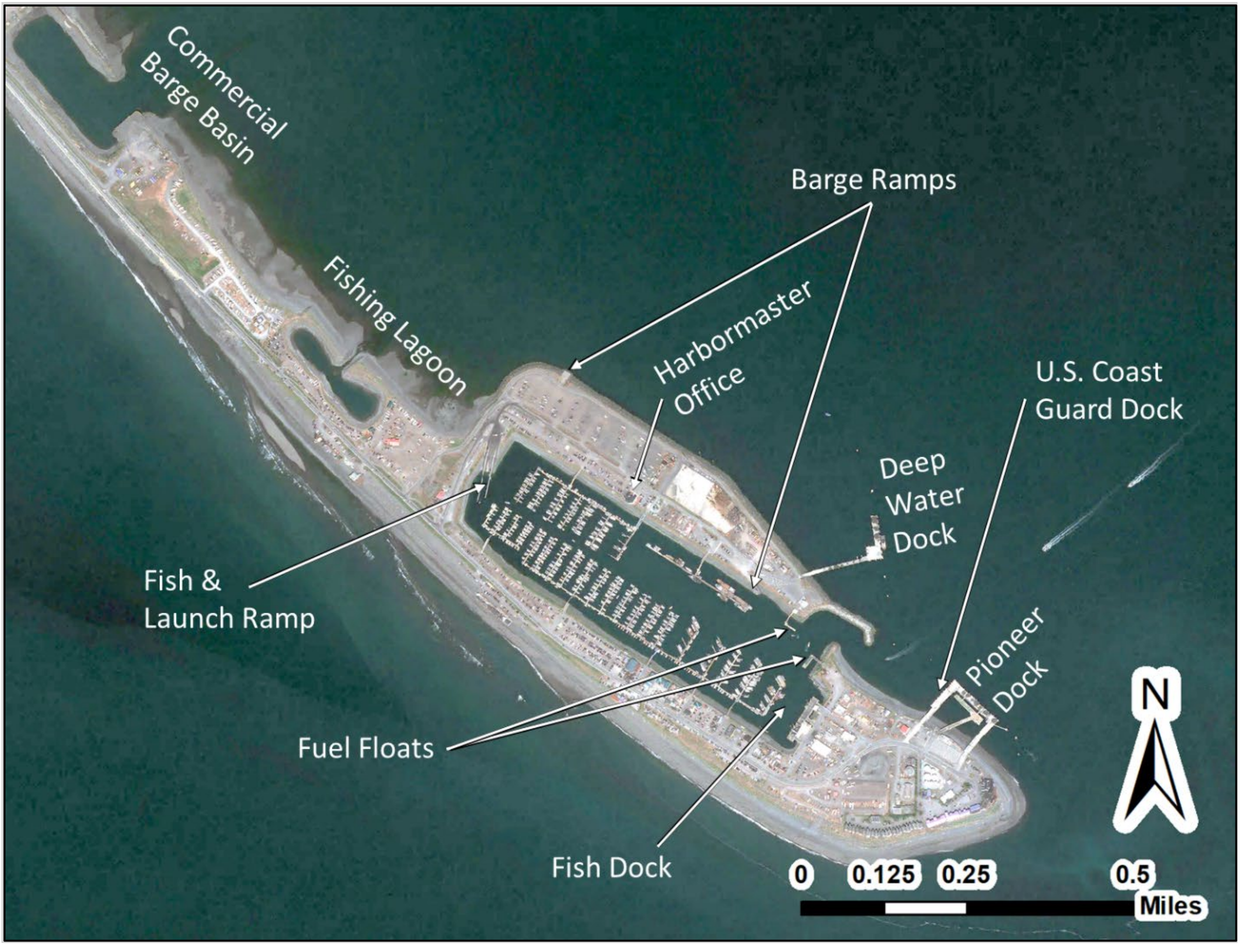
Figure 1-4. Homer Area

Construction of Homer Harbor began in the early 1960s. After significant damage to the original harbor during the Good Friday Earthquake of 1964, Homer was established as a first-class municipality, which gave the city access to Federal funding. Through a partnership with USACE, the harbor was reconstructed with a harbor basin of 16.5 acres.

By 1984, the fleet exceeded the harbor's capacity, and a harbor expansion project was initiated. During this expansion, the existing entrance channel was modified. The entrance channel was dredged to -20 feet mean lower low water (MLLW) but at a narrower width of 90 feet. However, the existing breakwaters were not altered during this expansion. Additional moorage areas were dredged, with mooring facilities developed incrementally over several years following the expansion. The dredged material disposal area from the expansion has since been converted into usable uplands. This expansion continued over the following three years after 1984, resulting in the 50-acre harbor basin that is still in use today.

The U.S. Coast Guard (USCG) has a presence in Homer and currently stations an Island Class cutter there. The City of Homer was designated as a Coast Guard City on May 22, 2023. The current harbor has 876 reserve slips and approximately 6,000 feet of transient moorage space, a 5-lane boat launch and barge-loading ramp, two tidal repair grids and haul out repair facility, a deep water dock, USCG Dock, a ferry terminal located at the Pioneer Dock, two fuel floats and a fish dock with cranes (Figure 1-5).

Figure 1-5. Homer Harbor Facilities



The harbor also serves as a critical supply hub for surrounding villages and many non-road-connected communities. Vessels from the harbor serve over 100 communities based on Automatic Identification System (AIS) tracking. Fifty communities not connected to the road system rely on Homer as a regional hub port. These communities are in Kachemak Bay, Cook Inlet, Lake Illiamna/Clark (Williamsport), Kodiak Island, along the Alaska Peninsula, the Aleutian Island chain, and Western Alaska.

1.6 Non-Federal Sponsor

The City of Homer is the NFS. The Feasibility Cost Share Agreement was signed on March 29, 2023.

The numerical wave and current modeling for this study was performed by HDR Engineering (HDR), an engineering consulting firm contracted by the NFS. Because HDR had previously developed a MIKE21 model encompassing Cook Inlet, USACE approved this model’s usage to leverage expertise and cost savings for the study. This report can be found in Appendix A, Attachment A. In addition to the coastal modeling, HDR coordinated a site-specific geotechnical investigation on behalf of the NFS. Eight offshore boreholes, located within the breakwater alignments and dredging area for the Tentatively Selected Plan (TSP), were drilled by Shannon & Wilson, Inc. in October 2025. This report can be found in Appendix B, Attachment A.

1.7 Related Reports and Studies

USACE Beach Erosion Control Study, Homer Spit, Alaska (1987) This report documents erosion issues facing the Homer Spit and recommends a revetment as erosion protection.

Homer Small Boat Harbor Navigation Improvements (2008) This study considered modifications to the existing harbor to alleviate rafting. The study was terminated prior to the Tentatively Selected Plan (TSP) because it was not found to be economically justified and did not result in a complete report.

Homer Small Boat Harbor and U.S. Coast Guard Cutter Hickory Berth, Homer, Alaska, Dredged Material Management Guide (2017) This report describes the guidelines for managing dredged material of the current Harbor and Coast Guard berth.

USACE Homer Planning Assistance to States (PAS) Section 22 Navigation Improvements (2019) This report updated economic analysis from the 2008 study to 2018 levels. Primary updates from the 2008 study included price level, discount rate, benefits considered, as well as updates to benefit categories relating to float and dock repairs, transportation cost saving for the commercial fleet, opportunities for increased subsistence harvests, and the removal of derelict vessels from the existing harbor. This update resulted in a new benefit-cost ratio (BCR) range of 0.89 to 1.0.

HDR Metocean Baseline Conditions Report (2026) This report was used to inform the project's environmental impacts.

2.0 PLANNING CRITERIA, PURPOSE AND NEED FOR PROPOSED ACTION

This section documents the purpose and need for navigation improvements at Homer Harbor and the basis for how alternatives will be evaluated. The purpose and need statement defines the underlying rationale for a proposed project and its fundamental intended outcome as a foundation for NEPA analysis.

The problem statement, opportunities, objectives, and constraints are how USACE frames water resource studies. By identifying existing issues (problems) and future possibilities (opportunities) USACE focuses on the objective of the study. Constraints and considerations are limitations or guiding restraining principles of the study.

The problem statement, opportunities, objectives, and constraints were initially scoped by the City of Homer and the Alaska District. USACE solicited public and stakeholder input during the public charrette held in Homer May 17–20, 2023. The problem statement, opportunities, objectives, and constraints were then further refined to not exceed USACE's authority or policies as outlined in Section 1.3.

Alternatives are compared using the National Evaluation Criteria: Completeness, Effectiveness, Efficiency, and Acceptability. The national evaluation criteria depend on clearly defined problems, opportunities, objectives, and constraints.

2.1 Purpose and Need

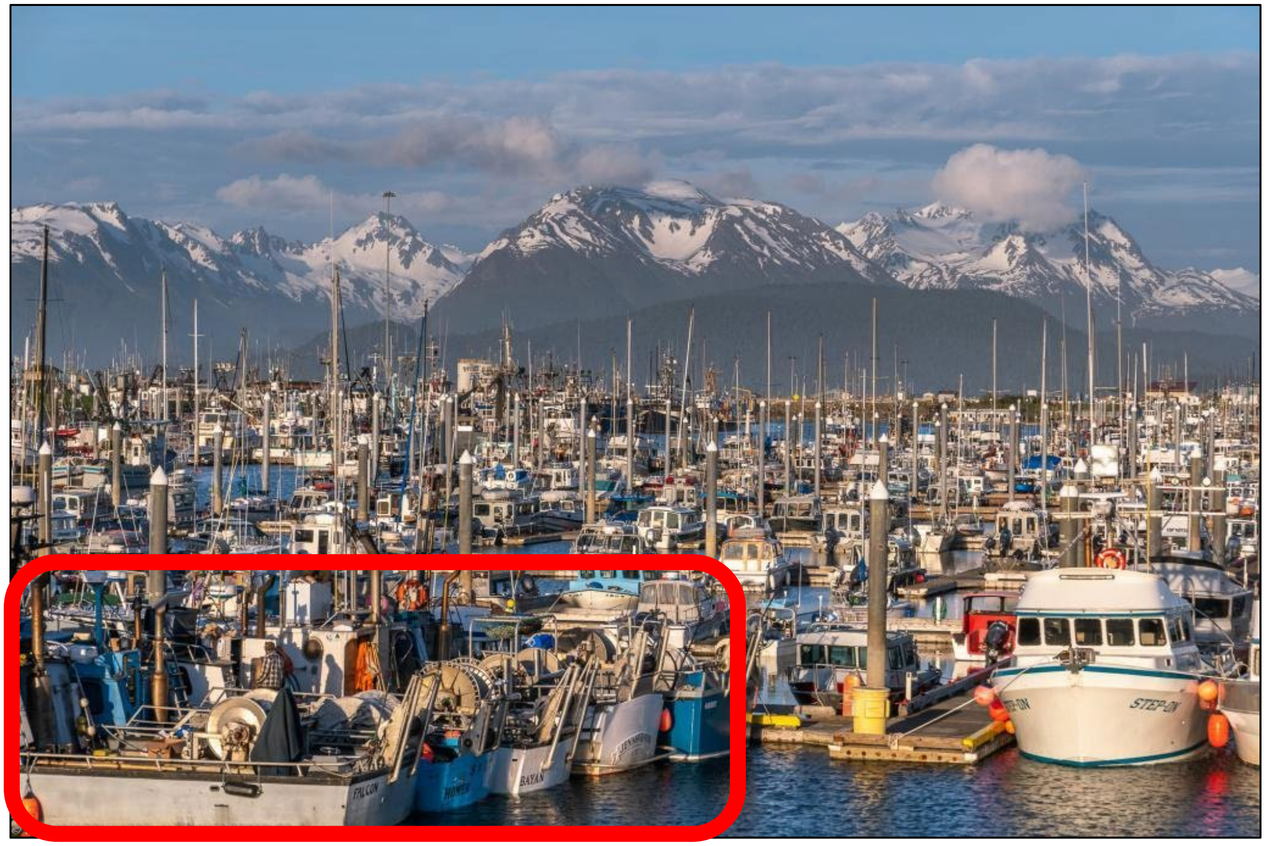
Homer's Port is a regional port serving the needs of commercial vessels operating across southcentral and western Alaska in the commercial fishing, marine transportation, and maritime industrial industries. Over time, the fleet of vessels calling on Homer has exceeded the harbor's ability to serve this fleet safely and efficiently.

The harbor is overcrowded. Moorage is often at or over capacity even after rafting large vessels three to four deep and small vessels up to five deep on moorage floats (Figure 2-1). When vessels are rafted, inner vessels must wait for outer vessels to move before they can depart from the harbor. These delays can sometimes be resolved in a matter of hours but can also take days if crew are not in Homer and must travel from elsewhere to move the vessel. The Harbor staff do their best to minimize these disruptions and will even move vessels themselves with owner permission when possible. However, not all delays can be avoided, owners cannot always be contacted, and use of staff to move vessels taxes the Harbor resources.

These rafting conditions occur in transient mooring sections partially because there are not enough moorage slips to accommodate permanent moorage for vessel demand. In 2019 there were 270 boats on the harbor permanent moorage waitlist; in 2024 there were 379. This number does not fully represent demand, since there is no permanent moorage for vessels over 85 feet in length. It takes several years for users to receive permanent moorage (average wait times vary by vessel size). This lack of permanent moorage increases the number of vessels using transient moorage which in turn increases the amount of rafting in the harbor. Rafting narrows navigation lanes, inducing congestion and introduces tidal limits to navigation for larger vessels on the shoreside of the System 5 float. Congestion in the harbor contributes to vessel delays and damages.

Rafting is a serious safety concern and increases risks of fires, falls, and collisions. During the charrette, a community member described falling while climbing over rafted vessels and breaking their ribs. Over half of respondents of a 2024 safety survey conducted by the harbor listed rafting as a factor contributing to injuries. Rafted vessels must run power cords from the dock over multiple intermediate vessels, which increases electrical hazards such as fire. Harbor staff stated that the firefighting equipment on float systems are not designed with rafted vessels in mind and that it would be much more difficult to put out a fire on a rafted vessel due to the difficulty of drawing a water hose over multiple vessels.

Figure 2-1. Vessels Rafted Five Deep

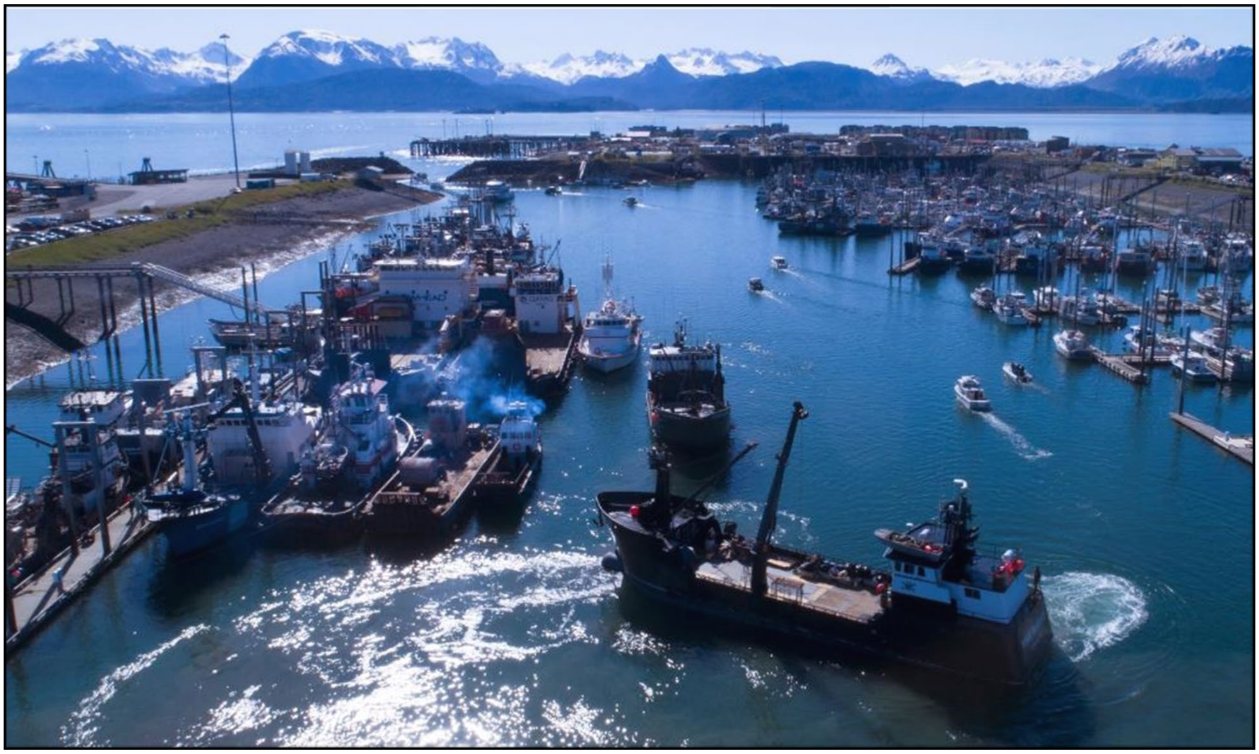


The dredged depth of the harbor basin, the width of the entrance channel, and the channel configuration limit the types of vessels that can call on Homer Harbor. Larger vessels may require that harbor staff temporarily close the channel to two-way traffic and assist them through the harbor. This taxes the resources of the harbor and causes delays for other vessels.

Negative impacts from navigational inefficiencies are not limited to Homer residents. Harbor staff identified 50 communities across Alaska that depend on essential fuel and freight services from vessels that moor in Homer Harbor. Delays experienced by these communities can have compounding effects. Several industries in Alaska have very restricted time windows such as fishing and construction so a loss of a single day has larger opportunity costs than in other regions. Certain communities can only be accessed on very high tides, so delays in Homer Harbor could delay deliveries by an entire month.

This study evaluates the feasibility for solutions that provide safe, reliable, and efficient navigation and mooring for the local and commercial vessels that call on Homer Harbor.

Figure 2-2. Vessels Manuevering Around Rafted Vessels



2.1.1 Problem Statement

Homer Harbor experiences navigational inefficiencies. This has led to negative economic impacts to a large region of Alaska. The navigational inefficiencies stem from overcrowding in the harbor. The harbor entrance channel and moorage basin depth also limit the ability for larger and deeper vessels to access the harbor.

Negative economic impacts are directly experienced by 50 non-road connected communities that depend upon Homer Harbor for essential goods such as fuel, freight, and food. Additional impacts are experienced by 147 communities in the region as users of Homer Harbor travel to perform their functions.

2.2 Opportunities

Potential opportunities that can be realized by improving navigation to/from Homer include the following:

- Improve access for vessels that serve communities without road access.
- Increase moorage facilities for large and small vessels.
- Reduce damages to floats and docks.
- Reduce vessel damages due to collisions and congestion in the harbor.
- Increase NED and other social effects (OSE) economic activities.
- Improve access for recreational activities.

2.3 Objectives

The overall objective of this study is to provide safe, reliable, and efficient navigation for commercial, private, and government users over the 50-year period of analysis from 2034 to 2083 by providing for the safe maneuverability and protected mooring of the existing and anticipated fleet.

2.4 Study Constraints and Considerations

Constraints are restrictions that limit the planning process related to laws, policies, and resource availability. There are no specific constraints for this study, but the following points have been used as planning considerations:

- Avoid or minimize impacts to existing commercial and subsistence fisheries.
- Avoid or minimize impacts to significant existing economic activities.
- Avoid or minimize impacts from sediment transport within Kachemak Bay.
- Avoid or minimize impacts to floodplains and wetlands.
- Avoid or minimize impacts to Essential Fish Habitat (EFH) and Anadromous Waters.
- Avoid or minimize impacts to marine mammals, migratory birds, and eagle populations that utilize the area.

These considerations were developed by the Alaska District and the NFS with input from the public and stakeholders through comments received during the public charrette on May 17–20, 2023.

2.5 National Evaluation Criteria

The *Principles, Requirements, and Guidelines for Federal Investments in Water Resources* (PR&G) govern how Federal agencies evaluate proposed water resources projects and provide a common framework for analyzing a diverse range of water resources projects, programs, activities, and related actions involving Federal investment. The PR&G require alternatives to be assessed to the extent which an alternative achieves each of the following criteria: completeness, effectiveness, efficiency, and acceptability.

2.5.1 Completeness

The extent to which an alternative provides and accounts for all features, investments, and/or other actions necessary to realize the planned effects, including any necessary actions by others. It does not necessarily mean that alternative actions need to be large in scope or scale.

2.5.2 Effectiveness

The extent to which an alternative alleviates the specified problems and achieves the specified opportunities.

2.5.3 Efficiency

The extent to which an alternative alleviates the specified problems and realizes the specified opportunities at the least cost.

2.5.4 Acceptability

The viability and appropriateness of an alternative from the perspective of the Nation's general public and consistency with existing Federal laws, authorities, and public policies. It does not include local or regional preferences for solutions or political expediency.

2.6 Study Specific Evaluation Criteria

This study uses Cost-Effectiveness/Incremental Coast Analysis (CE/ICA) to support justification under authority Section 2006 of WRDA 2007 as amended. A detailed description of this analysis is in Section 4.8.4.4 of this report and Appendix C.

3.0 EXISTING AND FUTURE WITHOUT PROJECT CONDITIONS

The USACE planning framework relies on a comparison between conditions that are likely to exist if no federal action were taken and the conditions that are likely to exist with a federal action in place. These conditions are known as the future-without-project (FWOP) and future-with-project (FWP) conditions respectively. Future conditions are compared over the 50-year period of analysis. In order to make a comparison, USACE first documents the existing condition, and then projects that condition over the period of analysis into the FWOP condition. Conditions are described from four separate perspectives: the physical environment, natural environment, socio-economic environment, and built environment. This section explicitly documents when existing conditions are projected to change over the period of analysis.

3.1 Period of Analysis

The period of analysis is the 50-year period from 2034–2084. The base year (2034) was identified for analysis as it is the most likely year when project construction would be complete.

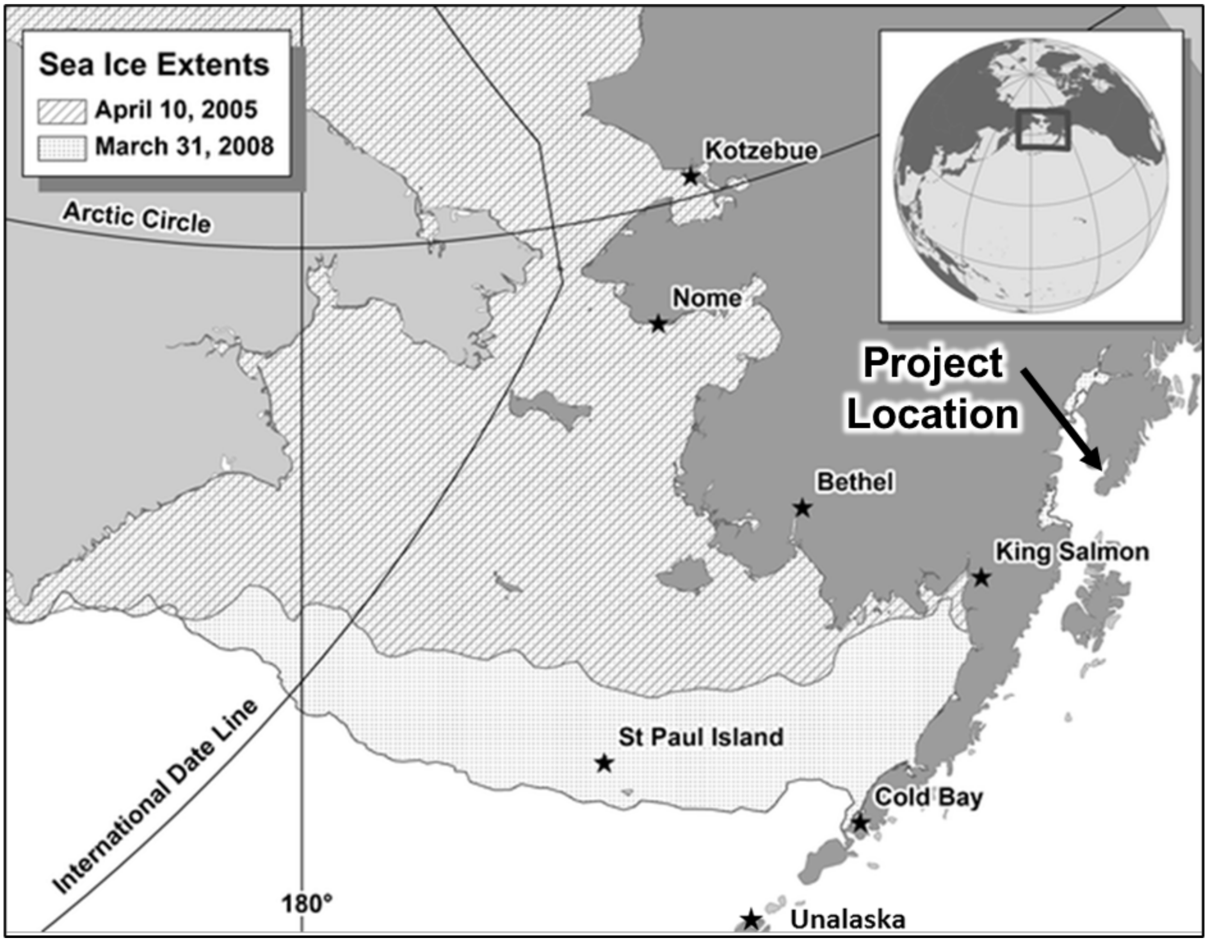
3.2 Physical Environment

The physical environment entails all non-living natural and anthropogenic features and processes associated with an area.

3.2.1 Sea Ice

Cook Inlet and Kachemak Bay are generally ice-free and remain navigable year-round, as they lie south of the region’s typical pack-ice extent (Figure 3-1). There is only one documented instance of the entire Kachemak Bay freezing over – during the severe winter of 1946–1947 (Gay 1993).

Figure 3-1. Alaska Sea Ice Extents



Source: Data from 1979–2012 study of sea ice extents (Wendler 2014)

Prolonged cold temperatures can create pan ice (large, flat sheets of broken sea ice) up to a foot thick at the head of Kachemak Bay. Within Homer Harbor, localized freezing is more common during prolonged cold spells due to lower surface salinity caused by freshwater vessel inputs. Ice can affect vessel operations, preventing small boats from operating and causing minor damage to larger vessels. The most severe recent event occurred in the winter of 2007, when up to 6 inches of ice accumulated in and around the harbor, preventing State Ferry access to the Pioneer Dock for several weeks. This was the most severe icing event in recent years; in most winters, the harbor experiences no icing at all.

3.2.2 Tides

Homer is in an area of semi-diurnal tides with two high waters and two low waters each lunar day. The area experiences significant tidal swings, with the highest observed tide being 25.62 feet and the lowest observed being -6.04 feet.

The closest operating tide station is in Seldovia (Station 9455500), approximately 15 miles southwest of Homer on the opposite side of Kachemak Bay. The station has validated monthly mean water level data from 1964 to 1970, and continuous water level monitoring data from 1979 to present.

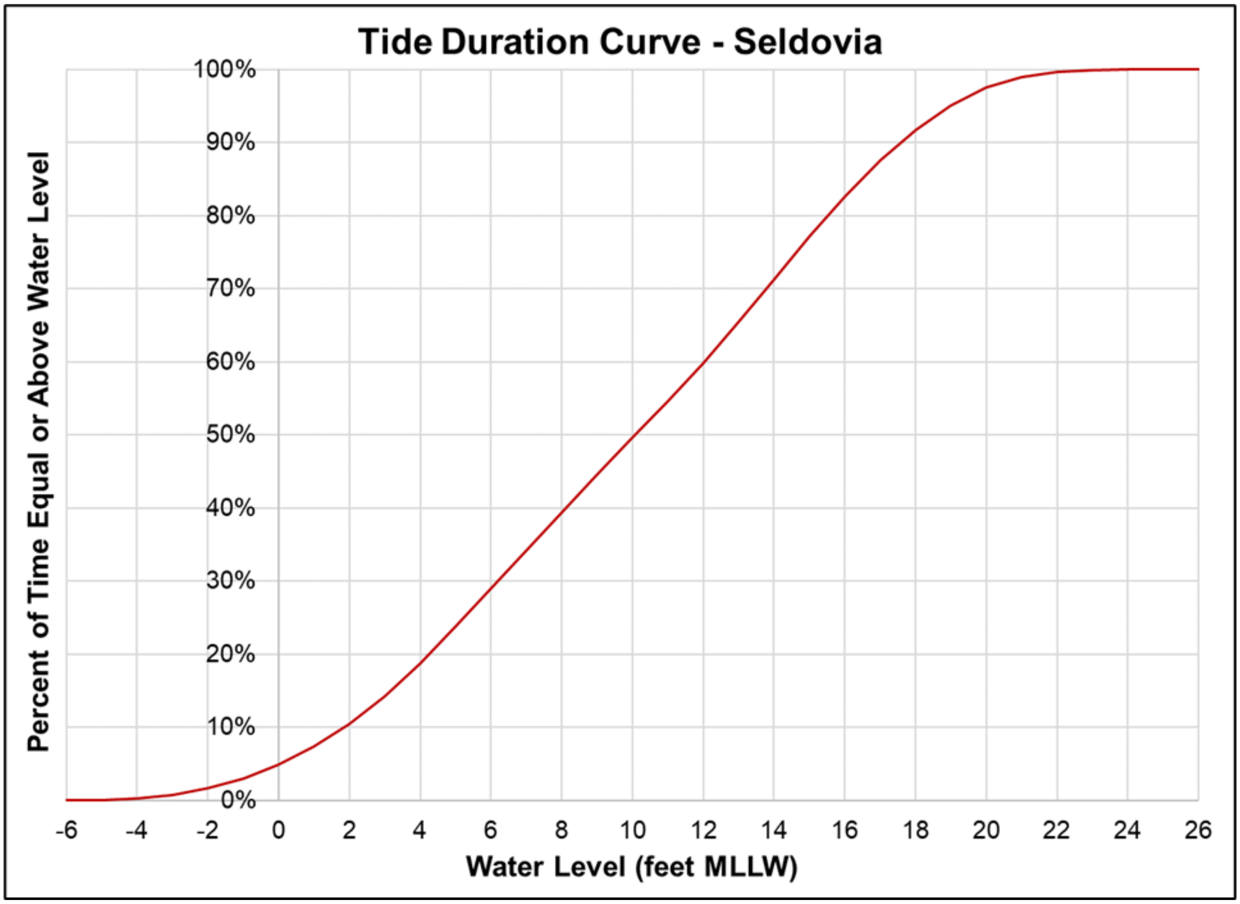
A temporary tide station was installed at Coal Point (Station 9455558) on the Pioneer Dock adjacent to Homer Harbor, operating from August 25 to December 8, 2018. Although limited in duration, data from Coal Point showed tidal characteristics comparable to those in Seldovia. The Seldovia station is preferred due to its continuous, multi-decade record. Therefore, all tidal references herein are based on data from the Seldovia station.

Table 3-1. Comparison of Seldovia (9455500) and Coal Point (9455558) Tide Gauges

	Seldovia	Coal Point
	Elevation (feet MLLW)	**Elevation (feet MLLW)**
Highest Observed Tide	25.62	-
Mean Higher High Water (MHHW)	18.05	18.43
Mean Tide Level (MTL)	9.47	9.63
Mean Sea Level (MSL)	9.56	9.73
Mean Lower Low Water (MLLW)	0	0
Lowest Observed Tide	-6.04	-

The tide duration curve for Seldovia was developed using hourly verified water levels from the Seldovia tide gauge between July 12, 1975, and December 31, 2024 (Figure 3-5 and Table 3-2). Results indicate that the water level at the proposed harbor site will be above 0.0 feet MLLW 95.074% of the time, and above -6.0 feet MLLW 99.998% of the time.

Figure 3-2. Tide Duration Curve



Source: Data from the Seldovia Tide Gauge for years 1975 to 2024 (NOAA 2024)

Table 3-2. Percent of Time Tide Equals or Exceeds Given Water Levels

Waver Level (Feet MLLW)	-7	-6	-5	-4	-3	-2	-1	0
Percent of Time Equal or Above Water Level	100%	99.998%	99.937%	99.699%	99.208%	98.331%	97.003%	95.074%

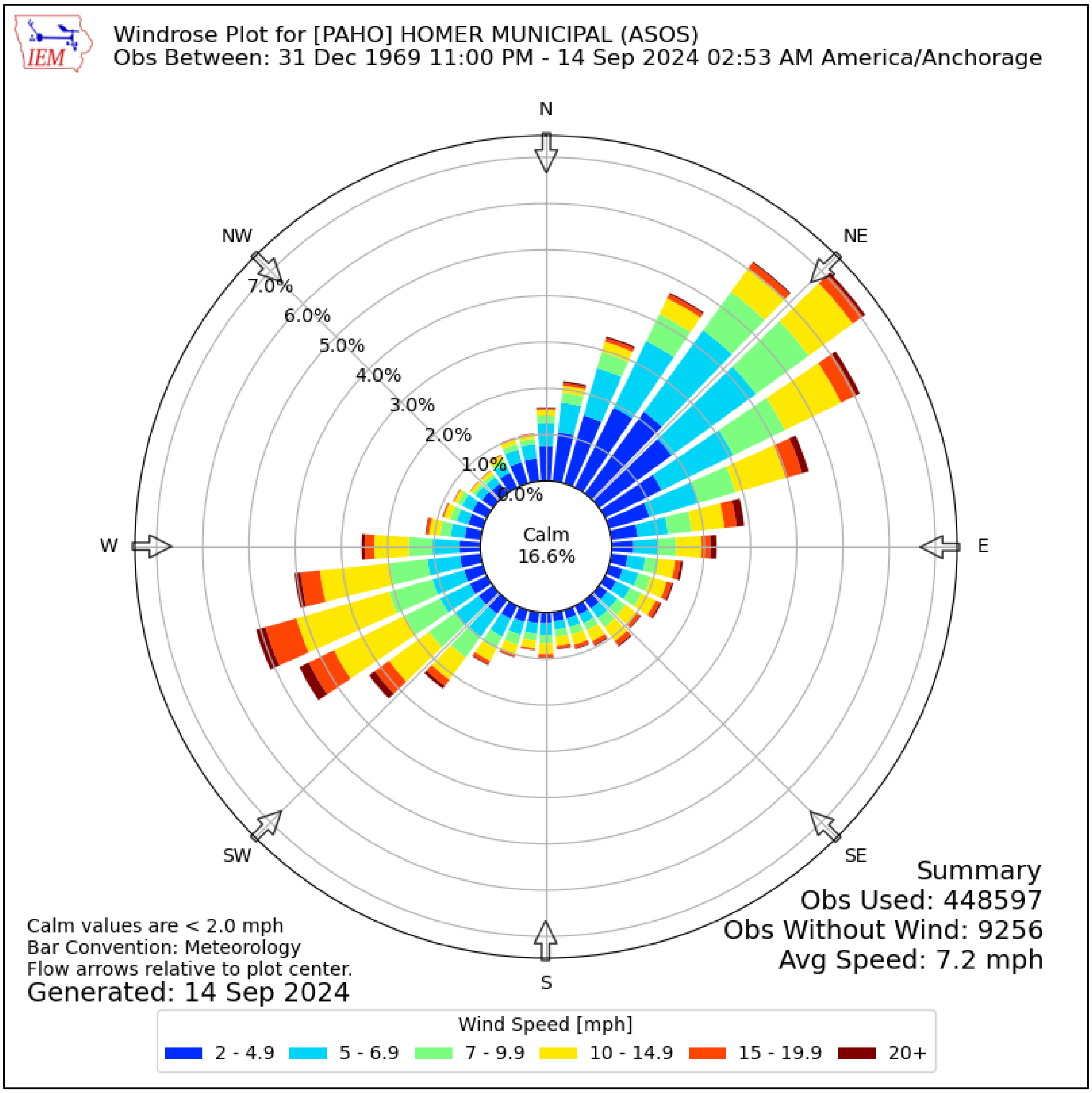
Source: Data is from the Seldovia Tide Gauge for years 1975 to 2024 (NOAA 2024)

3.2.3 Wind

Predominant winds at Homer are generally associated with low-pressure systems tracking eastward across the western Pacific Ocean and southern Bering Sea. Winds occur year-round but exhibit strong seasonal variation. Summer winds are typically from the west-southwest and are lighter, while winter winds are predominantly from the northeast and stronger (Figure 3-3). The Homer area is also subject to intense southwest storms in October and November, which drive wave energy toward the Cook Inlet side of the Spit. High winds combined with high tides have historically caused wave run-up and overtopping onto Homer Spit Road leading to the existing boat harbor

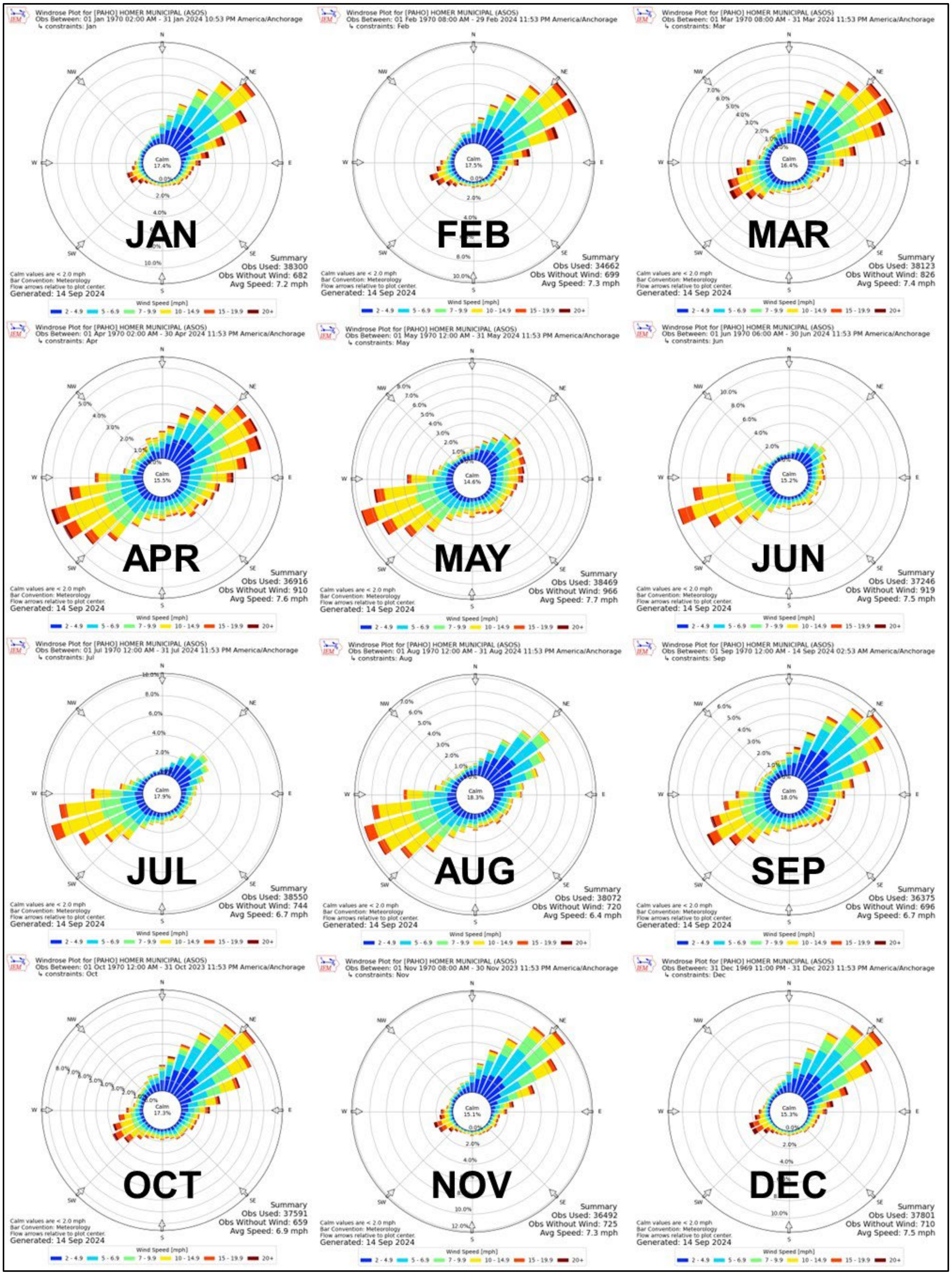
(USACE 2009). Further discussion of winds used for project design is provided in Appendix A.

Figure 3-3. Homer Airport Windrose, Yearly Average



Source: Iowa Environment Mesonet (Iowa State University 2024)

Figure 3-4. Homer Airport Windrose, Monthly Averages



3.2.4 Currents and Sedimentation

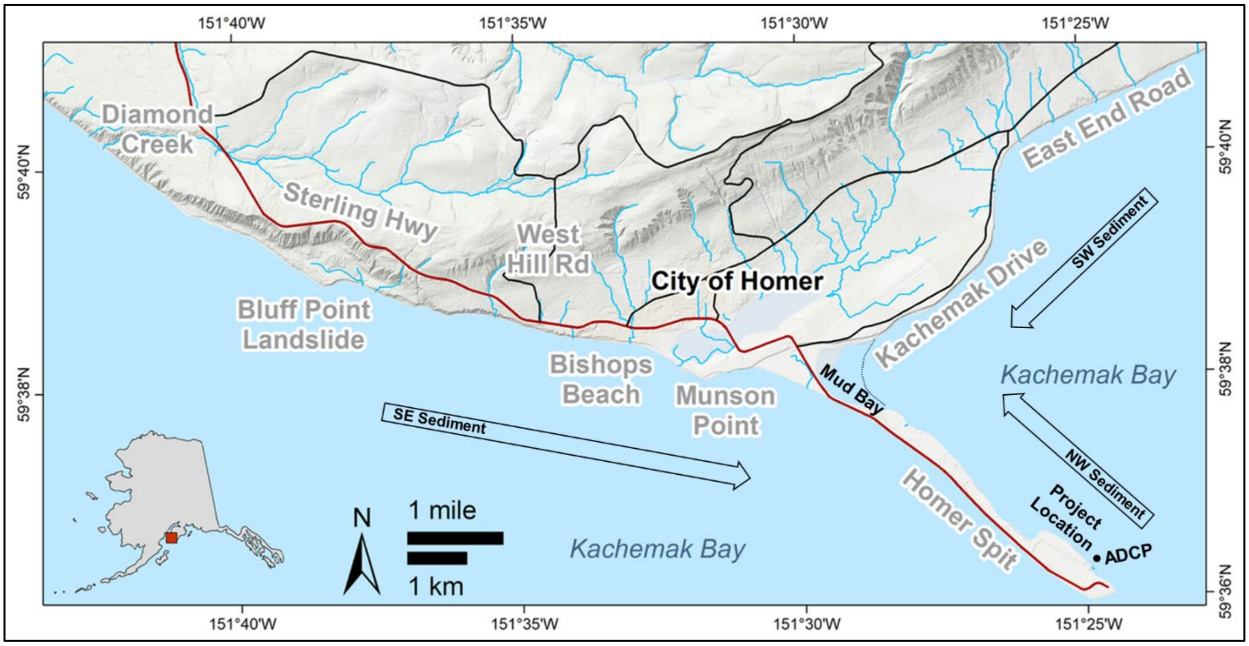
HDR Engineering (HDR) performed a literature review of the sediment transport studied around Kachemak Bay and Homer Spit. Two primary sources of sediment in the project area are eroding sea cliffs, henceforth referred to as bluffs (Adams 2007), and glacial outwash delivered by rivers discharging into Kachemak Bay. Bluffs between Diamond Creek to the west and East End Road to the east range in height from 30 to 90 feet, with the tallest, at Bluff Point Landslide, reaching 485 feet.

The predominant current direction in the Homer Spit area is generated by southeast winds funneled through Cook Inlet between Mount (Mt.) Iliamna and Mt. Saint Augustine, blowing roughly parallel to the Spit. These winds drive currents that wrap around the Spit's tip and continue northwest along the Kachemak Bay side. This circulation pattern was confirmed by an acoustic Doppler current profiler (ADCP) deployed adjacent to the Deep Water Dock, which recorded current velocity and direction throughout the water column every 6 minutes between July 1, 2015, and August 13, 2016 (Figure 3-5). Further detail is provided in the HDR Metocean Baseline Conditions Report located in Appendix A.

These wind-driven currents strongly influence sediment transport in the Homer Spit area. Along the Cook Inlet side of the lower Kenai Peninsula, net littoral drift moves from northwest to southeast, wrapping around the tip of the Spit toward Mud Bay. On the Kachemak Bay side, drift moves from northeast to southwest, also converging at the end of the Spit. The existence of the Spit itself reflects the long-term convergence of these sediment movements (USACE 2009).

Driven by the predominant current direction, sediment from eroding bluffs west of Homer Spit is transported southeasterly toward the tip of the Spit. As it wraps around the nose of the Spit, the sediment is carried northwest along the Kachemak Bay side toward the harbor entrance and Mud Bay. However, most of this sediment is lost to a trench more than 100 feet in depth off the Spit's tip, which acts as a sediment sink (Vitale 1981, Adams 2007). Sediment from bluffs along the Kachemak Bay side is also transported southwest toward the Spit by local wind-driven wave action, though at a lesser rate than transport driven by prevailing currents from Cook Inlet.

Figure 3-5. Location of Coastal Bluffs and Convergence of Sediment Transport



Source: Coastal Bluff Stability Assessment for Homer, Alaska (Buzard and Overbeck 2022)

The existing harbor entrance channel and Pioneer Dock berth function as primary sediment sinks and require annual maintenance dredging. Additional sediment loss will continue to occur in the trench off the end of the Spit.

3.2.5 Surface Water Stream Flow

A formal hydrology analysis of was not completed for this project. The project site is located at the terminus of a spit extending into the ocean, with no rivers or creeks present on the spit itself. See Appendix A for more information.

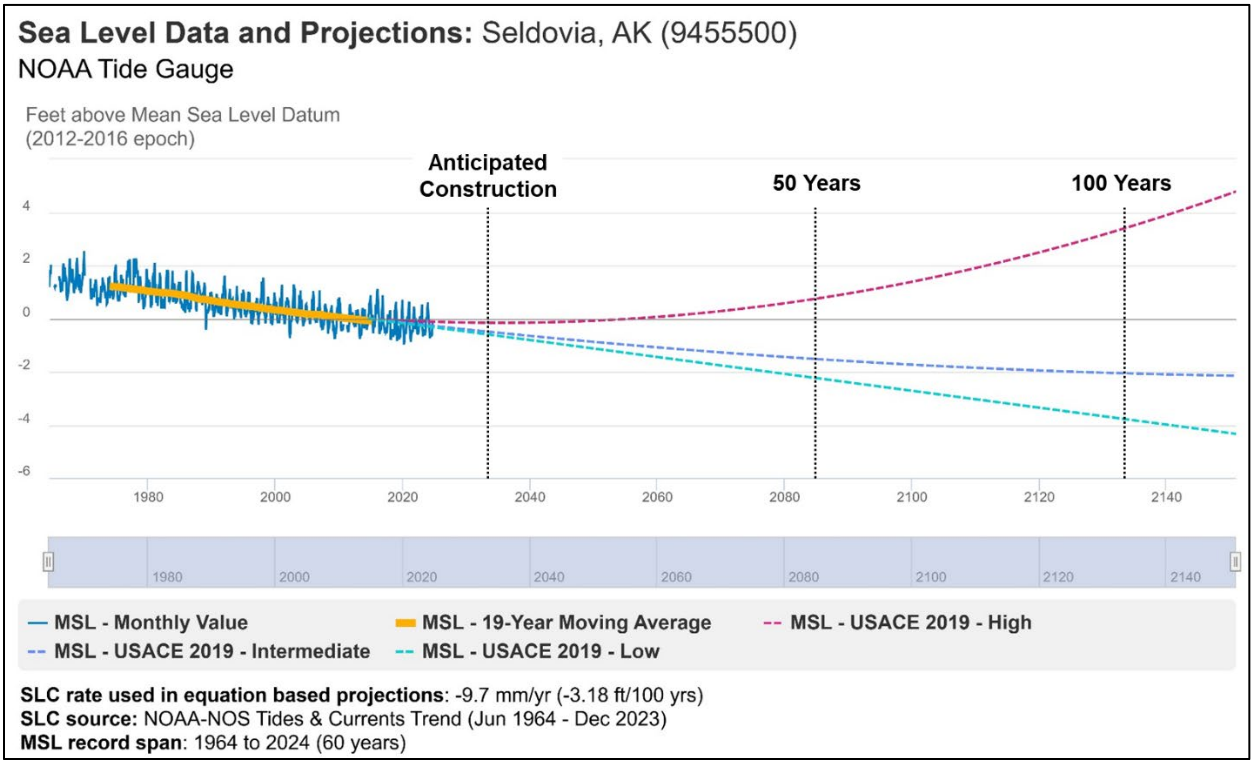
3.2.6 Relative Sea Level Change

ER 1100-2-8162 requires that planning studies and engineering designs evaluate alternatives across a range of potential future rates of relative sea level change (RSLC). The scenarios considered include:

- Low scenario – corresponds to the historic rate of sea level rise.
- Intermediate scenario – corresponds to the modified National Research Council (NRC) Curve I.
- High scenario – corresponds to the modified NRC Curve III.

These scenarios were projected over the 50-year period of analysis and 100-year planning horizon as shown in Figure 3-6 and Table 3-3.

Figure 3-6. Relative Sea Level Change Graph



Three scenarios of "low," "intermediate," and "high" sea level change (SLC) are evaluated over the project life cycle. According to the Engineering Circular (EC), the SLC "low" rate is the historic SLC. The "intermediate" and "high" rates are computed using the following:

- Estimate the "intermediate" rate of local mean sea-level change using the modified NRC Curve I and the NRC equations. Add those to the local historic rate of vertical land movement.
- Estimate the "high" rate of local mean SLC using the modified NRC Curve III and NRC equations. Add those to the local rate of vertical land movement. This "high" rate exceeds the upper bounds of Intergovernmental Panel on Climate Change (IPCC) estimates from both 2001 and 2007 to accommodate potential rapid loss of ice from Antarctica and Greenland.

Table 3-3. Relative Sea Level Change Table (in feet)

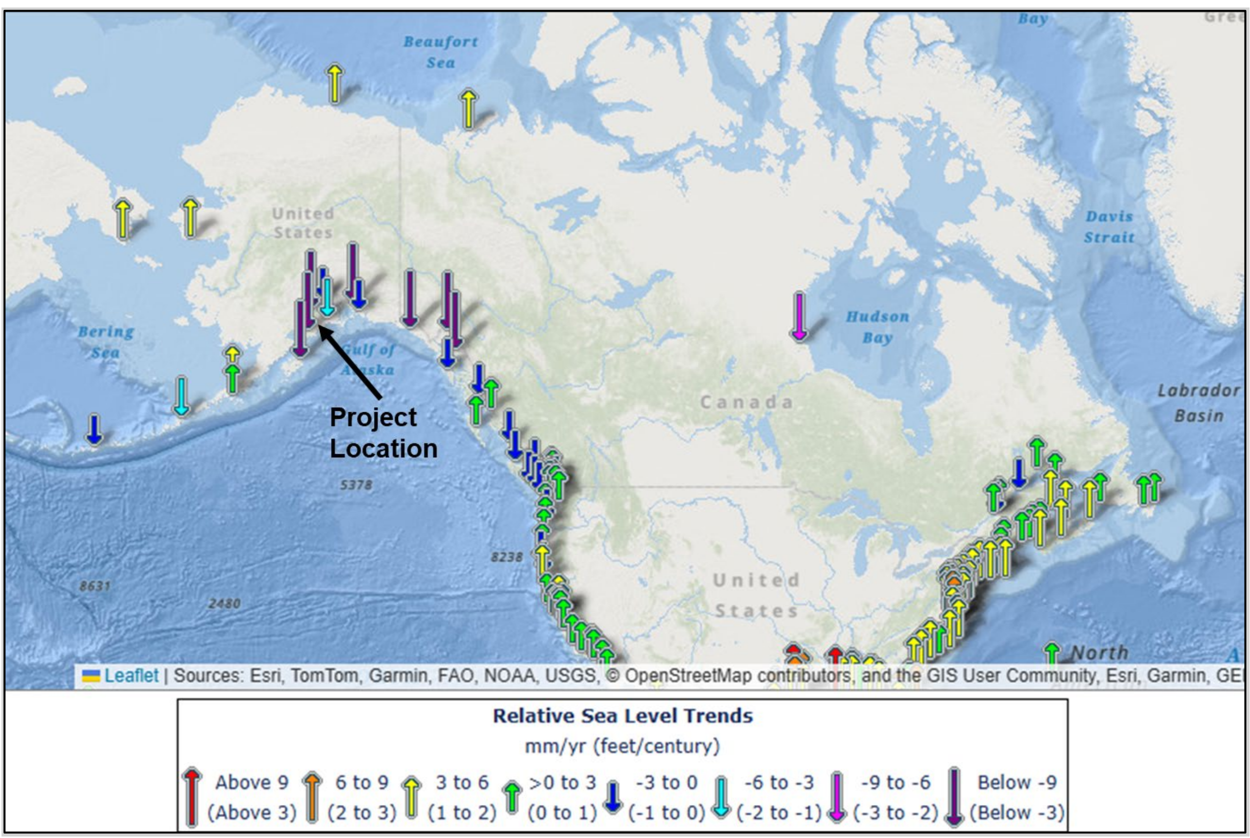
Year	High	Intermediate	Low
2030	-0.15	-0.42	-0.51
2040	-0.15	-0.67	-0.83
2050	-0.08	-0.89	-1.15
2060	0.07	-1.10	-1.46
2070	0.29	-1.28	-1.78

Year	High	Intermediate	Low
2080	0.59	-1.45	-2.10
2084 (50 Years)	0.73	-1.52	-2.23
2090	0.96	-1.61	-2.42
2100	1.41	-1.74	-2.74
2110	1.93	-1.86	-3.06
2120	2.52	-1.96	-3.37
2130	3.19	-2.04	-3.69
2134 (100 Years)	3.47	-2.07	-3.82

3.2.6.1 Vertical Land Movement

The study area, like most of Alaska, is experiencing isostatic rebound (Figure 3-7). This process, also known as glacial isostatic adjustment, is the gradual rise of land following the removal of ice age glaciers. Pollen records indicate that deglaciation of Kachemak Bay began approximately 13,000 years ago (Ager 2000).

Figure 3-7. U.S. Relative Sea Level Trends



3.2.7 Geology/Topography

Homer lies within the Cook Inlet-Susitna Lowland, a physiographic region characterized by moderate elevation changes and landforms shaped by stagnant ice and glacial debris from past ice ages (Wahrhaftig 1965). The landscape reflects the influence of significant glacial coverage during the late Pleistocene, as demonstrated by both the terrain and the layering of soils in the area (Coulter et al. 1965). The region typically lacks continuous permafrost (Ferrians 1965).

The subsurface geology near Homer consists largely of Tertiary-age sedimentary rocks that contain coal and are only slightly altered by tectonic activity. These formations are blanketed by deposits from glacial meltwater, ice movement, and ancient lakes. Homer Spit itself developed on an underwater terminal moraine left by the Kachemak Bay glacial lobe. Today, the spit is made up of well-sorted beach sands that rest atop older marine and glaciolacustrine sediments.

3.2.8 Soil & Sediment

The primary federal law governing the management of soils and sediments in the marine environment is the Clean Water Act (CWA). Specifically, Section 404 of the CWA requires a permit from USACE for any project involving the discharge of dredged or fill material into waters of the U.S. Although USACE does not issue permits for its own activities, USACE authorizes its own discharges of dredge and fill material by applying all applicable substantive legal requirements of the section 404(b)(1) guidelines (33 Code of Federal Regulations [CFR] 336.1(a)). The evaluation of dredged material is conducted in coordination with the U.S. Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation (ADEC). The Draft Alaska Dredged Material Evaluation Framework (ADMEF) serves as the guiding document for developing a sediment Sampling and Analysis Plan for Alaskan projects with discharge into CWA jurisdictional waters to ensure the material is suitable for its intended use and placement.

3.2.8.1 Existing Conditions

The existing soils in the project area consist of a surface layer of very soft to soft silt marine deposits. This is underlain by an intermediate layer of very soft to stiff lean clay, which is underlain by a very soft to stiff sandy silt layer, which then transitions to a layer of loose to very dense silty sand that increases in density with depth. Based on the chemical analysis performed for the project's Sampling and Analysis Plan, these sediments are considered clean and suitable for in-water use.

The local sediment dynamics are driven by the metocean conditions of Kachemak Bay. The HDR Metocean Baseline Conditions Report (Appendix A: Hydraulics & Hydrology, Attachment A) indicates that the area is subject to strong tidal currents and a complex wave climate. The dominant sediment transport pathway is influenced by estuarine circulation, with fine-grained sediments from glacial rivers being a primary source. The report notes that existing current velocities are sufficient to mobilize the soft silts and fine sands found on the seabed, leading to natural patterns of erosion and shoaling within and around the existing harbor infrastructure.

Input from the Environmental Stakeholder Working Group (ESWG) characterized the project area as having a dynamic and sensitive sediment environment. They described the existing conditions as being governed by established sediment transport patterns, which are particularly crucial for maintaining the ecological balance of Mud Bay. The group also acknowledged that the physical makeup of the seafloor is a key component of the existing habitat, a characteristic that the USACE has formally documented through the analysis of sediment grab samples.

3.2.8.2 Future Without Project Conditions

In the FWOP, the existing sediment conditions and transport patterns would persist. Natural shoaling would continue within the harbor, driven by the tidal and wave-induced currents identified in the HDR Metocean Baseline Conditions Report (Appendix A: Hydraulics & Hydrology, Attachment A), requiring periodic maintenance dredging to maintain navigable depths. The physical and chemical characteristics of the sediment accumulating in the harbor would not be expected to change significantly from existing conditions.

3.2.9 Bathymetry

The project alternatives are sited on a shallow shelf northeast of the Spit, with water depths ranging from -5 to -20 feet MLLW. This shelf is adjacent to a deep trench that begins off the Spit's tip and extends to the back of Kachemak Bay, with depths greater than 100 feet.

The bathymetric data used to determine project quantities for dredging and breakwater construction was collected from August 1–4 and August 9, 2024. The survey was conducted using a multibeam echosounder, with sound velocity corrections applied. The horizontal control for the survey is based on the Alaska State Plane coordinate system, Zone 4, NAD83 (2003), and the vertical control is referenced to MLLW based on the 2012–2016 tidal epoch from the National Oceanic and Atmospheric Administration's (NOAA) National Ocean Service (NOS) benchmark at Coal Point, Kachemak Bay. The collected sounding data was processed, and a 3x3 mean was used for the calculation of project quantities.

3.2.10 Seismicity

Homer is located in a seismically active region of Southcentral Alaska, an area well known for producing large and powerful earthquakes. The primary seismic risk to the Homer Spit is not from distant events but from a large, local earthquake causing submarine slope failure. The 1964 magnitude 9.2 event, with an epicenter located less than 200 miles from Homer, resulted in subsidence of the Homer Spit averaging 6 feet (with localized settlement up to 10 feet) and caused significant damage to harbor facilities (Suleimani, Nicolsky Salisbury 2019). Based on geologic records, the recurrence interval for a major earthquake (M8.0+) in this region is estimated to exceed 500 years. In the FWOP condition, these underlying seismic risks, including strong ground shaking, liquefaction, and the potential for a locally generated tsunami, will persist. Existing natural slopes and man-made structures, including the current harbor, will remain vulnerable to these events.

3.2.11 Air Quality

Under the Clean Air Act (CAA), a geographic area's air quality is classified based on its compliance with the National Ambient Air Quality Standards (NAAQS). An area is designated as nonattainment if ambient concentrations of one or more criteria pollutants are found to exceed the NAAQS thresholds. Areas where pollutant concentrations remain at or below the established standards are designated as attainment. Maintenance areas are nonattainment areas redesignated as attainment and subjected to the requirement to develop a maintenance plan. In instances where insufficient data exists to make a determination of compliance, the area is classified as unclassifiable.

3.2.11.1 Existing Conditions

Due to the absence of a long-term, regulatory-grade air quality monitoring site, the Homer area is part of the Cook Inlet Intrastate Air Quality Control Region, which is designated as an "unclassifiable" or “attainment” area for criteria pollutants under the CAA (18 Alaska Administrative Code [AAC] 50.015). The regional air quality is generally presumed to be good. This assumption is based on two key factors: the low density of stationary criteria pollutant and greenhouse gas (GHG) emission sources, and the persistent winds from Cook Inlet, which facilitate the effective dispersion of localized emissions.

Non-regulatory data is collected from an ADEC air quality sensor (QuantAQ MODULAIR sensor pod) deployed at the Kachemak Bay Campus of Kenai Peninsula College. While this sensor's data does not meet the rigorous requirements for a formal attainment designation, it consistently indicates a "good" Air Quality Index (AQI) throughout the year, punctuated by infrequent, temporary declines (ADEC 2025a, 2025b).

The primary anthropogenic emission sources on the Homer Spit are predominantly concentrated at the end of the Spit in and around Homer Harbor. These include criteria pollutants and GHGs from facility operations and associated transportation, as well as particulate matter (dust) from unpaved surfaces. Although aggregate emissions from terrestrial and marine vessel traffic are not monitored, they are understood to be highly seasonal, peaking from approximately May to September, and variable, depending on the density and activity of marine vessels during the ice-free season.

Regional air quality can be substantially impacted by episodic natural events, particularly wildland fires and volcanic eruptions. The severity of these impacts on Homer and Kachemak Bay is contingent upon event-specific factors, primarily the event's proximity and the prevailing meteorological conditions, such as wind speed and direction, which dictate the atmospheric transport of pollutants.

The ESWG discussions did not provide significant detail on existing air quality, as the group's focus was centered on marine and coastal resources. Therefore, the existing condition is understood to be the baseline air quality typical of a coastal Alaskan environment, primarily influenced by natural marine processes and the current, established levels of emissions from harbor-related vehicle and vessel traffic.

3.2.11.2 Future Without Project Conditions

In the FWOP, Criteria pollutant and GHG emissions are expected to increase over time at Homer and within Kachemak Bay. However, a substantial degradation of regional air quality due to these anthropogenic actions is considered unlikely. Criteria pollutant and persistent emissions are anticipated from existing and new sources, including inefficient marine vessel operations caused by harbor congestion, emissions from larger vessels anchoring offshore, and temporary, localized impacts from future maintenance, construction, and development activities.

While overall transportation and industrial development are projected to grow, the resulting direct and indirect effects on air quality are expected to remain highly seasonal, variable, and transient. Consequently, the cumulative increase in emissions is unlikely to be sufficient to trigger a nonattainment designation for the area or to fundamentally alter its predominantly good AQI.

3.2.12 Water Quality

Under the CWA, Alaska classifies its waterbodies based on compliance with state Water Quality Standards (WQS) found in 18 AAC 70. Waters that meet these standards are designated as attaining, while those that violate them for a specific use are designated as impaired. If data is insufficient for a determination, the waterbody is classified as unassessed.

The CWA requires USACE to seek state Water Quality Certification (WQC) for discharges of dredged or fill materials into waters of the U.S (33 CFR 336.1(a)(1)).

3.2.12.1 Existing Environment

The water quality of Kachemak Bay is characterized as a highly dynamic and complex system, significantly influenced by both large-scale climate patterns and local freshwater inputs (Doroff and Holderied 2018).

According to the "Final 2024 Integrated Report Fact Sheet" from ADEC, key waterbodies in the region meet standards for bacteria but lack sufficient data for a definitive assessment of other parameters (ADEC 2024). Table 3-4 summarizes these findings for Homer Harbor and the Stariski Creek-Frontal Cook Inlet.

Table 3-4. Integrated Water Quality Monitoring and Assessment Report Summary

Waterbody Name	Assessment Unit ID	Category 2: Attaining[1]	Category 3: Insufficient Data[2]	Summary of 2024 Assessment
Homer Harbor	AK_M_ 2030108_006	• Enterococcus • Fecal Coliform	• Copper • Dissolved Oxygen • Nickel • pH • Zinc	Both waterbodies met the WQSs for bacterial indicators. However, the status for key metals, dissolved oxygen, and pH

Waterbody Name	Assessment Unit ID	Category 2: Attaining[1]	Category 3: Insufficient Data[2]	Summary of 2024 Assessment
Stariski Creek-Frontal Cook Inlet	AK_M_ 2030108_000	• Enterococcus • Fecal Coliform	• Copper • Dissolved Oxygen • Nickel • pH • Zinc	is currently undetermined, because not enough data was available to make a formal assessment.

Source: (ADEC 2024)
Notes: [1] This is a positive designation and indicates that enough data was available to determine that the WQS for the listed parameters were met.
[2] This designation means that while some data exists, it is not sufficient for the ADEC to determine whether the WQS are being met or are impaired for the listed parameters.

While the most recent ADEC Integrated Water Quality Monitoring and Assessment Report indicates waterbodies monitored in Kachemak Bay are attaining standards for key bacteria, there is not enough data to confirm the status for several other important parameters. Although not currently on the State of Alaska's CWA Section 3030(d) list as an impaired water, there is historical record of the inner portion of the Homer Harbor listed as an impaired waterbody for petroleum hydrocarbons, oil, and grease (ADEC 2012). This impairment was primarily attributed to historical and ongoing vessel and harbor operations. Documented sources of contamination included engine exhaust, fuel spills from vessels, and urban runoff from the paved areas of the Homer Spit.

The Kachemak Bay National Estuarine Research Reserve (KBRR), in partnership with the NOAA Kasitsna Bay Laboratory, conducts water quality monitoring in Kachemak Bay as part of the Kachemak Bay National Estuarine Research Reserve System-Wide Monitoring Program, which began collecting oceanographic data in 2001. The program monitors a wide range of parameters, including water temperature, salinity, dissolved oxygen, turbidity, pH, chlorophyll, and nutrients (Doroff and Holderied 2018).

Monitoring is conducted through a network of continuous water quality stations at three key nearshore sites: Homer Harbor, Seldovia Harbor, and a buoy in Bear Cove. These locations are strategically chosen to capture conditions across Kachemak Bay, from the inner bay (Homer), outer bay (Seldovia), and the head of the bay (Bear Cove; Doroff and Holderied 2018). This network provides real-time, publicly accessible data, which is supplemented by water quality monitoring from the City of Homer.

There are several factors that influence the water quality of Kachemak Bay. Water temperature and salinity fluctuate seasonally and are influenced by broader climate patterns. Monitoring from 2012 to 2016, for example, captured a significant climate-driven shift from the anomalously cold ocean temperatures of 2012 to the persistent warm anomalies of 2014 to 2016, associated with the Pacific Warm Anomaly, also known as "The Blob" (Doroff and Holderied 2018).

In addition to temperature, Kachemak Bay is defined by highly variable salinity and turbidity, both driven by freshwater input from rain, snow, and glacial melt. The turbidity is a particularly dynamic feature, creating a distinct gradient from the turbid inner bay to the clearer outer bay (KBRR 2017; Doroff and Holderied 2018). During the summer melt season (May–September), plumes from major rivers cause turbidity to exceed 50 Nephelometric Turbidity Units (NTU), while winter levels are often below 1 NTU (KBRR 2017). The movement of these sediment plumes is controlled by a combination of river discharge, tides, and wind (Wang et al. 2021). This high turbidity limits sunlight penetration, restricting vegetation like kelp to the clearer, outer bay areas, but it also delivers essential nutrients that support the bay's overall productivity (Cooney 1986).

Meanwhile, the same freshwater influx that drives turbidity also lowers salinity, making the surface waters of the inner bay generally fresher than in the outer bay. The connection between the bay and larger oceanographic patterns was further highlighted during the 2014–2016 warm period, when even the deeper waters of the bay became fresher, a change consistent with observations of the Alaska Coastal Current (Doroff and Holderied 2018).

Within Kachemak Bay, factors of particular concern with regard to water quality include the following:

- Nutrient Pollution: Excess nitrogen and phosphorus from various sources can fuel algal blooms.
- Harmful Algal Blooms (HABs): The bay has a history of HABs. After more than a decade without incident, increased blooms of the toxic dinoflagellate Alexandrium led to significant paralytic shellfish poisoning events in 2015 and 2016, resulting in the closure of local oyster farms (Doroff and Holderied 2018).
- Turbidity and Sedimentation: Glacial and river runoff introduces fresh water and sediment into the bay, affecting water clarity. This is particularly influential in the inner bay, which is more impacted by freshwater inputs than the outer bay (Doroff and Holderied 2018).
- Invasive Species: The European green crab and invasive tunicates are a concern, with ongoing monitoring programs to track their presence (See Section 3.3.7 for further information about invasive species).
- Ocean Acidification: Since 2017, sensors have been deployed to monitor changes in the bay's water chemistry. The high productivity of the bay's ecosystem has been shown to influence its water chemistry.
- Historical Pollution: Past events, such as the *Exxon Valdez* Oil Spill have had lasting impacts on the bay’s ecosystem.

Through their discussions, the ESWG characterized the existing water quality as being critically dependent on the harbor's current hydrodynamic regime. They described the existing state as a well-defined system of water circulation and flushing that is essential for transporting nutrients and preventing the formation of stagnant water, thereby supporting the health of the entire local marine ecosystem.

3.2.12.2 Future Without Project Conditions

During FWOP, the water quality of Kachemak Bay would continue to be shaped by the complex interplay of large-scale climate patterns, seasonal freshwater inputs, and existing land use. The key trends identified in the existing environment are expected to continue and, in some cases, intensify. The ongoing monitoring by the KBRR, NOAA, and the ADEC would persist, continuing to build a long-term understanding of the bay's dynamic conditions. It is anticipated that ADEC’s Integrated Report would continue to show that waterbodies like Homer Harbor are attaining standards for bacteria, while the status for other parameters like metals would likely remain in the "Insufficient Data" category until more targeted monitoring is conducted.

The most significant driver of future change would be the ongoing effects of environmental changes. The trend of warming water temperatures, exemplified by the "Blob" event, is expected to continue, potentially leading to more frequent or prolonged marine heatwaves. This warming will likely influence the timing and volume of glacial melt, altering the established patterns of freshwater input, salinity, and turbidity in the bay.

The water quality of Kachemak Bay would remain a dynamic system subject to increasing pressure from environmental changes. While regulatory protections and robust monitoring programs would continue, the underlying trajectory points toward a future with warmer water, altered salinity and turbidity patterns, and a heightened risk from HABs and ocean acidification.

3.2.13 Floodplain

The management of floodplains is guided by a framework of federal and local regulations designed to minimize flood risk and protect natural values. At the federal level, the Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program (NFIP). Through the NFIP, FEMA identifies flood hazards, assesses flood risks, and provides official Flood Insurance Rate Maps (FIRMs) that delineate Special Flood Hazard Areas (SFHAs), i.e., the areas subject to inundation by the 1%-annual-chance flood.

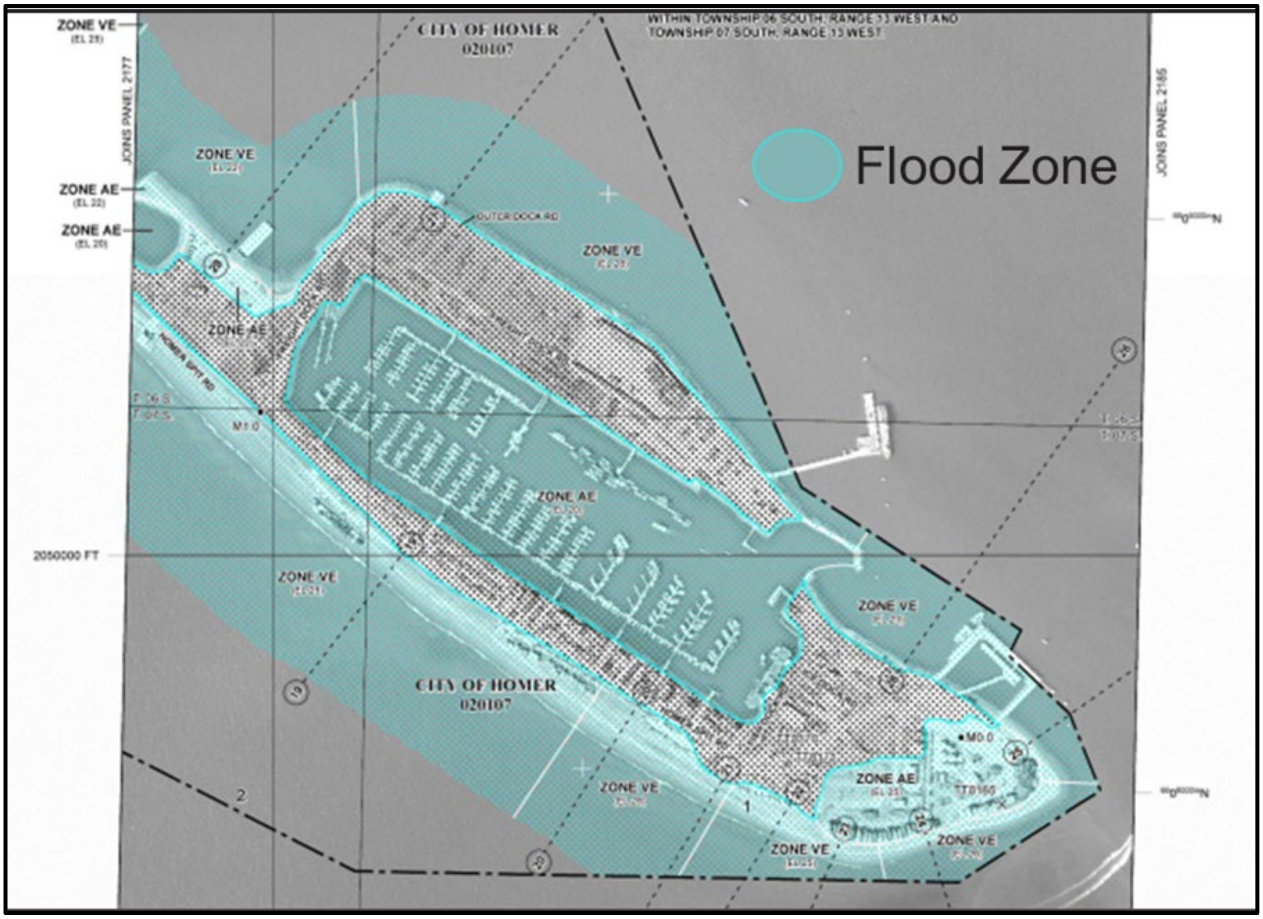
For a community to participate in the NFIP, it must adopt and enforce local floodplain management ordinances that meet or exceed FEMA's minimum criteria. Homer City Code 21.41 (Flood Prone Areas) is the local ordinance that fulfills this requirement, establishing specific standards for construction and land use within the city's mapped floodplains.

In addition to this community-based program, Executive Order (E.O.) 11988, Floodplain Management, directs federal agencies to use FEMA's FIRMs to avoid, to the extent practicable, taking actions within a floodplain and to minimize potential harm if avoidance is not possible.

3.2.13.1 Existing Conditions

The project footprint is located within a SFHA as mapped by FEMA. Specifically, the Homer Spit is designated as Zone VE, a Coastal High Hazard Area subject to inundation by the 1%-annual-chance flood event with the additional hazard of high-velocity wave action (waves 3 feet or greater; Figure 3-8 modified from FEMA 2016). This designation confirms the area's high-risk status.

Figure 3-8. FIRM Panel 2181E; SFHA of the End of Homer Spit



The area's vulnerability is well-documented through direct observation and historical events. For example, a severe storm in November 2024 combined high tides with high winds, causing significant wave run-up and overtopping that led to the collapse of a lane of the Sterling Highway. This event serves as a practical demonstration of the hazards identified by the Zone VE designation.

Several factors influence the floodplain dynamics of the Homer Spit. The primary drivers are extreme high tides, which can exceed 25 feet, and storm surge, where low atmospheric pressure and high winds elevate sea level above predicted tidal heights. The combination of these two factors during a storm event creates the conditions for the most severe flooding and wave-action damage.

In addition to storm-driven events, the area's long-term floodplain risk is shaped by two competing geological and environmental trends:

- Isostatic Rebound: The ongoing rise of the landmass in the study area following the retreat of glaciers. This is causing a relative fall in sea level under low and intermediate environmental scenarios, which could decrease future flood risk over time.
- Sea Level Rise: Projections of accelerated sea level rise due to environmental change. Under a high-end scenario, this trend would overcome the effect of

isostatic rebound, leading to a relative sea level rise and a significant increase in future flood risk.

The Homer Spit is inherently vulnerable to coastal flooding from storm surges and wave overtopping. Under the existing conditions, current infrastructure is frequently tested by marine storms and new projects should carefully consider its influence on coastal processes.

3.2.13.2 Future Without Project Conditions

In the FWOP, the Homer Spit would remain a FEMA-designated SFHA, with its vulnerability continuing to be shaped by the interplay of severe storms, extreme tides, and long-term environmental trends. The regulatory framework of E.O. 11988, FEMA, and Homer City Code 21.41 would remain in place, providing a baseline of guidance for any future private or local development.

The key trends identified in the existing environment are expected to continue. The most significant driver of future change will be the net effect of isostatic rebound versus sea level rise trends. While the land will continue to rise, the rate of sea level rise will ultimately determine whether the overall flood risk decreases or increases over the project's lifespan. Independent of the project, the City of Homer and the State of Alaska would likely continue to pursue proactive measures to protect the Sterling Highway and other critical infrastructure from erosion and flooding as conditions evolve.

The floodplain of the Homer Spit would remain a dynamic and vulnerable system. While the regulatory framework provides guidance, the underlying trajectory points toward a future where the risk profile is actively changing, demanding continuous monitoring and adaptation to the combined effects of storm events and long-term sea level trends.

3.2.14 Noise

This section focuses on the effects of noise on the human environment; noise impacts on fish and wildlife are addressed under Section 3.3.

Sound is measured on a logarithmic decibel (dB) scale to quantify sound intensity. To assess the impacts of airborne noise on humans, measurements are adjusted using the A-weighted decibel (dBA), which accounts for the frequency sensitivity of the human ear. The baseline for this scale, 0 dBA, represents the faintest sound detectable by a person with normal hearing. Due to the scale's logarithmic nature, a 10 dBA increase corresponds to a tenfold increase in sound energy and is generally perceived as a doubling of loudness. For instance, a sound level of 50 dBA is perceived as twice as loud as a 40-dBA sound.

For regulatory context, the U.S. EPA identified exposure limits in 1974 to protect public health and welfare. These guidelines recommended a 24-hour average exposure of 70 dBA and an 8-hour average of 75 dBA as the thresholds to protect 96% of the population from developing hearing loss due to environmental noise (EPA 1974).

The potential for acoustical injury heavily depends on a sound's duration, frequency, power, and intensity. The distinction between non-impulsive and impulsive noise sources (Table 3-5) is fundamental method for assessing the risk of acoustic injury.

Table 3-5. Classification of Noise Sources

Sound Type	Characteristics
Non-impulsive	Continuous or intermittent sounds that do not have high peak pressure or a rapid rise time.
Impulsive	Transient, brief (less than 1 second) sounds with high peak pressure and a rapid rise and decay time.

3.2.14.1 Existing Conditions

The acoustic environment at Homer Harbor is dominated by anthropogenic noise with a pronounced seasonal variation. Noise levels significantly during the peak summer season (May–September), driven by increased community, commercial, and tourist activity. Conversely, the number of noise sources diminishes during the winter months (October–April). The overall noise profile is sporadic and inconsistent, due to the variable timing of human and vessel movements. Notably, residential areas are situated directly within or adjacent to the project area.

The area's anthropogenic noise is predominantly non-impulsive. These continuous or intermittent sounds originate from sources such as marine vessel engines, vehicle traffic, and machinery. A specific, routine source of non-impulsive noise is the annual maintenance dredging, which utilizes a cutterhead suction dredge for approximately 3–5 days, creating a continuous sound that remains above ambient levels for the duration of the operation. In contrast, impulsive sound sources are less common. They are typically associated with specific maintenance or construction activities, such as rock placement.

The background ambient sound level is shaped by natural sources. These include wildlife (e.g., the cacophony of gulls) and meteorological phenomena such as wind, rain, and surf. The intensity of these natural sounds is highly dependent on weather conditions; for instance, strong northwesterly winds in Kachemak Bay can significantly increase the sound of surf along the Homer Spit's southern shore.

The ESWG discussions helped to characterize the project area's existing acoustic environment. They described the current underwater soundscape as a baseline composed of natural ambient sounds (e.g., wind, waves, marine life) combined with a consistent level of anthropogenic noise generated by the daily operations and existing volume of vessel traffic moving in and out of the Homer Harbor.

3.2.14.2 Future Without Project Conditions

Growth in the tourism and marine industries at the Homer Spit is expected to drive a gradual increase in ambient noise under the FWOP scenario, manifesting as a rise in both airborne and underwater sound levels that would remain highly seasonal, variable, and transient.

3.2.15 Cultural Resources

3.2.15.1 Area of Potential Effect

The APE is a term specific to the NHPA, as amended. The APE includes any areas that would be used for the proposed project. The APE generally includes construction sites, access routes, staging areas, worker camps, monitoring wells, etc. The APE is defined at 36 CFR § 800.16(d) as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist, for the foreseeable future. The APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.

3.2.15.2 Existing Conditions

3.2.15.2.1 Regional Overview

The western coast of the Kenai Peninsula has been inhabited for a substantial period of time, with semi-nomadic groups inhabiting multiple areas between summer and winter camps (Langdon 2002). Archaeological investigations of the area have provided radiocarbon dates identifying initial occupation of Kachemak Bay at approximately 8,200 years ago (Klein and Zollars 2004). These groups populated the region during what archaeologists define as the Paleoarctic tradition; over time they developed regionally specialized tools which evolved through trade and contact with other coastal and inland groups. Tool types identified as Dena'ina Athabascan have been recognized in the Upper Cook Inlet basin from 1,500 to 1,000 years ago (Reger 2003). Although these groups were mobile, they avoided marshy inland areas of the Kenai Peninsula in favor of staying near salmon-bearing rivers. Group mobility followed subsistence patterns, with summer camps occupied during salmon runs, and winter camps focusing on hunting terrestrial mammals (Klein 2008). As Russian fur traders and British explorers began to enter the Cook Inlet region in the mid-to-late 1700s, they encountered Dena'ina people from the Upper Kenai Peninsula to Kachemak Bay. It is thought that the Dena'ina had migrated into the Cook Inlet region from the north approximately 700 years earlier, about 1,000 years ago (Klein 1996).

3.2.15.2.2 History of Homer

Russian American Company records indicate that Captain Mikhail Tebenkov's crews built at least one cabin on what is now called the Homer Spit and established trading posts at nearby Yukon Island and Halibut Cove in the late 1840s and early 1850s (Wood 1995).

In 1867, under the Treaty of Cession, the U.S. purchased the territory of Alaska from Russia. In 1880, William H. Dall mapped the Spit, but did not observe anyone living there. Homer Pennock and his crew arrived at the spit on April 13, 1896. They observed a log cabin built by Russian trappers, two collapsed shacks, and a ship's galley at the end of the Spit. They repaired the buildings and built several more that became the headquarters for the Alaska Gold Mining Company. Homer Pennock left the Spit and headed to the interior after hearing of the Klondike gold rush (Klein 2008).

When the Harriman Expedition arrived at the Homer Spit in June 1899, they observed four or five abandoned buildings at the end of the landform. A few months later, the Cook Inlet Coal Field Company arrived at the Homer Spit, bringing with them all they needed to build a new town (Klein 1981). The buildings belonging to the coal company were of wood-frame construction and sheathed in tin. They laid almost 8 miles of track to a small pier at the end of the Spit. Work in the coal fields stopped in 1902, and the Spit was again abandoned (Klein and Lane 1986).

In 1904, a U.S. Geologic Survey team recorded 20 standing buildings on the Spit, but only two men living there. The railroad tracks and coal cars were removed from the Spit between 1913 and 1915. In 1930, there were many abandoned buildings still on the end of the Spit. The buildings were eventually moved, disassembled for their lumber, or collapsed (Klein 1981). In 1934, a coal car was set on fire, burning down nearly all the buildings and the pier (Lord 1973).

The Homer Airstrip was built in 1942, and the Sterling Highway was completed in 1951 (Klein 1981). Before that, people came and went by boat via a pier at the end of the Spit. There have been a series of piers over time. The original pier was built by the Cook Inlet Coal Field Company in 1899 and destroyed by fire in 1934. The second was built in 1939 and owned and operated by the people of Homer. Every few years, the pier was destroyed by sea ice and would have to be entirely rebuilt (Lord 1973).

The population of Homer grew dramatically during and just after World War II, but this growth was not observed on the Spit. Its remaining structures included small shacks, a cannery, and a few other buildings. The railroad grade was still there, but the tracks had been disassembled and stacked nearby. Homer Spit was covered with tall grass at the time and between 20 and 40 horses and cattle would winter there. The pier built in 1947 lasted until the 1964 Good Friday Earthquake. It was the only pier in the earthquake zone left standing but was so severely damaged that it had to be replaced (Lord 1973).

In 1961–1962, USACE constructed the Homer Harbor along the northern side of the Homer Spit. The city government of Homer was incorporated in March 1964, shortly after the Good Friday Earthquake. After the earthquake, the U.S. Coast and Geological Survey observed differential subsidence along the Spit, determining that the tip of the Spit had subsided an average of 6 feet during the earthquake (Waller 1966).

Shortly after the earthquake, Homer Harbor was restored and expanded by USACE in 1964–1965. The expansion dimensions were 180 feet by 672 feet with an 840-foot rock-mound jetty. The basin and protective jetty were extended 100 feet by local interests in 1968. A year later, in 1969, the basin and protective jetty were extended 600 feet by the local government in cooperation with USACE (USACE 1981). In 1984, work began on a major harbor expansion project to increase the boat basin from 16.5 acres to 50 acres. The expansion was completed by USACE in 1985 and included a 30-acre staging area and the addition of 130,000 cubic yards (CY) of armor rock. In 2002, a new ferry terminal and USCG berth were constructed by local interests (USACE 2023).

3.2.15.2.3 Known Cultural Resources

USACE conducted a literature review of archaeological projects on the Homer Spit, reviewed the Alaska Heritage Resources Survey (AHRS), Bureau of Ocean Energy Management (BOEM) shipwrecks database and NOAA wrecks and obstructions mapper. Table 3-6 contains known cultural sites within 0.5 miles of the APE, and their status on the National Register of Historic Places (NRHP). The BOEM and NOAA database and mapper did not indicate any wrecks in the project APE, which was confirmed with bathymetric survey data.

Table 3-6. Known Cultural Resources within 1/2 mile of the APE

AHRS Site Number	Site Name	Description	NRHP Status	In APE?
SEL-00019	Homer	This town appears to have been established on or near the Homer Spit in November 1895. Both the town and Spit were named for Homer Pennock, a prospector who worked in the Cook Inlet area. A post office was established in the town in 1896.	Unevaluated	No
SEL-00077	Homer Spit 1	Reger (1974) originally reported a very discontinuous, 6-inch thick mussel shell midden, heavily disturbed by earthmoving equipment. Workman (1979) later conducted further investigation, collecting a number of undiagnostic artifacts, and concluded that the site was not of NRHP significance. (Destroyed)	Unevaluated	No
SEL-00116	Salty Dawg Saloon	This saloon complex is a composite of three small log structures. The oldest portion may have been built as early as 1897. The Salty Dawg Saloon, and the nearby Salty Dawg Cafe, originally opened in 1957. The complex was moved to its present location after the 1964 earthquake.	Unevaluated	No
SEL-00379	Sterling Highway	The Sterling Highway is approximately 138 miles long and runs from the Seward Highway to the end of the Homer Spit. Construction began in 1947 and the highway was formally opened to the public in 1950. A portion of the Sterling Highway designated as Interstate Highway System is under the Interstate Exemption [2005] and is exempt from Section 106 Review.	Not Eligible	No
SEL-00386	City of Homer Timber Dock	The Homer Timber Dock is a city-owned facility built in the intertidal zone of treated pilings, timbers, and planks at the end of Homer Spit. A 320-foot gangway leads from the shore towards the deeper water of Kachemak Bay, joining at an angle to a wharf 300-foot long	Not Eligible	No
SEL-00400	Homer Harbor	The harbor is along the northern side of the Homer Spit and includes the immediate area around the basin of the harbor and the entrance channel. Also included in the site is the extended parking area and Port Terminal which was constructed and extended past the natural boundary of the spit.	Not Eligible	Yes

3.2.15.3 Future Without Project Conditions

The Homer Spit has been subject to natural erosion forces from wind, wave, current, and storm damages since its formation. Historic accounts of fires on the Spit destroyed many of the original buildings and the 1964 Good Friday earthquake caused most of the Spit to subside by approximately 6 feet, resulting in additional disturbance to known and unknown cultural resources. The proposed project location consists of uplands created from the 1985 expansion project and were designated as staging areas at the completion of construction. Due to the project location being created from the previous expansions dredged material, it is not anticipated that these conditions would change in the FWOP.

3.3 Natural Environment

The natural environment comprises all living organisms and their intricate interactions, both among themselves and with the abiotic components of their surroundings.

USACE invited the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and the Alaska Department of Fish and Game (ADF&G) to formally collaborate on this study under the Fish and Wildlife Coordination Act (FWCA). Due to limited personnel resources, these agencies deferred their participation to the review of the IFR/EA and applicable formal consultations processes required under other environmental laws and regulations (e.g., Appendix E), and no FWCA Report was provided from these agencies to inform this study. However, USFWS did provide an initial Planning Aid Letter on August 16, 2023, to inform USACE’s study early in the planning process to assist in scoping for biological resources under their purview (Appendix J). Although limited coordination occurred under the FWCA, there was active participation from regulatory natural resource agencies in the ESWG activities (Appendix L).

A habitat represents an intricate system consisting of interactions between the abiotic and biotic components and processes that sustain an organism. These systems exhibit varying degrees of biodiversity and ecosystem resilience. The specific characteristics of a given habitat can determine a species' ability to persist and flourish. A species resource requirements are not static; they often change significantly across key life stages. This results in shifts in habitat use, where different environmental conditions are required to support specific life stages (e.g., juvenile, adult, and reproductive phases).

The Action Area, defined by Endangered Species Act (ESA) regulations (50 CFR 402.02), constitutes the entire expanse where a project's direct and indirect effects on endangered species and their critical habitat are anticipated to occur. This often makes it broader than the project area. The Action Area for the study encompasses Kachemak Bay and the Homer Spit, with particular attention given to the distal end of the Spit and the adjacent inner bay, west of the Spit. The Action Area is characterized by a mix of terrestrial and marine habitats. Special aquatic sites, as defined by the CWA, are found within these environments (See Section 3.3.3. and Appendix M).

Wildlife within these habitats encompass the diverse assemblage of fauna that inhabit and interact within a given ecological system. This assemblage is defined by a complex network of interdependencies, including predator-prey dynamics, competitive interactions, and symbiotic relationships that shape the structure of the biotic community. Each species exhibits a unique suite of physiological and behavioral adaptations that determine its specific ecological niche and its functional role within the ecosystem. These life history strategies are dynamic, varying across different life stages to meet the changing requirements for growth, survival, and reproduction. The composition, abundance, and health of the wildlife community are therefore direct indicators of habitat quality and overall ecosystem integrity. The Proposed Action Area supports distinct terrestrial and marine wildlife, intrinsically linked to the habitats they occupy.

As part of this study, USACE completed site-specific fieldwork during 2023 and 2024 to document the existing natural environmental conditions in and around the potential construction alternatives. A comprehensive summary of the fieldwork methodologies and their subsequent results is located in Appendix P.

3.3.1 Terrestrial Habitat

The terrestrial habitat within the Proposed Action Area encompasses the uplands on the east side of the Homer Spit, adjacent to the existing Homer Harbor.

3.3.1.1 Existing Conditions

The uplands adjacent to the Proposed Action Area constitute a heavily modified, anthropogenic environment. This landscape is characterized by extensive development, including parking lots, harbor infrastructure, public and private facilities, designated areas for scrap metal storage, campgrounds, and stockpiled dredged materials. Portions of the Spit are also utilized as barge haul-outs and repair yards, which presents a potential area for localized soil contamination.

While some native species have adapted to this setting, the high degree of ground disturbance renders the area susceptible to the establishment of invasive species. In contrast, the few undeveloped parcels are vegetated by a plant community dominated by various beach grasses and other herbaceous species that are naturally adapted to disturbed coastal soils.

Input from the ESWG characterized the existing terrestrial habitat as being largely confined to the built environment and modified habitat of the Homer Spit. They described this environment as consisting primarily of riprap and other developed surfaces, which currently function as important resting, roosting, and nesting sites for various resident and migratory bird species.

3.3.1.2 Future Without Project Conditions

In the FWOP, the existing, heavily modified anthropogenic environment is expected to persist. Ongoing anthropogenic activities, including the use and maintenance of existing facilities, and incremental future development will likely continue to cause ground disturbance consistent with existing conditions. While these activities are not anticipated to alter the existing plant community composition or increase the risk of invasive species establishment, they may further reduce the footprint of remaining undeveloped, vegetated parcels.

3.3.2 Marine Habitat

The marine habitat within the Proposed Action Area is within nearshore intertidal and deeper subtidal marine environments.

While designated ESA critical habitat is present within the marine environment of the Action Area, it will not be addressed in this section. To provide a more cohesive analysis, this habitat will be discussed in conjunction with the specific species for which it was designated in the sections that follow.

3.3.2.1 Existing Conditions

Research has demonstrated that the marine habitats on either side of the Homer Spit are biologically distinct, driven primarily by differences in exposure to wave action and the resulting substrate composition. Studies by USACE (1972) and Lees et al. (1981) quantitatively determined that the protected eastern side of the Spit supports significantly greater species diversity, biomass, and population density than the exposed western side. This finding is reinforced by subsequent research confirming that the physical environment, including depth, turbidity, and water flow, are the primary drivers of habitat type, with substrate serving as a reliable proxy for overall habitat characterization (Markis et al. 2010).

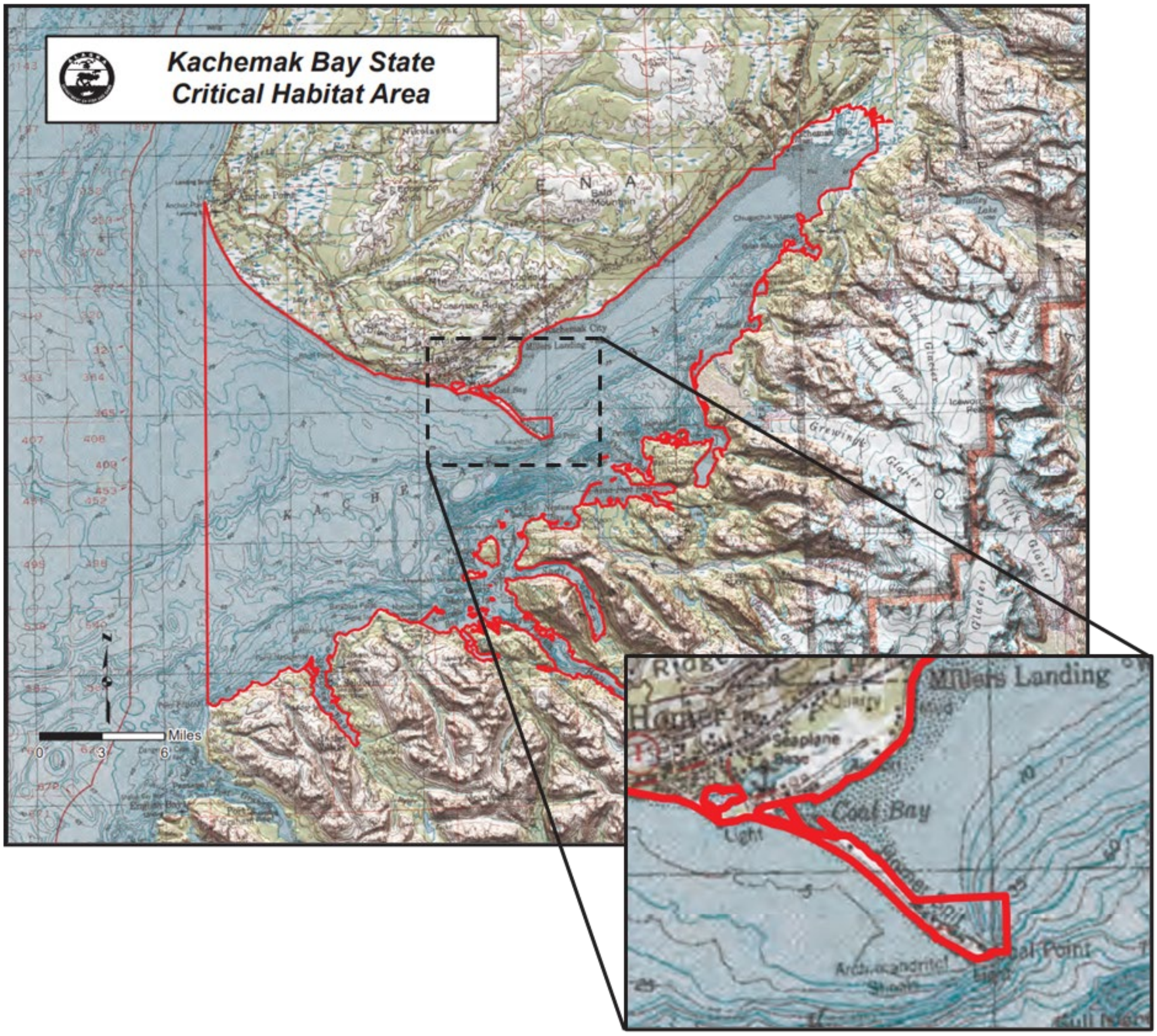
Based on the work of Lees et al. (1981), the marine environment on the east side of the Homer Spit is a low-disturbance, depositional area, protected from the high-energy wave climate of the west side and more geologically stable than the tip. Its substrate is predominantly fine-grained sediment originating from eroding bluffs and glacial runoff, which transitions to more exposed gravel, cobble, and boulders closer to shore along the gradual intertidal slopes of the east side of the Spit near the barge ramp.

This protected environment fosters a species-rich and diverse biological community. The nearshore intertidal area northwest of the deep-water dock is a flat, sandy expanse interspersed with boulder and cobble patches. These hard substrates are heavily vegetated with kelp, brown algae, and green algae, which in turn support a diverse assemblage of marine organisms. Beneath the kelp canopy, rock surfaces are encrusted with worm casings, red algae, and bryozoans, while crevices provide critical refuge for epifauna such as sea stars (*Pisaster* sp., *Evasterias* sp.), anemones, crustaceans, and sea urchins. The hard-packed sand surrounding these patches hosts an infauna community composed primarily of polychaete worms and bivalves. Small, scattered patches of eelgrass (*Zostera marina*) are also present near the toe of the shoreline riprap.

The infaunal communities in the soft-bottom deeper subtidal habitat are of major ecological importance, serving as a primary food source for macrofaunal grazers and predators such as crabs, shrimp, demersal fish, and diving birds (Markis et al. 2010). The infauna within the proposed harbor expansion region is characterized by small clams, marine worms, small arthropods, and burrowing brittle stars (Lees et al. 1981). Furthermore, sessile (stationary) organisms like kelp, seagrass, and anemones function as crucial "ecosystem engineers." By adding vertical dimensionality to the habitat, they create structural complexity that provides essential refugia for other organisms across various life stages (Markis et al. 2010).

The Alaska Legislature in 1974 established the tide and submerged lands of the Kachemak Bay Critical Habitat Area (KBCHA) to protect and preserve habitat areas deemed crucial to the perpetuation of fish and wildlife, and to restrict all other uses not compatible with that primary purpose in accordance with the KBCHA 1993 Land Management Plan (Figure 3-9).

Figure 3-9. Kachemak Bay State Critical Habitat Area



ADF&G manages these resources within the KBCHA, and an ADF&G Special Area Permit is required for any habitat altering activity in the KBCHA, such as:

- Construction or placement of structures
- Damaging or clearing vegetation
- Surface or shoreline altering activities
- Natural resource development or energy exploration
- Waste disposal

- Any other activity likely to have a significant effect on vegetation, drainage, water quality, soil stability, fish, wildlife, or their habitat, or which disturbs fish or wildlife

In 2014, Senate Bill 148 amended Alaska Statute (AS) 16.20.590 by exempting Homer Harbor and immediately adjacent deep-water area from the KBCHA.

Discussions with the ESWG provided a detailed characterization of the existing marine habitat as a productive and varied environment. They confirmed specific habitat uses, noting that the riprap of the existing vessel haulout area currently serves as an active herring spawning ground. Furthermore, they identified the presence of benthic invertebrate organisms (e.g., sea pens) near the Deep Water Dock as a feature of the existing seafloor community.

3.3.2.2 Future Without Project Conditions

In the FWOP, the difference between the western and eastern marine habitats of the Homer Spit will be maintained, as it is governed by regional-scale wave action and sediment transport processes. On the east side, the mosaic of marine habitat and high biodiversity are expected to persist. The substrate in this area is anticipated to remain predominantly fine-grained, with a transition to coarser materials like gravel, cobble, and small boulders along the gradual intertidal slopes near the barge ramp.

Ecologically, the marine habitat will continue to provide infauna as a crucial food source to predators and offer essential structural complexity from "ecosystem engineering" species like kelp and eelgrass.

3.3.3 Primary Productivity

Primary productivity, the conversion of solar energy into biochemical energy, is a fundamental process in marine and estuarine waters. It is performed by a diverse group of organisms, including microscopic phytoplankton floating on the water's surface, as well as macroalgae (seaweeds) and seagrasses found in coastal areas. Together, these primary producers form the base of the bay's marine and estuarine food webs.

The health and abundance of these primary producers are protected by federal and state laws designed to maintain water quality and ecosystem integrity. Their protection is critical, as they provide a variety of essential services. A key example of this legal framework is the CWA’s designation of "special aquatic sites." These are geographic areas recognized for their unique and easily disrupted ecological values, such as high productivity and critical habitat that often. Because of their significant contribution to environmental health, these sites are afforded a higher level of protection under the CWA's Section 404(b)(1) guidelines. This category is particularly relevant because special aquatic sites host significant primary productivity within an ecosystem; for example, the "vegetated shallows" classification directly protects vital primary producers like seagrasses. E.O. 11990, Protection of Wetlands, directs all federal agencies to take action to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance their natural and beneficial values. As the foundation of the marine food web, phytoplankton provide sustenance for zooplankton, which in turn feed fish and other organisms (Middleton et al. 2021), while macroalgae and seagrass serve as a direct food source for many marine animals. Large formations of macroalgae, such as kelp forests, and expansive seagrass meadows create complex underwater environments that serve as critical nursery grounds and offer shelter from predators. Furthermore, by stabilizing sediments and slowing water currents, they help reduce coastal erosion.

All three groups also play a crucial role in regulating atmospheric gases. Through photosynthesis, they contribute significantly to the Earth's oxygen supply and absorb carbon dioxide from the atmosphere (Maya 2024). Seagrasses are particularly effective at carbon sequestration, capturing it up to 35 times faster than tropical rainforests and storing it in their sediments for potentially thousands of years (Fugro and PlanBlue 2024). Consequently, the overall health and abundance of these primary producers are key indicators of the well-being of coastal, estuary, and marine environments.

3.3.3.1 Existing Conditions

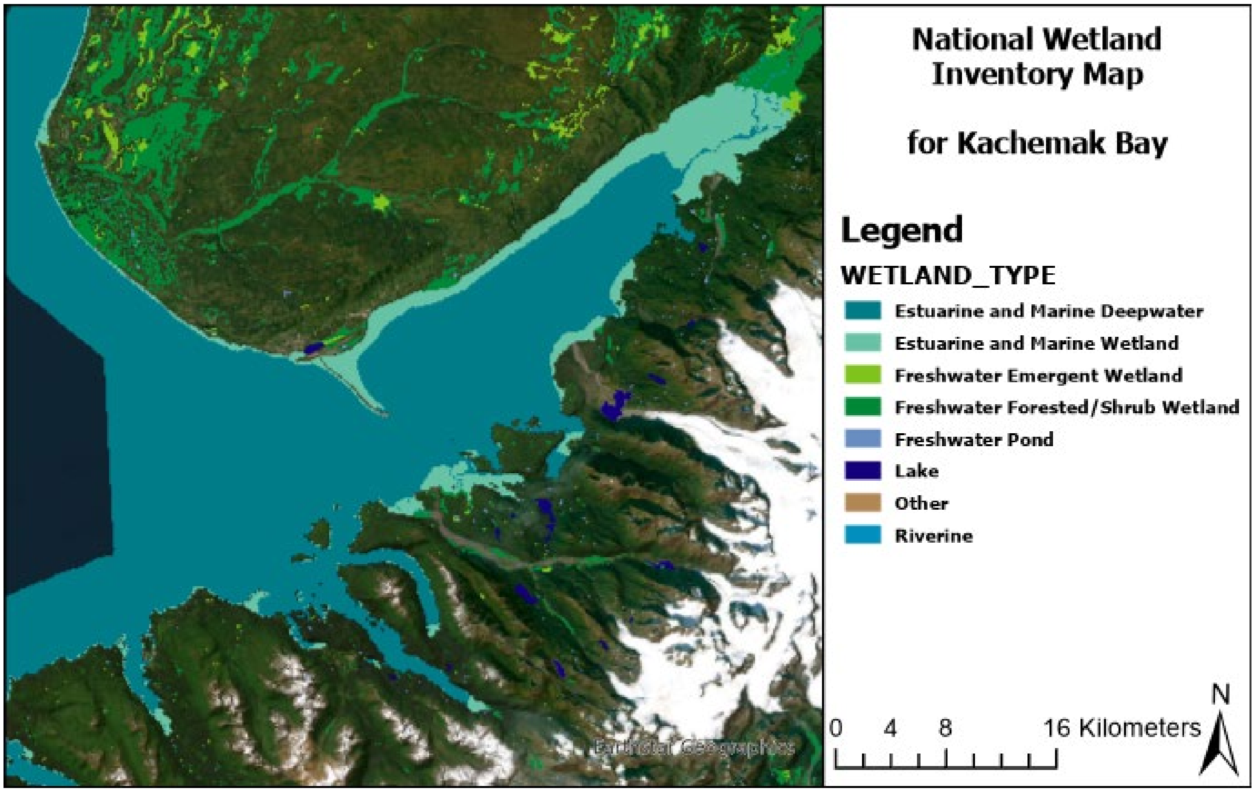
The high biological productivity of Kachemak Bay is supported by a "nutrient trap" estuarine system where nutrients from terrestrial sources mix with deeper, nutrient-rich oceanic currents (Jossart 2025). This nutrient abundance fuels a diverse community of primary producers form the foundation of Kachemak Bay's ecosystem, from vast underwater forests and meadows to microscopic organisms in the water column.

This productivity is visibly expressed in the bay's kelp forests, dominated by canopy-forming species like bull kelp (*Nereocystis luetkeana*) and ribbon kelp (*Alaria fistulosa*). These underwater forests are biodiversity hotspots, providing critical habitat and food for organisms like rockfish and invertebrates (KBRR 2017), and their health is intrinsically linked to the northern sea otter (*Enhydra lutris kenyoni*) population, which controls grazing sea urchins (Dean et al. 2014).

In the shallower, soft-sediment areas, eelgrass beds (*Zostera marina*) are another cornerstone of productivity. These submerged meadows serve as vital nursery grounds for juvenile salmon, Pacific cod, and crab, while also stabilizing the seafloor and sequestering carbon (Gotthardt et al. 2017; ADF&G 2026a). Complementing these structural habitats, the water column teems with phytoplankton, primarily diatoms and dinoflagellates, which form the base of the pelagic food web (Middleton et al. 2021) and responds dynamically to environmental conditions, sometimes forming HABs that are closely monitored by the KBRR (NCCOS 2019).

Special Aquatic Sites identified within Kachemak Bay include wetlands, mudflats, and vegetated shallows. Estuarine and Marine Deep Water and Estuarine and Marine Wetlands are dominant in Kachemak Bay according to the USFWS National Wetland Inventory (NWI) maps. However, this mapping appears based on1978 photography that predates the construction of the current harbor configuration and includes subtidal areas not conforming to standard wetland definitions based on observations of USACE biologist during fieldwork at the site (Figure 3-10). The area west of the Homer Spit near the project footprint is characterized as wetlands on the NWI, but the area is more accurately characterized as deepwater habitat pursuant to the definition of deepwater habitat in Cowardin 1979 and the 1987 US Army Corps of Engineers Wetland Delineation Manual (Cowardin et al. 1979; Environmental Lab 1987). The area also does not satisfy the definition of wetlands in E.O. 11990, Protection of Wetlands, because while it is inundated by surface water, it does not support vegetative or aquatic life that requires saturated soil conditions for growth and reproduction.

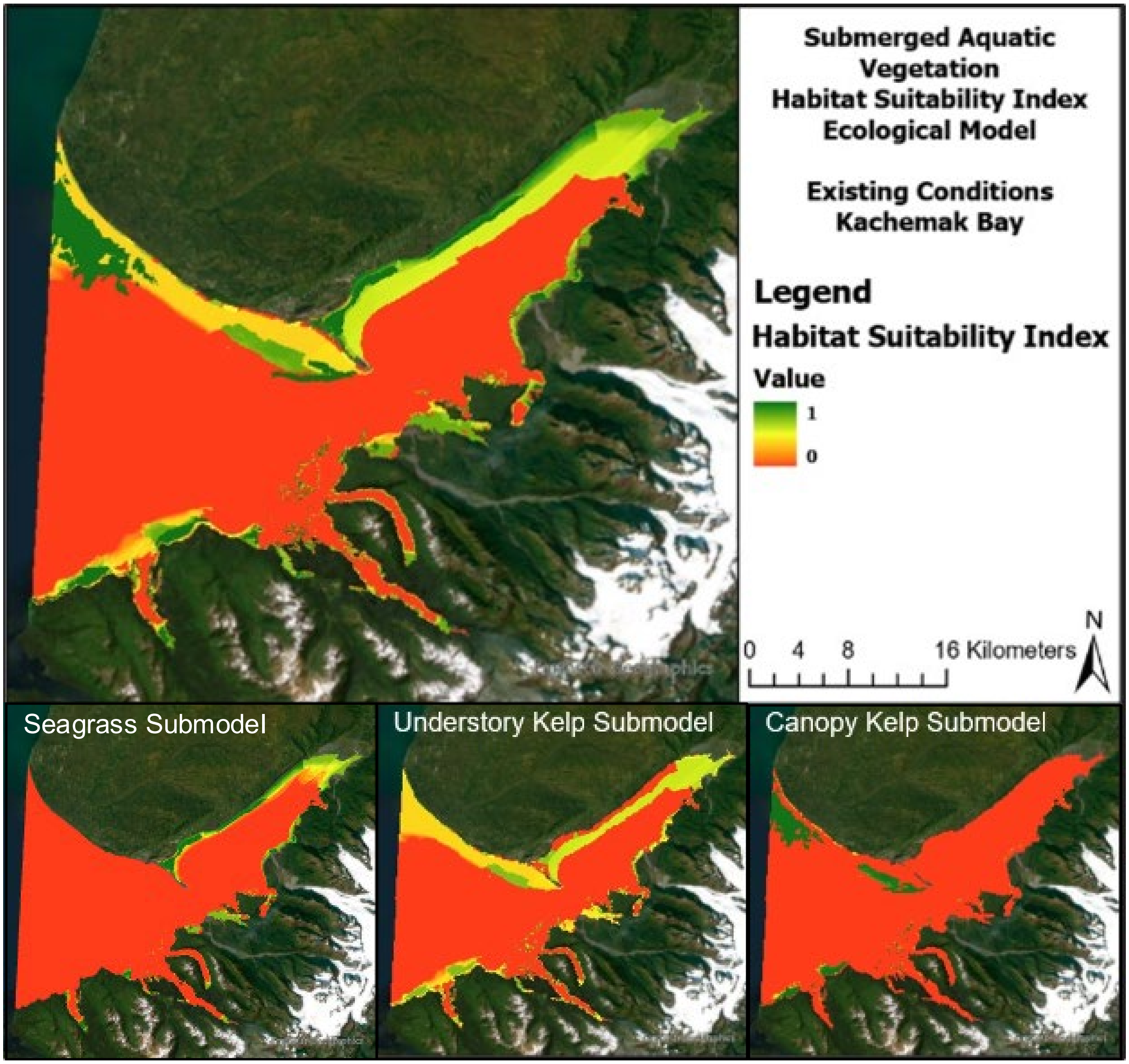
Figure 3-10. National Wetland Inventory



Extensive intertidal mudflats are critical habitats within Kachemak Bay, where primary productivity is driven by a microscopic community of benthic diatoms and cyanobacteria. These organisms form a nutrient-rich biofilm on the mud's surface, creating a crucial food source at the base of the food web (ADEC 2002). In expansive areas like Mud Bay, this productivity supports immense populations of invertebrates, which in turn make the bay a vital stopover site on the Pacific Flyway for hundreds of thousands of migratory shorebirds that feed on them (Tuttle 2004). In stark contrast, the mudflats near the Homer Harbor are now narrow relict features due to decades of port construction and shoreline hardening. This development has resulted in a direct loss of this productive habitat, reducing the area available for microphytobenthos growth and eliminating the vital feeding grounds for the invertebrate and shorebird communities that depend on them.

The bay supports an abundance of Submerged Aquatic Vegetation (SAV) in its vegetated shallows. Recognizing the high value of primary productivity to the ecosystem, environmental stakeholders at a project workshop emphasized the need to quantify this resource. To meet this need, a SAV Habitat Suitability Index (HSI) Model being developed by the NOAA National Centers for Coastal Ocean Science (NCCOS) (Figure 3-11; Whippo 2026) was refined through a collaboration between Dr. Ross Whippo at NCCOS, the USACE Engineer Research and Development Center (ERDC) Ecological Modeling Team, and the Alaska District Project Delivery Team (PDT). This model was used as a basis in the development of a draft USACE SAV HSI Spreadsheet Model (Appendix O) meant to evaluate habitat quality for SAV, seagrass, understory kelp, and canopy kelp on a 0.0 (unsuitable) to 1.0 (optimal) scale. It is designed to use outputs from the HDR sedimentation transport modeling (see the HDR Metocean Baseline Conditions Report in Appendix A) for evaluating how change in seabed level from a constructed alternative might impact SAV over time.

Figure 3-11. Kachemak Bay Submerged Aquatic Vegetation



Based on the NCCOS SAV HSI Model outputs, Kachemak Bay's nearshore environment appears generally favorable for SAV. Habitat Units (HUs), representing the total habitat value (quality × quantity), were calculated for each vegetation type. The outputs derived from the NCCOS SAV HSI Model (Whippo 2026), summarized in Table 3-7, show that understory kelp is the most widespread, while dense seagrass meadows are concentrated in the inner bay and canopy kelp is found primarily in the outer bay. While this model is still under development, it provides a preliminary assessment of the quality of SAV habitat within Kachemak Bay. Furthermore, this model would be improved as it is updated to reflect additional data inputs from surveys conducted by

NCCOS and other agencies. Nonetheless, model results should be interpreted with an awareness of potential data gaps or unmodeled factors that would influence the suitability of habitat for SAV.

Table 3-7. Ecological Model Habitat Unit Outputs

Vegetation Type	HSI Score Summation	Habitat Units		Distribution and Description
		m²	acres	
Seagrass	31,343.6	1,567,180	387.24	Predominantly occurs within the inner bay (east of the Spit). A dense, high-quality meadow of eelgrass (*Zostera marina*) occupies Mud Bay and extends eastward along the northern coastline.
Understory Kelp	56,855.7	2,842,785	702.47	Appears to be the most widespread type, occupying nearshore areas throughout both the inner and outer bays of Kachemak Bay.
Canopy Kelp	23,330.8	1,166,540	288.26	Primarily occupies areas in the outer bay, west of the Homer Spit.
Total SAV	79,930.4	3,996,520	987.57	Represents the combined habitat value for all SAV types across the Kachemak Bay ecosystem.

The ESWG discussions underscore the importance of existing primary productivity resources, which form the base of the local food web. They specifically characterized the extensive eelgrass beds, particularly those located in Mud Bay, as a vital component of the existing environment, recognizing them as critical habitat for juvenile fish and invertebrates.

3.3.3.2 Future Without Project Conditions

In the FWOP, the fundamental ecological processes driving primary productivity in Kachemak Bay are expected to continue along their current trajectories. Kachemak Bay’s "nutrient trap" estuarine system would persist as the primary engine of its high biological productivity, continuing to fuel the diverse communities of phytoplankton, kelp, and seagrass that form the base of the local food web. The overall health and distribution of these primary producers would remain subject to existing environmental conditions and ongoing anthropogenic pressures and Kachemak Bay would generally remain a robust and productive ecosystem that sustains localized, legacy impacts from past development.

The large-scale, healthy ecosystems of SAV would be expected to remain stable in the short term. The extensive kelp forests of the outer bay would continue to provide habitat for northern sea otters, fish, and other invertebrates. Similarly, the dense eelgrass meadows in the inner bay, particularly in Mud Bay, would continue to function as vital nursery grounds for commercially important species. In the water column, phytoplankton populations would continue to fluctuate seasonally, with the persistent risk of HABs, especially if regional water warming trends continue. While the existing baseline of nearly 987.57 acre-HUs for SAV is depicted to existing in Kachemak Bay (Table 3-7) representing a high-quality existing condition, this value is anticipated to degrade due to the mounting pressure of environmental trends, particularly increasing regional water temperatures.

The special aquatic sites near Homer Harbor are expected to remain as narrow, relict features with diminished ecological function; a direct contrast to the highly productive, extensive mudflats, eelgrass meadows, and wetlands in undeveloped areas like Mud Bay.

3.3.4 Marine Fish and Invertebrates

Federally, the Magnuson-Stevens Fishery Conservation and Management Act (MSA) provides broad habitat protection through the identification of Essential Fish Habitat (EFH). EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. At the state level, the Alaska Board of Fisheries sets fishing regulations, which are then implemented by ADF&G. ADF&G also stocks the Nick Dudiak Fishing Lagoon on the Homer Spit, releasing hatchery-raised chinook and coho salmon to enhance local sport fishing opportunities. These stocked fish are an important component of the local marine ecosystem. Alaska provides further, powerful habitat protection through the Anadromous Fish Act (AS 16.05.871), which requires a state permit for any activity that could alter anadromous salmon-bearing streams. Regulations in federal waters are set by NMFS, based on recommendations from the North Pacific Fishery Management Council.

For species facing a greater risk of extinction, the ESA offers the highest level of protection. The NMFS oversees the ESA for marine species, implementing measures designed to actively recover populations. These safeguards include a strict prohibition of take, the designation of critical habitat, the development of formal recovery plans, and a required Section 7 consultation process for federal activities.

3.3.4.1 Existing Conditions

Shallow nearshore and intertidal habitats are critical for many marine fish and invertebrate species during sensitive life stages (Dahlgren et al. 2006; Larson et al. 2022). This habitat use is often seasonal, influenced by environmental conditions and species-specific life histories. To better understand these seasonal patterns, Alaska District biologists conducted surveys near the Proposed Action Area in 2024 and 2025 (See Appendix P: Fieldwork Summary for survey methods and results).

Findings varied between beach seine surveyed nearshore intertidal and bottom trawl surveyed deeper subtidal marine habitats. Data from monthly beach seining surveys conducted from April through September 2024 revealed two main points about the nearshore intertidal habitat:

- Species composition was relatively consistent across all beach seine survey sites.
- Total catch varied substantially from month to month, with the highest total catch (116 individuals) occurring in August.

Data from monthly bottom trawl surveys (see Appendix P) conducted from April through September 2024 and January through March 2025 revealed three main points about the deeper subtidal habitat:

- Commercially and recreationally important species of fish appeared to occupy the deeper subtidal water habitat.

- Summer and fall (e.g., July through September) had greater catch than winter and spring (e.g., January through May) had the lowest catch.
- Highest total catch (74 individuals) occurred in September.

The North Pacific stock of sunflower sea star *(Pycnopodia helianthoides*) is currently a candidate species for listing under ESA. It was proposed for listing as threatened throughout its range by Proposed Rule 88 FR 16212. It is unknown when the decision will be made on whether the species will be listed. Sunflower sea stars have historically occurred in Kachemak Bay year-round, but there was a major die-off in August and September 2017 due to an outbreak of the sea star wasting syndrome. The species appears to be recovering within Kachemak Bay based on observations made by the NCCOS (2024). The sunflower sea star was not common in the low, rocky intertidal habitat before the wasting disease. Rather they appear to occur more abundantly within deep water within the subtidal zone (NCCOS 2021).

Pacific herring (*Clupea pallasii*) serve as a foundational forage species in Kachemak Bay, maintaining a year-round presence in deep-water overwintering areas before migrating to shallow nearshore zones each spring (ADF&G 2024a). The peak spawning window typically occurs during late April and May once water temperatures stabilize between 4°C and 7°C (Danielson et al. 2022). Mass spawning events in high-value habitats such as Halibut Cove Lagoon and Bear Cove turn coastal waters into milky turquoise through the release of milt and the deposition of adhesive roe on intertidal vegetation (ADNR 2001). These annual cycles provide a vital nutrient surge that supports diverse marine life, including predatory fish and marine mammals (ADF&G 2024b). This ecological productivity directly benefits the Nick Dudiak Fishing Lagoon on the Homer Spit, an artificial terminal fishery where Chinook (*Oncorhynchus tshawytscha*) and coho (*Oncorhynchus kisutch*) salmon smolts are annually stocked typically between late spring to early summer. Local herring provide a natural food source for maturing salmon as they return to the Spit.

Discussions with the ESWG, combined with recent field surveys, provided a detailed characterization of the existing marine fish and invertebrate resources. The environment is a productive and varied mosaic of habitats, with nearshore intertidal zones showing consistent species composition that peaks in late summer, while deeper subtidal waters support commercially and recreationally important fish stocks. The ESWG confirmed specific habitat uses, noting that the riprap of the current vessel haulout area serves as an active herring spawning ground and that sea pens (invertebrates) are established near the Deep Water Dock. They also described the current state of local bivalve populations as significantly depleted, a condition underscored by a clam harvesting closure on the Homer Spit that has been in effect for approximately 14 years. Furthermore, the subtidal community includes the sunflower sea star.

3.3.4.2 Future Without Project Conditions

In the FWOP, the marine environment and its biological communities would continue to evolve under the influence of natural processes (e.g., climate variability) and existing conditions (e.g., vessel traffic). Marine fish and invertebrates would continue to use the nearshore intertidal and deeper subtidal habitats on a seasonal basis. The observed patterns of species abundance and composition is expected to continue, with populations fluctuating in response to natural cues. Nearshore areas would remain a vital habitat in spring and summer, and deeper waters would continue to support key stocks with peak abundance in late summer and fall. The marine fish and invertebrate community would remain subject only to existing environmental stressors.

3.3.5 Avian Species

Except for the state-managed game bird species, all native birds in Alaska, including active nests, eggs, and nestlings, are protected under the Migratory Bird Treaty Act (MBTA). Resident birds inhabit an area year-round, while migratory birds use the area seasonally. Both groups are key indicators of environmental health and serve diverse ecological roles by linking marine and terrestrial food webs.

Specific avian species are afforded protection beyond the MBTA. The Bald and Golden Eagle Protection Act (BGEPA), for instance, provides targeted safeguards for bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*), and the USFWS manages the protection of ESA-listed avian species. The BGEPA prohibits any form of take, which is broadly defined as the killing or disturbance of eagles, or destroying their nests. The BGEPA governs human activities that could interfere with their essential life functions like breeding, feeding, or sheltering.

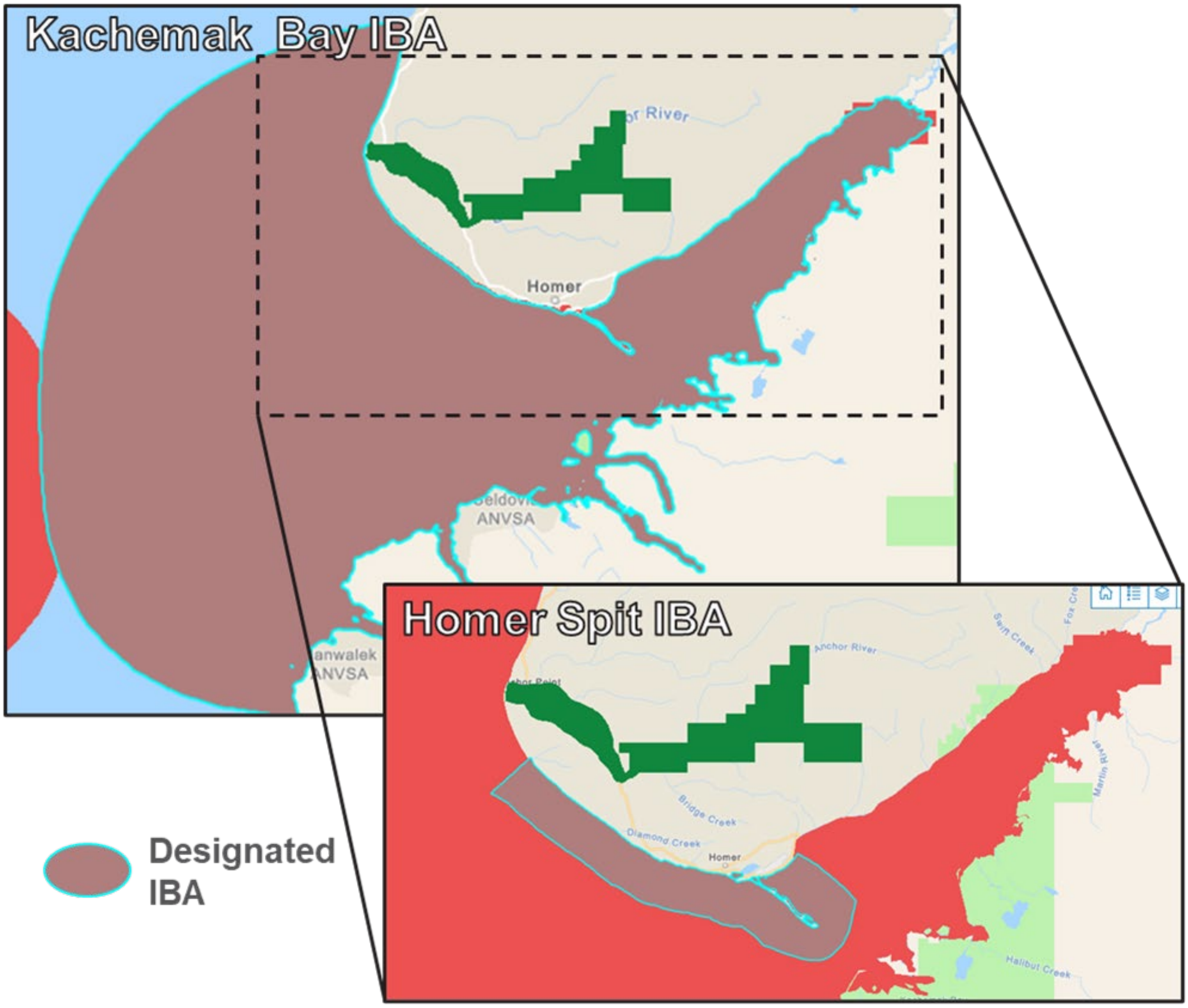
While taking of migratory birds and eagles are prohibited, the USFWS can authorize specific activities that would result in take through a formal permitting process. The type of permit required depends on the nature of the proposed action and its potential effect on the protected species. This framework allows for necessary activities to proceed while ensuring they are conducted in a manner that avoids or minimizes harm to migratory birds and eagles.

3.3.5.1 Existing Conditions

Kachemak Bay has two distinct conservation designations for migratory birds:

- Globally Significant Kachemak Bay and Homer Spit Important Bird Areas (IBAs) from the National Audubon Society (Figure 3-12); and,
- A Site of Hemispheric Importance in the Western Hemisphere Shorebird Reserve Network.

Figure 3-12. International Bird Areas of Kachemak Bay



These designations highlight the region's critical role as a vital stopover site on the Pacific Flyway, supporting vast populations of migratory birds.

The Spit itself offers several key habitats that different avian groups use. The exposed, rocky shorelines and man-made breakwaters are prime foraging grounds for shorebirds like the surfbird (*Calidris virgata*), black turnstone (*Arenaria melanocephala*), and rock sandpiper (*Calidris ptilocnemis*), which feed in the high-energy surf zone. In contrast, the sheltered tidal mudflats of Mud Bay, at the base of the Spit, serve as a crucial resting and feeding area for thousands of shorebirds and waterfowl during migration. Upland areas with beach grass provide habitat for various passerine (songbird) species.

The bald eagle (*Haliaeetus leucocephalus*) is a conspicuous year-round resident, frequently observed in Homer Harbor foraging and nesting on infrastructure. They often congregate near areas of increased human activity, such as dumpsters and harbor floats, scavenging for food. In contrast, the golden eagle (*Aquila chrysaetos*) is rarely observed in coastal areas like Kachemak Bay. While its range includes most of Alaska, breeding densities are lowest in coastal regions (Gibson and Byrd 2007, Katzner et al.

2020). Local data from the Kachemak Bay Birders (KBB) confirms the species is an infrequent visitor (KBB 2023).

The area is also historically significant for the Steller's eider (*Polysticta stelleri*), a species whose Alaska breeding population was listed as threatened under the ESA in 1997 (62 Federal Register [FR] 31748). While their designated critical habitat does not overlap with Kachemak Bay (66 FR 8850), they are known to winter in its shallow nearshore waters. The Pacific population of this species breeds primarily in Siberia and the Arctic Coastal Plain of Alaska, wintering along the Aleutian Islands and Alaska Peninsula (Fredrickson 2020). Surveys confirm their presence in southwestern Kachemak Bay, supporting potential occurrence from November to April, with peak abundance in January and February.

Input from the ESWG characterized the existing conditions for avian species as being defined by the area's diverse and critical habitats. They described the intertidal zones and mudflats as essential foraging grounds for numerous local and migratory shorebirds. The group also highlighted that the existing anthropogenic structures, such as the existing harbor riprap, currently function as important resting and potential nesting sites for various seabirds. Critically, the discussions emphasized that the area provides key wintering habitat for the federally threatened Steller's eider, a fact confirmed by targeted USACE waterfowl surveys and a central consideration for the species' existing use of the area.

3.3.5.2 Future Without Project Conditions

In the FWOP, the seasonal abundance and distribution of avian species would likely continue to fluctuate in response to natural migratory patterns, food availability, and broader environmental shifts, and the globally important avian communities of Kachemak Bay would remain subject to the existing environmental stressors.

The habitats of the Homer Spit would continue to evolve under the influence of natural processes and existing levels of human activity, with potential for incremental increase due to further shoreline development. The Spit would retain its crucial function as part of a Globally Significant IBAs, providing vital habitat for both resident and migratory birds.

The established patterns of avian use are expected to persist. Shorebirds, such as surfbirds and rock sandpipers, would continue to forage along the high-energy shorelines, while passerine species would inhabit the upland vegetation. The tidal flats of Mud Bay would remain a key stopover site for thousands of migratory waterfowl and shorebirds. Among resident raptors, the bald eagle would remain a common year-round presence, particularly around the harbor, while the golden eagle would continue to be an infrequent visitor. Furthermore, Steller's eiders are expected to remain in their traditional wintering areas, with the highest abundance in Kachemak Bay west of the Homer Spit.

3.3.6 Marine Mammals

Marine mammals are vital components of a healthy marine ecosystem. Many function as apex predators or keystone species, regulating prey populations and shaping the structure of their environment.

The cornerstone of marine mammal protection is the Marine Mammal Protection Act (MMPA). This act establishes a moratorium on the "take," defined broadly as harassing, hunting, capturing, or killing, of all marine mammals in U.S. waters. The MMPA allows for exceptions to the take prohibition, such as incidental take during otherwise lawful activities (e.g., construction), which must be authorized by NMFS or USFWS. The primary goal of the MMPA is to ensure that populations are maintained at or restored to their "Optimum Sustainable Population" level. Jurisdiction under the MMPA is split between two key agencies:

- NMFS is responsible for cetaceans (whales, dolphins, porpoises) and pinnipeds (seals and sea lions).
- USFWS is responsible for sea otters, walruses, polar bears, and manatees.

For marine mammal species facing a greater risk of extinction, the ESA offers an even higher level of protection. When a species is listed under the ESA (such as the Cook Inlet beluga whale [CIBW] or Western U.S. Distinct Population Segment [DPS] of Steller sea lion), it receives all the protections of the MMPA plus the additional safeguards of the ESA. In cases involving a species that is protected by both acts, the more restrictive provisions of the two laws apply.

3.3.6.1 Existing Conditions

Kachemak Bay supports a diversity of marine mammals. Resident species, such as northern sea otters and harbor seals (*Phoca vitulina*), utilize the bay year-round, while migratory species, such as humpback whales (*Megaptera novaeangliae*), visit seasonally to feed or pass through on their extensive journeys. As apex predators and key consumers, both groups are vital indicators of marine ecosystem health and play crucial roles in shaping the structure of the local food web. The area directly affected by the project (i.e., the Action Area) encompasses the new harbor's footprint and the zone of potential acoustic and vessel traffic effects, serving as a subset of the broader Kachemak Bay ecosystem that these species inhabit.

An initial marine mammal species list for Kachemak Bay was developed based on NMFS and USFWS online resources such as the National NMFS ESA Critical Habitat Mapper (NMFS 2026), NMFS Alaska Endangered Species and Critical Habitat Mapper (NMFS 2023), and USFWS Information, Planning, and Conservation (IPaC) System planning tool (USFWS 2026; Appendix E). The initial species list was further developed based on feedback received from the ESWG on August 23, 2023 (Appendix L). The ESWG provided valuable onsite local information to inform the development of a final marine mammal species list (Table 3-8). This list, with exception of the proposed sunflower sea star and northern sea otter, was submitted to NMFS via formal letter for review and feedback on June 2, 2023. NMFS responded via email on July 19, 2023, that the list appeared complete and provided reference to potential applicable critical habitat near the area (Appendix E).

Table 3-8. Marine Mammal Species List for Kachemak Bay

Common Name (Scientific Name)	Population / Stock / Region	MMPA Status	Seasonality	Presence Description with Respect to the Project Area
Beluga Whale (*Delphinapterus leucas*)	Cook Inlet	Protected, Depleted	Predominantly winter but sporadic sightings in spring and winter.	Infrequent visitor. While Kachemak Bay is critical habitat, their presence in the inner bay near the project is rare. They primarily use the area for foraging and avoiding killer whale predation.
Dall's Porpoise (*Phocoenoides dalli*)	Alaska	Protected	Year-round	Unlikely to be in the project area. Prefers deeper, open waters of the outer bay.
Fin Whale (*Balaenoptera physalus*)	Northeast Pacific	Protected, Depleted	Primarily summer & fall	Unlikely to be in the project area. A seasonal visitor that typically remains in deeper, open waters west of the Spit.
Gray Whale (*Eschrichtius robustus*)	Eastern North Pacific	Protected	Spring & fall migration	Migratory visitor, generally passing through the area offshore and unlikely to enter the inner bay near the project.
Harbor Porpoise (*Phocoena phocoena*)	Gulf of Alaska	Protected	Year-round	Likely to be in the project area. Frequently sighted throughout Kachemak Bay and one of the most common cetaceans present.
Harbor Seal (*Phoca vitulina*)	Gulf of Alaska	Protected	Year-round	Likely to be in the project area. Abundant resident often seen hauled out on natural and man-made structures, including floats within the Homer harbor.
Humpback Whale (*Megaptera novaeangliae*)	Western North Pacific	Protected, Depleted	Primarily spring, summer, & fall	Likely to be in the project area. Common seasonal visitor for feeding. Can be seen throughout the bay and may enter the harbor.
	Hawaii	Protected		
	Mexico	Protected		
Killer Whale (*Orcinus orca*)	Eastern North Pacific Alaska Resident	Protected	Year-round	Presence in the project area is possible but unpredictable. Both resident (fish-eating) and transient (mammal-eating) types are observed.
	Gulf of Alaska, Aleutian Islands, and Bering Sea Transient			
Minke Whale (*Balaenoptera acutorostrata*)	Alaska	Protected	Primarily summer & fall	Presence in the project area is possible. Known to inhabit the bay during the summer feeding season, sometimes closer to shore.
Northern Fur Seal (*Callorhinus ursinus*)	California	Protected	Extremely rare/Vagrant	Not expected in project area. Presence is considered extralimital or accidental.
	Eastern Pacific	Protected, Depleted		
Pacific White-Sided Dolphin (*Lagenorhynchus obliquidens*)	North Pacific	Protected	Extremely rare/Vagrant	Not expected in project area. Not a regular inhabitant; considered a very rare visitor.
	Eastern U.S.	Protected	Year-round	

Common Name (Scientific Name)	Population / Stock / Region	MMPA Status	Seasonality	Presence Description with Respect to the Project Area
Steller Sea Lion (*Eumetopias jubatus*)	Western U.S.	Protected, Depleted		Likely to be in the project area. Present year-round, forages throughout the bay and uses established haulouts on nearby islands.
Northern Sea Otter (*Enhydra lutris kenyoni*)	Southcentral Alaska	Protected	Year-round	Likely to be in the project area. Abundant keystone species with a large, well-established population. Frequently seen foraging in nearshore waters.

Of the marine mammals likely to occur in Kachemak Bay, there are four ESA listed species (Table 3-9).

Table 3-9. ESA Marine Mammal Species List for Kachemak Bay

Common Name *(Scientific Name)*	Population / Stock / Region	ESA Status	Habitat Use and Behavior	Critical Habitat In Kachemak Bay
Cook Inlet Beluga Whale *(Delphinapterus leucas)*	Cook Inlet DPS	Endangered	Year-round potential for foraging and transit, confirmed by acoustic data[1], recent sightings[2], and historical Traditional Ecological Knowledge[3]. Behavior is characterized by deep dives[4] in winter months. When observed in nearshore environment, it is typically during warmer months.	Yes. The bay is designated as Critical Habitat (Area 2)[5].
Fin Whale *(Balaenoptera physalus)*	Northeast Pacific Stock	Endangered	Infrequent visitor that rarely enters enclosed bay waters. Primarily a deep-water forager, with acoustic data confirming seasonal presence in the broader Lower Cook Inlet region[1].	No.
Humpback Whale[9] (*Megaptera novaeangliae*)	Mexico DPS	Threatened	Possible seasonal visitor (summer), with an 11% probability of encounter[6]. Engages in seasonal feeding, typically alone or in small groups.	No.
	Western North Pacific DPS	Endangered	Rare seasonal visitor (summer), with a 1% probability of encounter[6]. Engages in seasonal feeding, typically alone or in small groups.	No.

Common Name *(Scientific Name)*	Population / Stock / Region	ESA Status	Habitat Use and Behavior	Critical Habitat In Kachemak Bay
Steller Sea Lion (*Eumetopias jubatus*)	Western U.S. DPS	Endangered	Year-round resident that forages throughout the bay and utilizes nearby haulouts. Thousands are present in the Lower Cook Inlet[7].	No, but a major haulout critical habitat boundary is adjacent to Kachemak Bay, i.e., the Action Area[8].

Note:
[9] An encountered humpback whale in Kachemak Bay is most likely to be from the non-listed Hawai'i Stock (89% probability of encounter) while it engages in seasonal feeding, typically alone or in small groups.
Sources:
[1] Castellote et al. 2020
[2] McGuire et al. 2022
[3] Huntington 2000; NMFS 2016
[4] Hobbs et al. 2005
[5] 76 FR 20179
[6] NMFS 2021; Wade 2021
[7] Sweeney et al. 2017
[8] 58 FR 45269

Northern sea otter, harbor seal, harbor porpoise (*Phocoena phocoena*), and Steller sea lion (*Eumetopias jubatus*) are likely the most common occurring species in the study footprint. Vagrant species, not included in the list but that have confirmed observation records within Kachemak Bay, include the elephant seal (*Mirounga angustirostris*), Guadalupe fur seal (*Arctocephalus townsendi*), and California sea lion (*Zalophus californianus*; Appendix L).

Existing marine and shoreline activities in Kachemak Bay, particularly coastal development and vessel traffic from industry and recreation, create significant disturbances for marine mammals. These activities introduce noise and visual disruptions that can displace animals from their immediate vicinity. Furthermore, these activities bring the risk of vessel strikes and environmental contamination. These risks are of particular concern at the existing Homer Harbor and other coastal marine infrastructure along the Homer Spit.

3.3.6.2 Future Without Project Conditions

In the FWOP, marine mammal communities would remain subject to existing environmental stressors and natural ecosystem changes. Marine mammal species will continue to use Kachemak Bay based on their established residency and migratory patterns. Risks from existing vessel traffic, noise, and development would continue and are anticipated to incrementally increase over time with regional growth, independent of the project.

The most common species in the study footprint, e.g., northern sea otter, harbor seal, and harbor porpoise, would be expected to remain abundant year-round residents. Migratory species, such as humpback whales, would continue their seasonal use of Kachemak Bay for feeding and migration, with their presence and abundance fluctuating annually. The ESA-listed CIBW would remain an infrequent nearshore visitor, and the Western U.S. DPS of Steller sea lion would continue to use their established haulout locations.

Vagrant species not typically found in the region, such as elephant seals and Guadalupe fur seals, may appear sporadically, with the potential for increased frequency over time due to broader environmental shifts.

3.3.7 Invasive Species

The management of invasive species is governed by E.O. 13112, Invasive Species, which defines an invasive species as a non-native species whose introduction causes or is likely to cause economic or environmental harm. A key piece of federal legislation is the National Invasive Species Act (NISA) of 1996, which specifically addresses the prevention and control of non-indigenous aquatic species, with a major focus on managing the discharge of ballast water from ships—a primary vector for introductions. Project activities must comply with these federal frameworks and any state-level regulations from the ADEC designed to prevent the introduction and spread of invasive species.

3.3.7.1 Existing Conditions

Numerous activities and natural processes in the Action Area could introduce non-native species to Homer and Kachemak Bay. Marine vessel traffic associated with Homer Harbor is a primary pathway, given the mix of local, regional, national, and international traffic.

Key introduction methods for marine and terrestrial invasive species in Alaska include:

- Ballast Water Exchange: Ships take on or discharge water, transporting invasive organisms.
- Hull Fouling: invasive organisms attach to the submerged parts of a vessel.
- Accidental Human Transport: invasive species are moved unintentionally by people.

Evidence shows these pathways are active threats. A 2016 study (Verna et al. 2016) found that the ecoregion including Kachemak Bay accounted for 2–10% of discharged ballast water in Alaska, which resulted in seven documented ballast-borne invasive species. There is also a notable Kachemak Bay example of hull fouling that occurred with the *Randolph Yost*, an international jack-up rig. Community concerns were raised about the extensive fouling on its structure. An investigation by the KBRR in April 2016 found several tropical, non-native species attached to the rig's legs, including barnacles (*Megabalanus*), bryozoans, and clams (KBRR 2016). A leading expert, Dr. James Carlton, confirmed the specimens were dead and concluded it was improbable that these tropical species would survive in Alaskan waters, or after a 30+ day dry-dock period (KBRR 2016). This incident highlighted the significant risk posed by international vessel movements.

Shifting environmental conditions can increase the risk of a non-native species becoming invasive by destabilizing the ecosystem and allowing newcomers to outcompete native species. The European green crab (*Carcinus maenas*) exemplifies this threat. Considered one of the most aggressive marine invaders, it destroys eelgrass beds and outcompetes native species for food and habitat. While not yet documented in Kachemak Bay, its range is extending northward along the west coast. Confirmed specimens collected in Southeast Alaska, on Annette Islands Reserve (2022) and in Ketchikan (2025), indicate that this is a threat to the region. Table 3-10 lists invasive species of particular concern for the Homer and Kachemak Bay area.

Table 3-10. Invasives of Particular Concern

Scientific Name	Common Name	Predominant Habitat	Key Impacts & Local Presence	Primary Introduction Method
Rattus norvegicus	Norway Rat	Damp coastal environments and human-made structures (e.g., marine infrastructure).	**No known existing presence in Homer.** Spread extensively throughout Alaska via marine transport. They harm wildlife (especially seabird colonies) and carry diseases.	Transported via ships.
Columba livia	Rock Pigeon	Wild: Coastal cliffs. Urban: Ledges on tall buildings.	Identified in Homer. Potential crop pest. Displaces native birds, and carries parasites/pathogens (e.g., avian influenza).	Feral populations from escaped domesticated birds.
Didemnum vexillum	Colonial Tunicate	Hard surfaces like docks, boat hulls, and the seabed.	Forms thick mats that smother other marine organisms and rapidly dominates habitats.	Hull fouling and drifting fragments.
Carcinus maenas	European Green Crab	Shallow intertidal areas, estuaries, and bays.	Aggressive predator that disrupts habitats and threatens native crabs and shellfish. **Confirmed in Southeast Alaska (2022, 2025).**	Ballast water and hull fouling.
Asterias amuresis[1]	Flatbottom Sea Star	Diverse coastal habitats, often aggregating over shellfish grounds.	Abundant around harbor pilings; outcompetes native sea stars.	Ballast water.

Note: This table and its contents are not all-inclusive and focus on the primary concerns within Kachemak Bay and Homer.
[1] There is uncertainty about whether this species is native or nonnative to Kachemak Bay (ESWG Meeting Minutes August 23, 2023).

To combat these threats in Kachemak Bay, KBRR leads community-based monitoring for early detection of European green crabs and invasive tunicates. This includes partnering with the Smithsonian Environmental Research Center's "Plate Watch" program, conducting beach surveys, and inspecting heavily encrusted marine infrastructure. ADF&G also provides a hotline (1-800-INVASIVE) for the public to report suspected sightings.

The ESWG described invasive species currently present in the project area or that were of particular concern. They identified several established non-native populations as a key feature of the existing biological environment, citing the presence of non-native tunicates and the flat-bottom sea star (*Asterias amuresis*), which actively competes with native sea star species. The ESWG also confirmed there is active monitoring for European green crab to allow early detection should it spread to Kachemak Bay.

3.3.7.2 Future Without Project Conditions

In the FWOP, the risk of invasive species becoming established in Kachemak Bay would remain a threat. This risk is shaped by existing activities and environmental trends in Kachemak Bay. The primary pathways for introduction; i.e., ballast water exchange, hull fouling, and accidental human transport; would persist, driven by the ongoing Alaska, national, and international vessel traffic at Homer Harbor.

The threat from specific, known invasive species is projected to grow. For example, the European green crab, which has already been documented in Southeast Alaska, is expected to continue its northward expansion. Without any change to current conditions, it is probable that this highly aggressive species will eventually arrive in Kachemak Bay, where it could disrupt local habitats and outcompete native crab and shellfish populations.

Existing monitoring programs led by the KBRR and community partners will remain critical for the early detection of new threats. While these efforts provide a crucial defense by enabling rapid response, they do not eliminate the underlying risk of introduction from ongoing marine activities and environmental shifts.

3.4 Socio-Economic Environment

The socio-economic environment documents existing economic conditions as well as assumptions used to generate FWOP conditions and broader economic trends.

3.4.1 Population

3.4.1.1 Existing Conditions

As of 2023, the population of Homer is estimated to be 5,669. The 2020 Census reported the population of Homer at 5,522. This is an increase of 519 over its 2010 Census population of 5,003. The population of Homer has been increasing steadily over the last 40 years.

3.4.1.2 Future Conditions

While population projections for the city of Homer are not readily available, the Alaska Department of Labor and Workforce Development released *Alaska Population Projections 2023 to 2050,* which includes population projections at the state, regional, and borough (Alaska's county equivalent) levels. Homer is located in the Kenai Peninsula Borough (KPB) and accounted for approximately 10.6% of KPB's population in 2020, according to the census. Table 3-11 shows population projections for the KPB for the years 2025–2050.

Table 3-11. Kenai Peninsula Borough Population Projections, 2025–2050

Year	Population Projection
2025	62,090
2030	63,138
2035	63,581
2040	63,417
2045	62,771

Year	Population Projection
2050	61,784

These projections suggest that the population of the KPB will continue to increase through 2035 and will begin declining starting in 2040, though it will still be above current levels. This is consistent with the expected trends at the regional and state levels discussed in the same publication. Driving factors for these population projections include negative net migration and death rates (the number of deaths per 1,000 people), which are expected to increase as Alaska’s population ages.

This analysis makes the assumption that Homer’s population will remain stable throughout the period of analysis. While it is possible the local population will decrease with the population of the borough, it is also possible that, as smaller communities shrink, people may relocate to Homer as it is one of the larger communities in the borough.

3.4.2 Employment

The City of Homer’s website identifies fishing, tourism, marine trades, and education and health services as noteworthy industries.

The 2022 American Community Survey (ACS) reports Homer’s unemployment rate as 9%, as compared with the state rate of 4.6%. Table 3-12 shows the percentage of Homer’s population employed in various industries as compared with employment in the state as a whole. Notably, “agriculture, forestry, fishing and hunting and mining,” “retail trade,” and “arts, entertainment, recreation, accommodation, and food service” are all higher than the state percentages. This is consistent with an economy that focuses on commercial fishing and tourism.

Table 3-12. Employment by Sector, Homer and State Comparison

Sector	Percent of Homer Population Employed	Percent of Alaska Population Employed
Agriculture, forestry, fishing and hunting, and mining	6.4%	4.7%
Construction	5.6%	7.3%
Manufacturing	4.5%	4.4%
Wholesale trade	1.4%	1.4%
Retail trade	13.9%	10.5%
Transportation and warehousing, and utilities	8.9%	8.7%
Information	1.7%	1.7%
Finance and insurance, and real estate and rental and leasing	3.3%	4.2%
Professional, scientific, and management, and administrative and waste management services	7.1%	8.6%
Educational services, health care and social assistance	25.4%	24.5%
Arts, entertainment, recreation, and accommodation and food services	11.4%	8.1%

Sector	Percent of Homer Population Employed	Percent of Alaska Population Employed
Other services, except public administration	4.1%	4.6%
Public administration	6.1%	11.3%

Source: 2022 ACS, “Selected Economic Characteristics”, retrieved from data.census.gov, Dec. 2024

3.4.3 Marine Trades

Dozens of businesses in Homer provide services needed by the marine industry, including vessel construction, repair services, dry storage, marine electrical and hydraulics work, salvage, towing and gear supply. The wide variety of services available in Homer make it a very attractive location for working vessels looking for a place to homeport or to haul out for the winter.

3.4.4 Tourism on the Homer Spit

In addition to the harbor, many businesses are located on the Spit, including restaurants, tourist shops, fishing charters, and small hotels. The Spit is a popular tourist attraction and draws significant crowds, especially between late May and early September. Water taxis provide hikers with access to trail systems on the other side of Kachemak Bay, and R.V. parking is available for those who want to camp on the Spit. The Nick Dudiak Fishing Lagoon, commonly referred to as the Fishing Hole, just north of the harbor, is a public park and is stocked with coho (silver) and Chinook (king) salmon for sport fishing (City of Homer n.d.).

3.4.5 Traffic on the Homer Spit

The Spit is accessed via Homer Spit Road, and parking is available at the harbor, however the narrowness of the Spit makes expanding existing parking or widening the two-lane road difficult. Traffic on and off the Spit can frequently be delayed, and a need for additional parking has been highlighted as a concern by community members. In the event of an emergency, existing traffic conditions would make evacuating the Spit time-consuming and inefficient.

There have been discussions in the community about developing additional parking near the Spit where it connects to the mainland, however this area is already developed, with limited space available.

3.4.6 Personal Use Fishing Activities

Homer is located in a designated non-subsistence zone, meaning that the area does not have an historical or cultural association with subsistence practices. For this reason, subsistence activities were not considered in this analysis. However, personal use fishing does occur in the Homer area. In Alaska, "personal use" is a legally defined regulatory category of fishery distinct from sport and subsistence fishing. Personal use fishing is open to Alaskan residents only, and you must have a valid resident Sport Fishing License to participate in personal use fisheries.

Two personal use fisheries are accessed via Homer Harbor: the China Poot Bay sockeye (red) salmon dipnet fishery and the Kachemak Bay set gillnet coho salmon fishery. China Poot Bay is located approximately four miles southeast of the Homer Spit, across Kachemak Bay. This fishery is open from June 15th through August 15th and has a bag limit of six fish. A permit is not required. The Statewide Harvest Survey has estimated annual anglers for this fishery since 2022 at an annual average of 2,713, with an average of 1.6 annual angler days per person.

The Kachemak Bay set gillnet coho fishery does require a permit and has a bag limit of 25 fish for the first member of a household, plus 10 fish for each additional member. This fishery is open from mid-August to mid-September but may be closed early if the guideline harvest limit is reached. Between 2019 and 2024, there were an average of 141 permits fished for this fishery, and an average of 0.9 angler days per person.

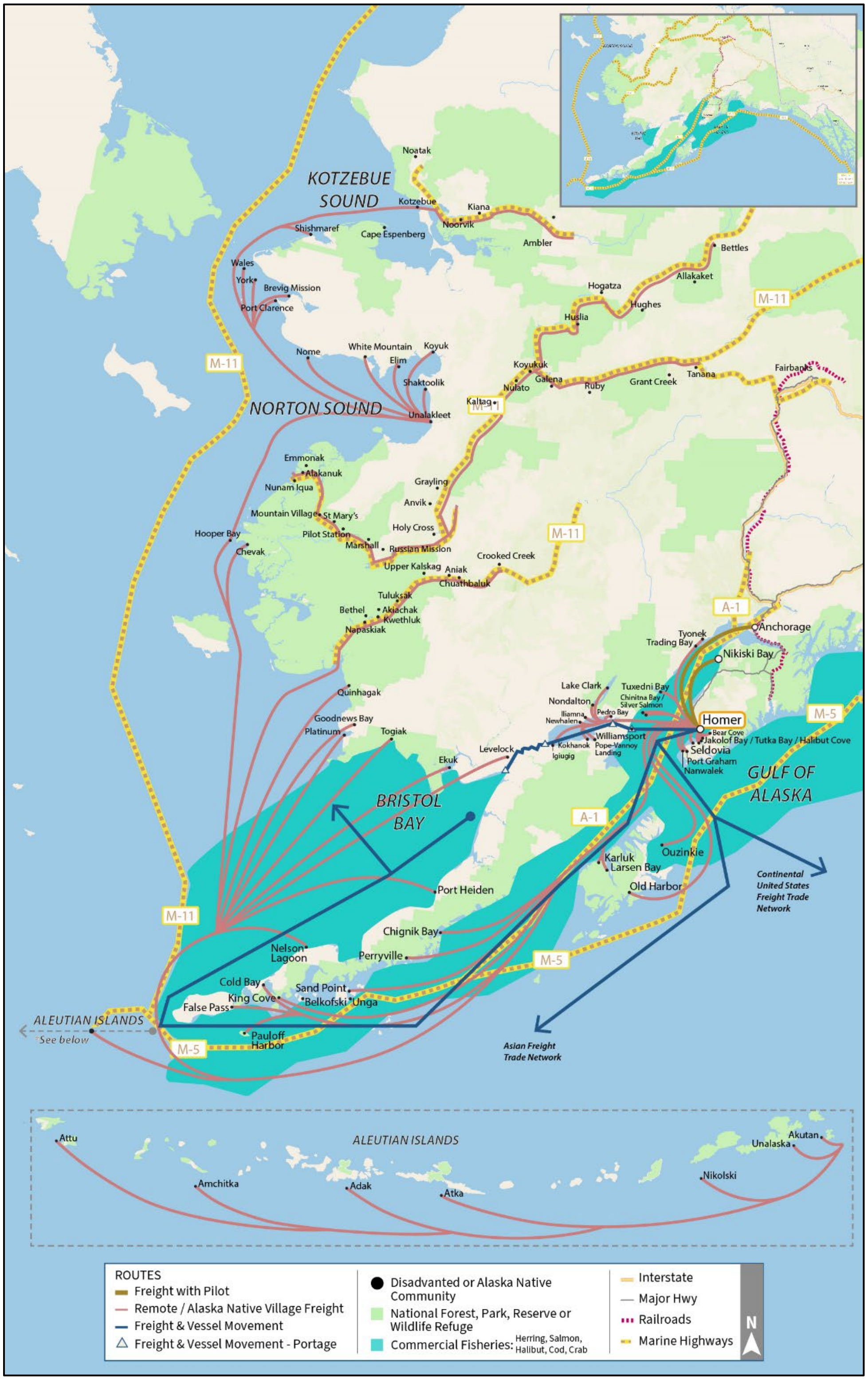
3.4.7 Road Connectivity

Homer is the southernmost point on the Sterling Highway and is the furthest that freight brought into Anchorage by barge can be sent south by truck. For vessel owners, road connectivity means easier access to supplies and parts than they would find in harbors off the road system, such as Kodiak or Dutch Harbor.

According to the *2025 Alaska Infrastructure Report Card*, published by the American Society of Civil Engineers, approximately 82% of the communities in Alaska are not connected to the road system. For these communities, the only ways of receiving goods are either by plane or by boat, and Homer provides the closest connection point for vessel cargo traffic. Residents of small communities may take a boat to Homer to purchase groceries, and coastal freight operations from Homer transport goods to communities around the State.

The NFS identified that coastal freight vessels departing from Homer serve over 50 communities, including ones as far west as Attu in the Aleutian Islands and as far north as Kotzebue on the northwest coast of Alaska. Freight transportation routes are identified in Figure 3-13.

Figure 3-13. Homer Freight Routes



Source: received from non-Federal sponsor, February 2025

3.4.8 Cruise Ships

Homer is not a port of call for the major cruise lines that visit other parts of the state, whose vessels can be upwards of 1,000 feet long and can carry 2,000 passengers or more. According to Homer Harbor staff, Homer does receive a few visits each summer from smaller cruise ships, although these visits are not regular. These vessels are too large to enter the Homer Harbor, so they typically moor to the Deep Water Dock outside the harbor.

3.4.9 Homer Fleet

This section discusses the vessels that make up the Homer fleet by size, user group, and preferred moorage type. Vessels using the Homer Harbor choose between reserve moorage, in which a user leases a dedicated slip for a year at a time, or transient moorage, in which a user has access to side-tie areas of the harbor on a daily, monthly, semi-annual, or annual basis.

The majority of vessels in Homer are either commercial fishing or recreation vessels; however, several other user groups are also present, including but not limited to fishing charter vessels, water taxis, and vessels that deliver freight to coastal communities around the state. Data on the Homer fleet was provided by the harbor and reflects transient, reserve, and waitlisted users for the 2023 calendar year.

This section also discusses demand for moorage which is currently unmet. If a user wishes to purchase reserve moorage of a slip size for which there are no available slips, they are waitlisted. Similarly, crowding for large transient vessels has become severe enough in recent years that the harbor has had to turn away vessels that would like to use the harbor. Other transient vessels use the unprotected docks outside the harbor as moorage, because they are too large to navigate the harbor entrance.

Lastly, this section estimates demand which may be “invisible.” When a harbor is known to be badly overcrowded, this disincentivizes potential users from voicing interest and can lead to underestimated demand if only waitlists are considered.

3.4.9.1 Existing Conditions

3.4.9.1.1 The Homer Fleet by Moorage Type

3.4.9.1.1.1 Reserve

The Homer Harbor sells “reserve” moorage (also called “tenant” and “permanent” moorage but referred to in this analysis as reserve) in the slip sizes shown in Table 3-13. Because the size of popularly owned boats has increased over time, and because vessels under approximately 32 feet long are easier to store on trailers, there is higher demand for larger slips than for smaller ones. As a result, vessels are frequently assigned to slips that are too short for them, which constricts the open waterways where vessels need to maneuver. The number and size of slips available in Homer, and the length over all (LOA) of vessels allowed in each size of slip, are shown in Table 3-13.

Table 3-13. Homer Reserve Moorage

Slip length	Number of Slips	LOA Range Allowed
20’	103	0–23’
24’	199	21’–29’
32a’*	32	25’–32’
32’	410	28’–42’
40’	65	38’–47’
50’	34	47’–60’
60’	9	56’–70’
75’	24	60’–85’
Total Reserve Slips	876	

Source: Information received from harbor staff via email and phone call.
*32a slips are the same length as 32’ slips but are limited to a 19’ beam.

In June of 2023 there were 809 vessels leasing reserve moorage in Homer. Vacancies are generally attributable to a slip holder ending their lease or losing it due to nonpayment of fees. The harbor does not reassign available slips to new clients until October, so slips which become vacant before this may remain officially unleased until fall. Unleased slips are generally still used, as hot berthing (allowing a boat to use a slip leased by another user while they are not using it) is a standard practice. Table 3-14 shows vessels which had reserved moorage in Homer in 2023 by user group.

Table 3-14. Homer Reserve Moorage Fleet by User Group, 2023

Harbor User Group	Number of Vessels
Recreation	554
Government	6
Commercial Fishing	102
Fishing Charters	100
Water Taxi	22
Tugboats	5
Commercial Freight	6
Research	4
Not Specified	10
Total	809

Source: Information received from harbor staff via email, July 2024

Vessels that would like to lease reserve slips but are unable due to availability can request placement on the waitlist. Vessels longer than 85 feet cannot be waitlisted for reserve moorage in Homer because there are no reserve slips long enough to accommodate them. Vessels that wish to homeport in Homer but are too large for the waitlist must use transient moorage.

3.4.9.1.1.2 Transient

The Homer Harbor sells transient moorage on an annual, semiannual, monthly, and daily basis. In 2023, there were 1,448 vessels that used transient moorage in Homer. Table 3-15 shows these vessels by user group.

Table 3-15. Homer Transient Fleet by User Group, 2023

Harbor User Group	Number of Vessels
Recreation	617
Government	20
Commercial Fishing	610
Fishing Charters	44
Water Taxi	14
Tugboats	12
Commercial Freight	18
Research	11
Not Specified	102
Total	1,448

Source: Information received from harbor staff via email, July 2024

3.4.9.1.1.3 Unmet Demand

There is demand for moorage in Homer which is not being met under existing conditions. Because reserve moorage is generally at capacity, vessel owners must join a waitlist and often wait several years for an assigned slip. Additionally, since the winter of 2021–2022, harbor staff have tracked the number of vessels seeking transient moorage in Homer that have been turned away due to the severity of crowding.

3.4.9.1.1.3.1 Waitlisted Vessels

Homer maintains a separate waitlist for each size of slip available in the harbor, from 20 feet to 75 feet long. It is typical for vessels to be assigned to slips that are too short for them. Vessels up to 85 feet LOA are eligible for the waitlist. Vessels longer than 85 feet LOA cannot utilize reserve moorage in Homer and must instead utilize transient moorage areas. Users pay an annual fee of $30 to remain on the waitlist and are contacted by the harbor once a year in October regarding available slips.

Demand for different slip lengths varies, and some slip length categories go years without any turnover. Harbor staff report that turnover is faster for 20-foot and 24-foot slips, and especially slow for 50, 60, and 75-foot slips. Two primary factors contribute to this slow turnover for larger slips sizes. Firstly, there are significantly fewer slips of these sizes available. Secondly, vessels of these sizes are more difficult to store on trailers, meaning that vessel owners have a stronger incentive to keep vessels in the water rather than launching and retrieving them for each use.

Additionally, some users currently waitlisted for reserve slips use transient moorage in the interim while they wait for a slip to become available. The percentage of waitlisted users who use transient moorage varies by vessel size, but accounts for approximately 40% of waitlisted users overall. Waitlisted users who do not use transient moorage are assumed to be inactive until reserve moorage becomes available for them.

The number of users waitlisted for different slip lengths as of July 2024 are shown in Table 3-16. This table also shows when the user who has been on each waitlist the longest was added to the list. These waitlist dates were received in June of 2025 and so do not precisely correspond to the numbers of waitlisted users.

Table 3-16. Number of Waitlisted Users by Slips Length, July 2024

Slip Length	Users Waitlisted	Earliest Date User Added to Waitlist
20’	No List Provided	N/A
24’	45	July 2024
32’a*	15	August 2022
32’*	179	June 2022
40’	75	November 2019
50’	39	May 2020
60’	4	August 2021
75’	22	October 2023
Total Users Waitlisted	379	

Source: Information received from harbor staff via email, July 2024
*32a slips are narrower slips which can only be used by vessels with beams of 19’ or less

Because waitlist times for slips and crowding conditions are well known, it is likely that the waitlist does not fully reflect unmet demand for moorage in Homer. Boaters who might otherwise have demand for Homer moorage may be discouraged from self-identifying because acquiring a slip can take so long.

3.4.9.1.1.3.2 Vessels Turned Away

In 2021 the harbor began keeping a list of boats that contacted them regarding moorage and had to be turned away due to overcrowding. Generally, these are transient vessels too large to be waitlisted for slips. Most of these are seeking moorage for the winter off-season and have expressed interest in homeporting in Homer. Between 2021 and 2023, 18 vessels contacted the harbor and were turned away. Of these, several were later accommodated in transient moorage.

The sizes of the remaining 12 vessels which have not yet been accommodated in Homer are shown in Table 3-17. According to the harbormaster, these boats would prefer reserve moorage were it available in their size.

Table 3-17. Vessels turned Away by Size

Vessel Length	Number of Vessels Turned Away
86–115 feet	8
Over 115 feet	4

Source: Information received from harbor staff via email, July 2024

3.4.9.1.2 The Homer Fleet by User Group

3.4.9.1.2.1 Commercial Fishing Vessels

Commercial fishing is the second-largest user group in the Homer fleet, with over 700 vessels. The commercial fishing user group is shown by moorage type in Table 3-18.

Table 3-18. Commercial Fishing Vessels by Moorage Type

Moorage Type	Number of Vessels	Percentage
Reserve	102	14.3%
Transient	610	85.7%

Moorage Type	Number of Vessels	Percentage
Total	712	100.0%

Source: Information received from harbor staff via email, July 2024

3.4.9.1.2.2 Fishing Charters

Homer promotes itself as the “Halibut Capitol of the World” and has an active fishing charter fleet. These vessels tend to rely more on the consistent dock access afforded by a reserve slip to facilitate loading passengers. The majority of fishing charter vessels in Homer are smaller vessels with a capacity of six passengers; however, a smaller number of charters can carry 24 passengers. Table 3-19 shows the breakdown of fishing charter vessels by moorage type.

Table 3-19. Fishing Charter Vessels by Moorage Type, June 2023

Moorage Type	Number of Vessels	Percentage
Reserve	100	69.4%
Transient	44	30.6%
Total	144	100.0%

Source: Information received from harbor staff via email, July 2024

3.4.9.1.2.3 Coastal Freight Fleet

One of the harbor user groups in Homer is the coastal freight fleet. These vessels transport cargo to non-road connected communities around the State. They range in size from 20 feet to over 150 feet LOA and are often “landing craft”-style vessels, which are broad, have shallow drafts, and can be beached for loading and unloading. This makes them well suited for deliveries to coastal communities which may have little or no marine infrastructure, and for navigating Alaska’s large rivers.

Due to its location in southcentral Alaska, Homer is well-situated to serve as a regional hub for freight transport. With approximately 82% of Alaska’s communities not connected to the road system, these communities are reliant on planes and marine vessels to bring in virtually all goods.

Homer’s coastal freight fleet is shown by moorage type in Table 3-20.

Table 3-20. Coastal Freight Vessels by Moorage Type, June 2023

Moorage Type	Number of Vessels	Percentage
Reserve	6	25.0%
Transient	18	75.0%
Total	24	100.0%

Source: Information received from harbor staff via email, July 2024

Homer Harbor staff report, based on their experience and familiarity with their users’ work patterns, that over 100 non-road connected communities around Alaska receive coastal freight shipments from Homer. However, the NFS provided USACE with a list of 50 communities they had specifically identified that are served by the Homer coastal freight fleet, and this more focused list was used in this analysis.

3.4.9.1.2.4 Water Taxis

Water taxis are smaller vessels, generally between 25 and 40 feet long, which offer transportation between Homer and off-road communities in the area. Residents of communities such as Seldovia, on the opposite side of Kachemak Bay, may take water taxis to go into Homer to shop for groceries or to transport small freight loads. Tourists utilize water taxis to visit small communities on day trips and to access hiking trails on the opposite side of Kachemak Bay.

Water taxi operators stated that they generally run 2 trips per day in the winter, 5 per day in the spring and fall, and 7–10 per day in the summer for a total of 1,450 trips per vessel per year. According to the survey conducted by the port, there is an average of 5 passengers per trip. Table 3-21 shows the breakdown of the water taxi fleet by moorage type.

Table 3-21. Water Taxi Vessels by Moorage Type, June 2023

Moorage Type	Number of Vessels	Percentage
Reserve	22	61.1%
Transient	14	38.9%
Total	36	100.0%

Source: Information received from harbor staff via email, July 2024

3.4.9.1.2.5 Recreational Vessels

Recreational vessels are the largest user group in the Homer fleet. Harbor staff also report that this group is growing as a percentage of the fleet. Homer’s smaller population, beautiful scenery, and fishing opportunities make it an attractive retirement location, especially for boat owners. The harbor is also appealing as a homeport for many people in Anchorage and other southcentral Alaska communities that do not otherwise have harbor access. Recreational vessels are shown by moorage type in Table 3-22. Recreational vessels that utilize the boat launch, but do not purchase either transient or reserve moorage, are not reflected in these numbers.

Table 3-22. Recreational Vessels by Moorage Type, 2023

Moorage Type	Number of Vessels	Percentage
Reserve	554	47.3%
Transient	617	52.7%
Total	1,171	100.0%

Source: Information received from harbor staff via email, July 2024

3.4.9.1.2.6 U.S. Coast Guard

The Coast Guard buoy tender *Aspen* is permanently stationed at Homer but uses a berth outside the harbor on the Pioneer Dock because at 225 feet long, it is too large to use the harbor. This berth is dredged twice annually by USACE on behalf of the Coast Guard.

As of 2026, no other Coast Guard vessels are stationed in Homer; however, a Coast Guard representative stated that Fast Response Cutters (FRCs) will be stationed in communities around Homer within a year or two and are likely to call in Homer monthly. These FRCs are 154 feet long and will likely be unable to enter the harbor.

3.4.9.1.2.7 Float System 5 Users

Float System 5, sometimes referred to simply as System 5, is the only area in the harbor where vessels over 85 feet are able to moor. While System 5 is not a user group, it is discussed separately here because it serves as the sole moorage for vessels over 85 feet long and covers multiple user types that are analyzed collectively for delays, rather than with their respective user groups. In 2023, there were a total of 55 vessels that used System 5. The user groups of these vessels are shown in Table 3-23. About 64% of System 5 vessels are commercial fishing vessels, with 11% being research vessels and the remaining 25% being made up of tow, freight, charter, government, and unspecified vessels.

Table 3-23. System 5 Vessels by User Group

User Group	System 5 Vessel Count
Commercial Tow	3
Commercial Freight	4
Charter	1
Commercial Fishing	35
Research	6
Government	2
Not Specified	4
Total	55

Source: Fleet data received from harbor, 2023

3.4.9.2 Future Without Project Conditions

3.4.9.2.1 Waitlist Growth

The consulting firm HDR analyzed 20 years of data on the Homer waitlist and identified a long-term growth trend over the full data set and a slower growth trend over the most recent 5 years of data. Given that Homer Harbor is known to be overcrowded and wait times for reserve slips are known to be long, it follows that the waitlist would have grown more slowly in recent years. Because 20 years of data were analyzed to identify trends, trends are only projected forward up to 20 years, at which point the fleet is held constant.

HDR identified a range of historic growth rates for the Homer Harbor waitlist over the 20 years of data analyzed. In USACE's projection of growth over the next 20 years, for the first decade the waitlist is expected to grow at a rate averaged between the high and low rates of the analyzed 20-year waitlist data; then, beginning in the base year (2034), growth will be deterred by 50% as harbor crowding worsens. This analysis approximates an increase of 275 vessels over the next 20 years.

Based on the HDR report, it is estimated that 50% of the growth in demand over 20 years will be for 32-foot slips, 20% will be for 24-foot slips, 20% for 40-foot slips, and 10% for 50-foot slips.

The expected scenario for the FWOP is shown in Table 3-24.

Table 3-24. Small Vessel Reserve Moorage Demand Growth in FWOP over the Period of Analysis

Slip Size	Expected Waitlist Growth
24’ slips	55
32’ slips	138
40’ slips	55
50’ slips	27
Total Vessels	275

Source: HDR “Homer Fleet Demand Analysis” 2024

Because these growth projections are based on waitlist data, these vessels represent an increase in demand for reserve moorage. Similar projections for transient demand are not possible, because data is unavailable before 2019. Approximately 40% of waitlisted users use transient moorage while they wait for a slip assignment. This is expected to continue in the FWOP scenario, meaning that approximately 40% of future users who join the waitlist will use transient moorage in the interim. The number of vessels expected to join the waitlist and begin using transient moorage in the FWOP are shown by slip size in the Table 3-25. Please note that the percentage of waitlisted vessels varies by slip size, so vessel counts will not equal 40% for each slip size.

Table 3-25. FWOP Waitlisted Vessel Growth Using Transient Moorage Over the Period of Analysis

Slip Size	Expected Vessels
24’ slips	36
32’ slips	51
40’ slips	22
50’ slips	10
Total Vessels	119

Source: Data provided by harbor, 2024

User group information is not available for waitlisted vessels; however, this analysis assumes that vessels waitlisted for a given slip size will have a similar user group composition to that of the existing reserve users for that slip size. Table 3-26 shows the expected waitlist growth and the number of vessels expected to use transient moorage while waitlisted by user group. Vessel totals may vary as numbers are rounded.

Table 3-26. FWOP Waitlist Growth by User Group Over the Period of Analysis

User Group	Waitlisted, Using Transient	Waitlisted, Not Using Transient	Total Waitlist Growth
Recreation	73	109	182
Charter Fishing	16	23	39
Water Taxi	3	4	7
Freight	1	1	2
Commercial Fishing	15	22	37
Other/Not Specified	2	4	6
Total	110	163	273

Source: Data provided by harbor, 2024

3.4.9.2.2 Large Vessel Moorage Demand Growth

Reserve moorage is not available at Homer Harbor for large vessels over 85 feet long. Transient moorage is available at daily, monthly, semi-annual, and annual rates. While overall purchases of moorage for large vessels have not shown a trend in recent years, there was a 60% increase in sales of annual transient moorage for large vessels between 2019 and 2023, which is the most recent data available at the time of this analysis.

Because large vessels do not have access to reserve moorage, annual transient moorage is the closest available substitute. This analysis treats annual transient moorage sales for large vessels as a proxy for reserve moorage demand. If the trend in annual transient moorage sales continues, this will be an increase of 14 large vessels over 20 years.

3.5 Built Environment

The built environment describes the existing and planned federal and local projects and their associated operations and maintenance.

3.5.1 Homer Harbor

Examination of historical photographs and anecdotal accounts from the City of Homer indicate that prior to 1950, no small boat harbor existed on the Homer Spit (Figure 3-14). In the mid to late 1950s, local residents excavated a rudimentary harbor basin at the tip of the Spit (Figure 3-15).

Figure 3-14. Homer Spit Prior to Harbor, November 1950

Source: Homer Aerials, photo by Bewn Garland (National Archives 2025)

Figure 3-15. Homer Spit Rudimentary Harbor, March 1957

Source: Homer Aerials, photo by Hermann Kurriger (National Archives 2025)

USACE constructed improvements in 1961–1962 under the River and Harbor Act of 1958, and also reconstructed the harbor after the Good Friday Earthquake of 1964. The City of Homer and State of Alaska further extended the harbor in 1968 and 1970. By 1984, the harbor fleet had outgrown the available capacity, and a major harbor expansion project was initiated. USACE expanded the harbor basin from 16.5 acres to the 50-acre footprint that is still in use today. The dredged material disposal area from the 1984 expansion was developed into uplands. The entrance channel was deepened from -15 feet MLLW to -20 feet MLLW, and the channel width was reduced from 120 feet to 90 feet to accommodate the deepening. The breakwaters, including their alignment and rock structure, were not altered during the 1984 project and remain as originally constructed following the 1964 earthquake.

The harbor has 876 reserve slips and approximately 6,000 feet of transient moorage space. Amenities at the harbor include potable water, electricity, used oil collection, garbage and battery disposal, and fish cleaning tables. A sewage pump-out “eco barge” is made available seasonally.

Table 3-27. Homer Harbor Features and Dimensions

Feature	Length (feet)	Depth MLLW (feet)	Width (feet)
Outer Entrance Channel	700	-20	Varies
Inner Entrance Channel	850	-20	90
Maneuvering Channel	2790	-20, -15, -10	100
Basin (50 acres)	2985	-20, -15, -10	720
Main Breakwater	1018	—	—
Secondary Breakwater	238	—	—

3.5.1.1 Maintenance Dredging

Annual maintenance dredging is performed by the Federal Government for the outer and inner entrance channels, as well as at the USCG dock because of shoaling from littoral drift of material moving around the Spit, and the sloughing of material from the southwest shore of the entrance channel. The maneuvering channel, maintained at depths of -20, -15, and -10 feet MLLW, requires dredging far less frequently. All other portions of the mooring basin are maintained by the NFS. The current dredged material placement map is shown in Figure 3-16.

Figure 3-16. USACE Dredging and Placement Map

3.5.1.2 Float Systems

The Float Systems are the infrastructure that provides moorage for vessels. The float systems are organized by vessel size. Of significant note is the float system for transient vessels over 85 feet in length, also known as System 5. There is no permanent moorage for vessels of this size. As noted in Section 2.1, rafting puts excess strain on these float systems. This accelerates the degradation of the float systems. System 5 experiences particular strain as the rafted vessels are of much larger size. Harbor staff estimate that the float system for large transient vessels would need to be replaced by 2035.

3.5.1.3 Boat Launch

The Boat Launch is primarily used to launch and haul out seasonal use vessels. It is primarily used by recreational boaters. Day-use passes and seasonal passes are both available for purchase. In 2023, there were 7,299 passes sold, 356 (4.9%) of which were season passes.

Users may launch once at the beginning of summer and keep their boat in a reserve slip or in transient moorage until fall or may only use the harbor once and then trailer their boat again. The harbor does not record user information for sales of daily passes, so day pass user frequency cannot be determined. However, as season passes are equivalent in price to 10-day passes, it can be inferred that users who purchased season passes expected to launch their boats at least 10 times.

3.5.1.4 Barge Ramp

The Barge Ramp is used by “landing craft” style vessels to load gear and freight. Landing craft are a type of shallow-draft vessel that can be beached in order to load and unload and are particularly useful for moving freight in smaller communities that do not have extensive port infrastructure. Vessels of this type are frequently used to deliver freight to small communities along the western Alaskan coast or along the larger rivers, as many communities are not accessible by road.

3.5.1.5 Fuel Docks

Homer Harbor has two fuel docks. Of these, the larger primary dock is kept open consistently, while the smaller dock is sometimes unavailable if the company that operates them, Petro Marine, is understaffed. The primary fuel dock is frequently congested, especially between 3:00 p.m. and 6:00 p.m. When large vessels dock for fuel, they may block much of rest of the dock and will do so for a longer time, as larger vessels take on more fuel. Delays at the fuel dock are common, and the increased traffic created by boats queuing can increase the risk of accidents. This is exacerbated by the location of the fuel docks near the mouth of the harbor, where vessels queuing for fuel must avoid vessels entering and exiting the harbor, and the wakes they create.

3.5.1.6 Fish Dock

The Fish Dock (Figure 3-17) is 382 feet long with a depth of -20 feet at MLLW and a deck height above MLLW of 31 feet. It has six cranes that can lift up to 2.5 tons, and two cranes that can lift up to 5 tons. While it is used by commercial fishing vessels to offload fish, the Fish Dock is actually a multipurpose facility and is used by other working vessels to change gear, load supplies, and even replace parts for vessels. The Fish Dock is another congestion point in the harbor, and vessels may experience delays accessing it, or may be required to vacate the dock during usage to allow fish to be offloaded.

Figure 3-17. Vessel unloading at Fish Dock

3.5.1.7 Deep Water Dock

The Deep Water Dock is located outside the harbor. The dock has an inside, an outside, and a side berth. Mobile cranes can be driven out onto the dock to assist with loading gear. It is used by vessels too long or with too deep a draft to enter the harbor when they need to load gear, change crew, and/or conduct inspections.

3.5.1.8 Pioneer Dock

Pioneer Dock, also located outside the harbor, is primarily used by the *Tustumena*, a ferry vessel operated by the Alaska Marine Highway System. When the *Tustumena* is not in Homer, the harbor is able to utilize its berth for large vessels as they do with the Deep Water Dock; however, the ferry has priority usage and other vessels must be scheduled around it. Because of this preferential use, and because the ferry does not otherwise interact with the harbor, it is not impacted by harbor conditions and is not considered further in this analysis.

Pioneer Dock is also used by the USCG vessel *Aspen*, a 225-foot-long buoy tender that is permanently stationed in Homer. Pioneer Dock has a fuel header, and large vessels that cannot fuel inside the harbor may fuel there, or have fuel trucked to them at the Deep Water Dock if Pioneer Dock is not available.

3.5.2 Sterling Highway – Alaska Route 1

3.5.2.1 Existing Condition

The road that connects the Harbor to the mainland runs along the Homer Spit and terminates at the ferry terminal near Pioneer Dock. This is the only road that connects the harbor and mainland. It is necessary for all economic activity on the Spit and serves as an essential tsunami evacuation route. This stretch of road is part of Sterling Highway and Alaska Route 1. Since its construction in 1927, the inshore half of the two-lane roadway has been a continual source of maintenance problems. Severe storms accompanied by high water levels and wave action have overtopped and washed out stretches of the roadway causing the road to be closed or partially closed for major repairs on several occasions (Figure 3-18).

There have been several erosion mitigation projects completed and more are planned for the future. USACE constructed a rock revetment in 1994 that was extended in 1998 to its current length of 4,830 feet. This revetment impacted the area south of the rock revetment along the Spit. The Alaska Department of Transportation and Public Facilities (DOT&PF) armored that section of the highway under two emergency revetment projects. This area is still subject to occasional overtopping. A storm surge event on November 17, 2024 undercut the revetment wall and collapsed one lane of the highway, prompting a local disaster declaration and a State of Alaska Declaration of Disaster Emergency. The city finished all repairs and revetments in May 2025.

Figure 3-18. Highway partially collapsed after 2024 Storm Surge

Source: Photo by Homer City Manager, Melissa Jacobson

3.5.2.2 Future Condition

While the Spit and its infrastructure would continue to be threatened by erosion, the city and State would continue to act in a proactive manner to protect critical infrastructure. The City of Homer has listed additional erosion protection plans under their *2025–2030 Capital Improvement Plan* and will pursue funding and feasibility studies on the issue.

4.0 PLAN FORMULATION AND EVALUATION

The purpose of the Plan Formulation and Evaluation Section is to document how USACE developed and evaluated plans to meet project objectives.

4.1 Plan Framework

Planning for USACE Civil Works projects follows guidance from ER 1105-2-103: Planning Policy for Civil Works.

<u>Plan Formulation</u> is the process of building alternative plans that meet planning objectives and avoid planning constraints.

Alternatives are a set of one or more management measures functioning together to address the study objectives.

Management measures are features or activities that can be implemented at a specific geographic location to address one or more planning objectives.

Activities are defined as “nonstructural” actions.

Features are “structural” elements that require construction or assembly on-site, further subdivided into General Navigation Features and Local Service Facilities.

General Navigation Features (GNF) are necessary for the physical movement of vessels. Typical GNFs include: harbor and waterway channels such as entrance channels, main channels, and channels that connect harbor entrances with facilities; jetties and breakwaters; maneuvering basins; dredged material placement facilities, and; ice control structures.

Local Service Facilities (LSF) are the infrastructure necessary for navigation projects to obtain the benefits associated with that project. The full cost of LSFs are the responsibility of the local sponsor. Typical LSFs include: piers, wharves, floats, berthing, moorage, anchorage areas, recreation facilities such as boat ramps, parking, public access areas, restrooms, and utilities.

USACE received public input on project location, management measures, and alternatives during the public charrette held in Homer on May 17–20, 2023.

Plan formulation was carried out through the USACE Planning Process described in Section 1.2 to meet the Problems, Opportunities, Objectives, and Considerations detailed in Sections 2.1–2.4. Formulation began by identifying all possible measures that could, in whole or in part, address the study objective. Measures that met that standard were then arranged in various combinations to create alternative plans. This initial array of alternative plans was screened using the national evaluation criteria detailed in Section 2.5.

This initial array was further refined as USACE gathered data regarding the current fleet of vessels that call on Homer Harbor. By identifying the fleet, USACE was able to scale alternatives to meet specific objectives. Formulation focused on creating the smallest alternative that would meet the most pressing needs for navigation efficiency, safety, and community benefit, and designing subsequent alternatives at larger scales to address specific objectives.

The most pressing issue for Homer Harbor is overcrowding for transient vessels over 85 feet in length. Vessels of this size do not have permanent moorage, and overcrowding directly impacts the maneuvering channel used to traverse the harbor. Overcrowding induces navigation inefficiencies and safety risks for all vessel sizes, but this issue is more pronounced for vessels over 85 feet in length. Alleviating the overcrowding for vessels of this size was identified as a minimum requirement for meeting planning objectives. Alternative 1a and Alternative 1b were designed to address this minimum requirement.

While these alternatives meet the needs of current harbor users, they only partially address the needs for *all* potential users. To more adequately meet the opportunity to increase moorage facilities for large and small vessels, and to meet the needs of all users over the period of analysis, two subsequent alternatives were identified. Alternative 2 addresses the moorage needs of vessels on the waitlist for permanent moorage for Homer Harbor. Alternative 3 includes moorage not just for current needs of the harbor, but for the projected harbor growth over the next 20 years.

4.2 Site Selection

Three potential harbor locations other than the Homer Harbor were identified during the charrette and considered in the initial alternative screenings: Diamond Creek area, East of the Homer Airport, and the natural harbor at the city of Seldovia (Figure 4-1).

Figure 4-1. Harbor Expansion Sites Considered

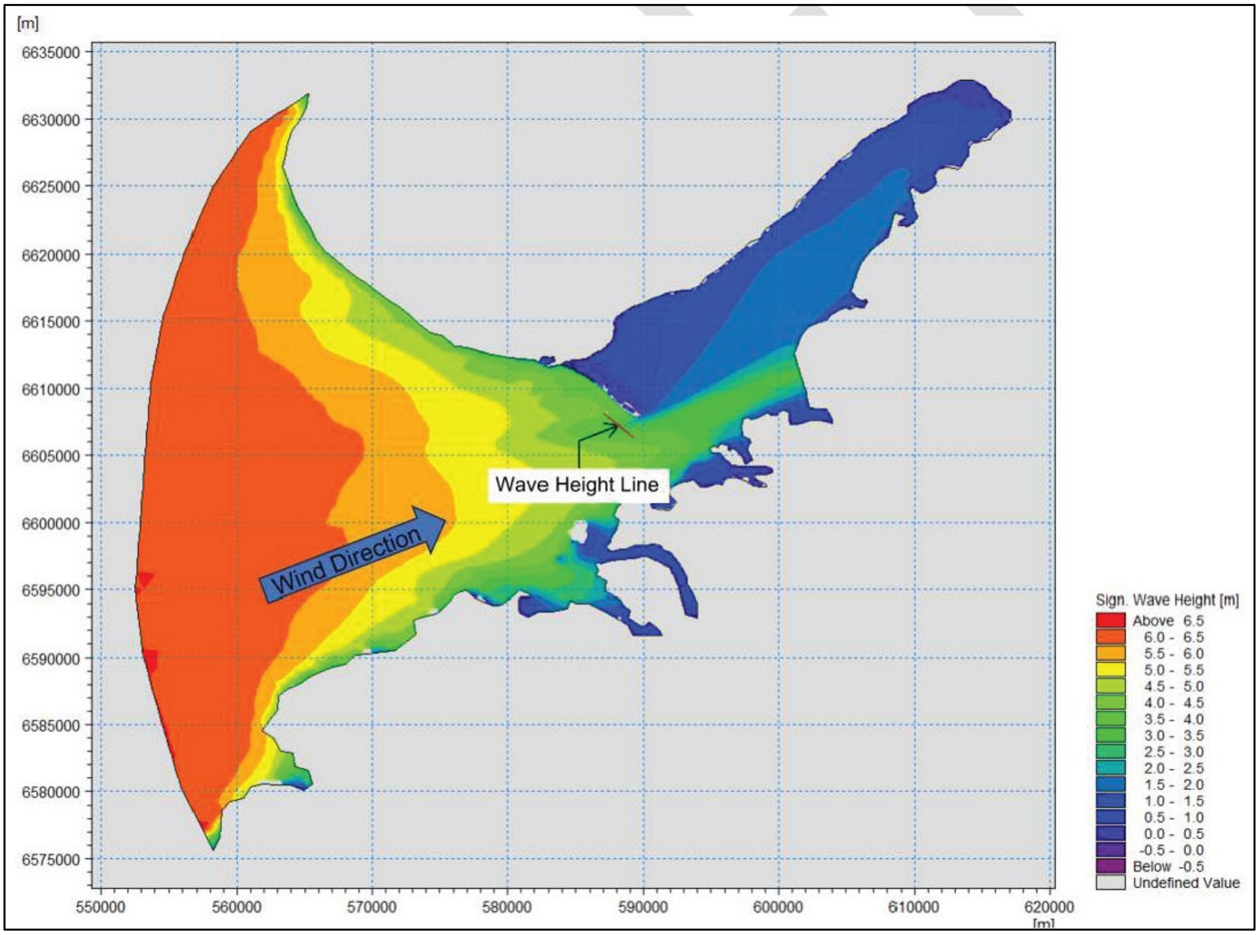
All locations aside from Homer Harbor were screened out due to their unsuitability. Diamond Creek is an undeveloped area west of Homer. Compared to other site locations, it would have significantly more environmental impacts and costs due to the need to construct associated infrastructure. The area East of the Homer Airport is not near deep water and would require a costly causeway to be constructed. Seldovia is outside the city limits and not connected with the sponsor of this project. It also is not on the Alaska road system which is one of the primary drivers of moorage demand in Homer.

Table 4-1. Screening of Harbor Locations

Site Location	Carried Forward	Screening Comments
New harbor at Diamond Creek	**No**	• Parts of the area around Diamond Creek under environmental protections, others are privately owned. • Concerns about erosion and disruption of long shore transport of sediments
New harbor east of Homer Airport	**No**	• Requires a road out to the site and a long causeway out to water of appropriate depth. • Would cause inefficiencies to marine trades businesses by separating their client base into two locations.
New harbor at Seldovia	**No**	• Outside City limits • Historical natural harbor • Not on the road system.

The area immediately adjacent to the existing harbor between the fishing lagoon and the Deep Water Dock was identified as the most suitable location for potential expansion. The Spit provides natural shelter from extreme weather entering from Cook Inlet, where wave heights are substantially greater than those on the protected Kachemak Bay side (Figure 4-2). Because breakwater quantities and armor stone sizing are major cost drivers for the project, even a modest reduction in design wave height can translate to significant cost savings. In addition, proximity to the existing Homer Harbor is expected to lower costs associated with required LSF.

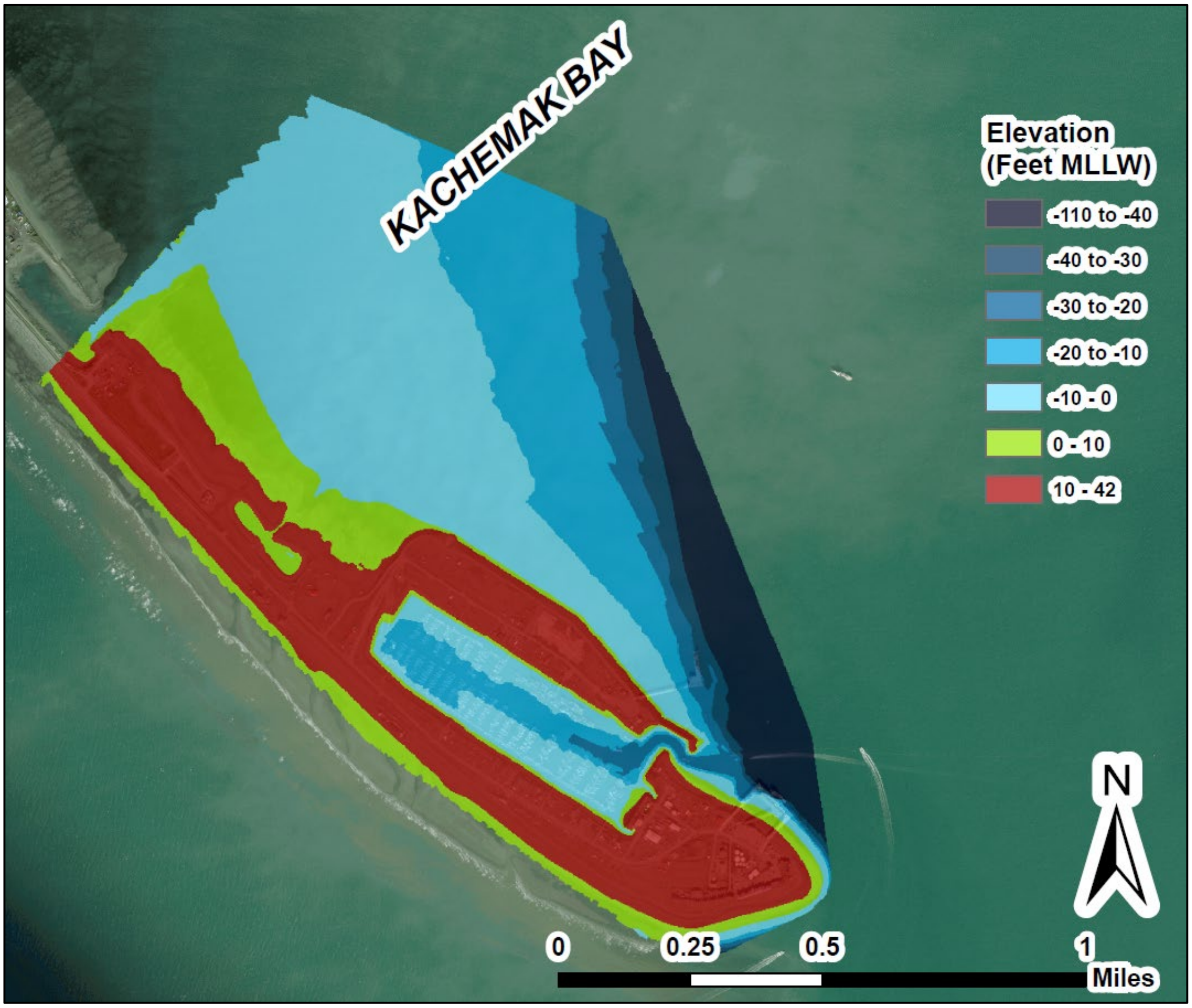
Figure 4-2. Wave Heights for Extreme Weather Conditions



Source: HDR Metocean Baseline Conditions Report (Appendix A: Hydraulics & Hydrology, Attachment A)

Along the east side of the Spit, a broad shelf extends from the tip of the spit to Mud Bay, generally ranging between the 0 and -20-foot MLLW contours. To reduce breakwater construction costs associated with deeper water, harbor alternatives were designed within this -20-foot and shallower zone (Figure 4-3).

Figure 4-3. Depths at the Proposed Project Site



4.3 Management Measures

4.3.1 Non-Structural Measures

There were three nonstructural measures identified during the charrette and evaluated further in PDT meetings. Harbor float restructuring was carried forward, while use of natural tides or a traffic management system was not. Harbor float restructuring was deemed to be effective when combined with other measures, but not effective without expanding the harbor.

Table 4-2. Non-structural measures and initial screening

Non-Structural Measures	Carried Forward (Yes/No)	Screening Comments
Harbor float restructuring	Yes	Can be optimized along with harbor expansion.
Use of natural tides	No	Does not address navigation inefficiencies

Non-Structural Measures	Carried Forward (Yes/No)	Screening Comments
Use of traffic management system	No	Currently already used by Harbor Staff

4.3.2 Structural Measures

All structural measures identified during the charrette were carried forward with the exception of floating breakwaters. This alternative was eliminated after being deemed ineffective for the project location due to the wave climate and harbor depth. Generally, floating breakwaters are only considered a cost-effective solution in mild wave conditions, such as those with a 4-foot height and a 4-second period (ERDC 2025). Design wave requirements for this project are significantly greater than conditions acceptable for a floating breakwater.

Additionally, with breakwater depths in most areas being relatively shallow at -5 to -20 feet MLLW, floating breakwaters were determined to be unsuitable. Tides fall to 0 to -6 feet MLLW nearly 5% of the time, which would cause a floating structure to ground in the project area. A list of initial structural measures is found in Table 4-3.

Table 4-3. Structural Measures and Initial Screening

Measures	Carried Forward (Yes/No)
GNF – Structural	
Aquatic organism passage (AOP)	No
Dredging	Yes
Entrance Channel	Yes
Floating breakwater	No: Inefficient for wave climate; Ineffective for harbor depth
Non-floating structure breakwater	Yes
Rubble-mound breakwater	Yes
Turning basin	Yes
LSF – Structural	
Boat launch	Yes
Boat wastewater disposal facility	Yes
Cargo loading infrastructure	Yes
Coast Guard berthing space	Yes
Docks	Yes

Measures	Carried Forward (Yes/No)
Float system	Yes
Harbor support facilities- fuel, potable water, electricity, sewage disposal, dock facilities	Yes
Moorage basin dredging	Yes
Uplands	Yes

4.4 Initial Array of Alternatives

Thirteen different alternatives were identified during the public charrette. Some of these alternatives have been grouped together based on scalable measures. Alternatives were developed with a focus on putting measures together in various combinations. The initial array of alternatives, after conducting an initial screening, consisted of five alternatives in addition to the No Action alternative. Alternative descriptions and screening comments are found in Table 4-4.

Table 4-4. Initial Alternative Screening

Alternative Description	Carried Forward	Screening Comments
Alternative 0: No Action	Yes	• Baseline Alternative
1a: Enclosed basin, minimal footprint (no uplands)	Yes	• Addresses planning objectives • Cost effective
1b: Enclosed basin, moderate footprint (uplands)	Yes	• Addresses planning objectives • Allows for uplands and associated benefits
1c: Enclosed basin (extended), moderate footprint (uplands)	Yes	• Addresses planning objectives • Allows for harbor expansion to accommodate future fleet growth
1d: Enclosed basin (crescent), maximum footprint	Yes	• Addresses planning objectives • Allows for harbor expansion to accommodate future fleet growth • Allows inclusion of significantly larger vessels • Allows significant space for expansion of uplands
2: Detached breakwater	Yes	• Addresses planning objectives
3a: Floating breakwaters with enclosed basin	No	• Addresses planning objectives • May allow more cost-effective alternatives to rubble-mound construction, dependent upon depth • Inefficient for wave climate • Ineffective for harbor depth

Alternative Description	Carried Forward	Screening Comments
3b: Floating breakwater and non-floating breakwater	No	• Addresses planning objectives • May allow more cost-effective alternatives to rubble-mound construction dependent upon depth. • Inefficient for wave climate • Ineffective for harbor depth
4: Material removal and inside harbor modification	No	• Provides insufficient additional moorage to address overcrowding and inefficiency issues • Not Cost effective; high cost to NFS for minimal additional moorage
5a: New harbor at Diamond Creek	No	• Parts of the area around Diamond Creek are under environmental protections, others are privately owned. • Concerns about erosion and disruption of longshore transport of sediments
5b: New harbor east of Homer airport	No	• Requires a road out to the site and a long causeway out to water of appropriate depth • Requires an additional harbormaster's office and staff • Very high NFS costs due to all-new LSF infrastructure • Would cause inefficiencies to marine trades businesses by separating their client base into two locations
5c: New harbor at Seldovia	No	• Outside city limits
6: Enclosed basin, external small boat harbor	No	• Repurposing the current harbor for large vessels would require significant changes to inner harbor dock and float configuration • Inner harbor would require more dredging to accommodate larger vessels
7: Nonstructural float optimization	No	• May increase harbor efficiency for some users but would make it unusable for others depending on boat type • Would not address other planning objectives

4.5 Focused Array of Alternatives

The initial array of alternatives that were carried forward were further refined after analysis of the fleet spectrum to be optimized to target specific objectives and opportunities. A fleet spectrum analysis was conducted and each alternative was paired to either the existing or anticipated fleet in Homer. Fleet considerations were limited to vessel sizes that currently call on Homer Harbor.

The NFS identified the primary design vessel as the largest vessel that would use the harbor in a FWP. This vessel, an oil rig tender named the *Perseverance*, operated by Cook Inlet Spill Prevention and Response (CISPRI ;Figure 4-4), has an LOA of 207 feet, a 40-foot beam, and a draft of 14.3 feet. It currently treats Homer as its home port but cannot enter the existing harbor due to its size. The Harbormaster indicated this vessel would have a permanent berth in the TSP.

The dimensions for *Perseverance* and three other large local vessels that could also use the harbor are shown in Table 4-5. These other vessels were used to validate specific design features, such as using the *Ross Chouest* for design depths and the *Unalaq* for channel widths, ensuring the harbor can accommodate them as well. While their future use is not guaranteed, these vessels represent the size and type of other large vessels active in the region that could be serviced by the new harbor.

Figure 4-4. CISPRI *Perseverance* – Design Vessel

Source: CISPRI webpage (CISPRI 2024)

Table 4-5. Large Vessel Dimensions

Vessel Name	Type of Vessel	Length (feet)	Beam (feet)	Draft (feet)
CISPRI *Perseverance*	Oil Response	207	40	14.3
Unalaq	Landing Craft	150	50	6.5
Ross Chouest	Tug	120	35	19
USCG *Aspen*	Cutter	225	46	13

All alternatives include an entrance channel design with a width of 215 feet and a depth of -26 feet MLLW. This allows two large vessels up to 40 feet wide to pass safely, and a 7-foot under-keel clearance for the deepest draft vessel, the *Ross Chouest.*

As data on potential impacts was collected, the PDT added and screened measures accordingly. Alternatives were modified to include the minimum uplands required for parking and other activity to avoid impacting the congested conditions at the harbor and potentially disrupting the functions of the current harbor.

The detached breakwater alternative was screened out as analysis progressed to the focused array. The objective of this alternative was to offer passage for aquatic organisms. Further evaluation showed that sediment could enter the harbor through the required gap, construction costs would be higher compared to a shore-connected breakwater, and that mitigation to provide benefits for aquatic organisms could be provided through other measures.

The boat launch, crane dock, and coast guard berthing space LSF measures were also not included in any alternatives in the focused array. The boat launch, crane dock, and USCG berthing space measures were determined to have significant costs. During consultation with USCG they were unable to commit to using such facilities. As the benefits for this measure were uncertain, the PDT removed it from all alternatives. The cargo loading infrastructure could be incorporated into the harbor by the NFS at a future date as necessary. The resulting focused array of alternatives is described in Table-4-6.

Table-4-6. Focused Array of Alternatives

Alternative	Major Alternative Features
0: No Action Alternative	
1a: Large Transient Vessel Harbor	• Alleviates overcrowding of larger vessels with lengths between 85 and 225 feet • 8-acre moorage basin • 1 acre of uplands • 64 large vessels accommodated in expanded harbor • Current harbor reconfiguration accommodates 239 vessels with lengths under 32 feet
1b: Transient Vessel Harbor	• Alleviates overcrowding in current harbor • 33-acre moorage basin • 3 acres of uplands • 116 vessels accommodated in outer harbor • Current harbor reconfiguration accommodates 239 vessels with lengths under 32 feet
2: Transient and Waitlisted Vessels Harbor	• Alleviates overcrowding and accommodates current moorage waitlist • 37-acre moorage basin • 6 acres of uplands • 304 vessels accommodated in expanded harbor • Current harbor reconfiguration accommodates 239 vessels with lengths under 32 feet

Alternative	Major Alternative Features
3: Transient, Waitlisted, and Projected Vessels Harbor	• Alleviates overcrowding, accommodates current moorage waitlist, and projected fleet growth over the next 20 years • 50-acre moorage basin • 13 acres of uplands • 779 vessels accommodated in expanded harbor • Current harbor reconfiguration accommodates 239 vessels with lengths under 32 feet

4.6 Final Array of Alternatives

The focused array of alternatives was developed before geotechnical investigations were complete. Therefore, the initial design assumed subsurface conditions were similar to those at the Valdez commercial boat harbor, a USACE project constructed in 2017. The geotechnical investigation of the study area performed in October 2025 revealed that actual site conditions contain softer, siltier material than previously assumed.

The PDT had assumed that dredged material from the project could be used to create uplands. However, the material in the project footprint is not suitable for upland conversion. Transporting material to create uplands would result in a significant increase in project costs. The alternatives were reformulated to not include uplands and to accept potential impacts from increased vehicle parking on the Spit. This action is preferable as those impacts can potentially be mitigated through actions taken by the City of Homer, if necessary.

The breakwater also underwent design alterations due to data from the geotechnical investigations. Breakwater alignment remained the same across all alternatives, but the breakwater toe on the seaward side was widened from 15 to 20 feet to increase stability.

Table 4-7. Final Array of Alternatives

Alternative	Major Alternative Features
0: No Action Alternative	
1a: Large Transient Vessel Harbor	• Alleviates overcrowding of larger vessels with lengths between 85 and 225 feet • 8-acre moorage basin • 64 large vessels accommodated in expanded harbor • Current harbor reconfiguration accommodates 239 vessels with lengths under 32 feet
1b: Transient Vessel Harbor	• Alleviates overcrowding in current harbor • 33-acre moorage basin • 116 vessels accommodated in outer harbor • Current harbor reconfiguration accommodates 239 vessels with lengths under 32 feet

Alternative	Major Alternative Features
2: Transient and Waitlisted Vessels Harbor	• Alleviates overcrowding and accommodates current moorage waitlist • 37-acre moorage basin • 304 vessels accommodated in expanded harbor • Current harbor reconfiguration accommodates 239 vessels with lengths under 32 feet
3: Transient, Waitlisted, and Projected Vessels Harbor	• Alleviates overcrowding, accommodates current moorage waitlist, and projected fleet growth over the next 20 years • 50-acre moorage basin • 779 vessels accommodated in expanded harbor • Current harbor reconfiguration accommodates 239 vessels with lengths under 32 feet

4.6.1 Common Alternative Features

All alternatives other than the No Action Alternative are harbors located on the northeast side of the existing harbor. The harbor basin would be protected by a rubble-mound breakwater. The breakwater would be constructed to an elevation of +30 feet MLLW, matching the height of the existing harbor breakwaters. Access to the harbor is provided by dredging a 215-foot-wide entrance channel to a depth of -26 feet MLLW, with the adjoining fairway and mooring area dredged to -24 feet MLLW.

The System 5 float in the existing harbor, designed for large transient vessels, would be removed and replaced with a new float system providing moorage for 40 vessels at 24 feet in length and 132 vessels at 32 feet in length. Supporting LSF for the harbor include a new float system for the expanded basin (complete with gangways, finger floats, and electrical utilities) and the construction of a new fuel dock.

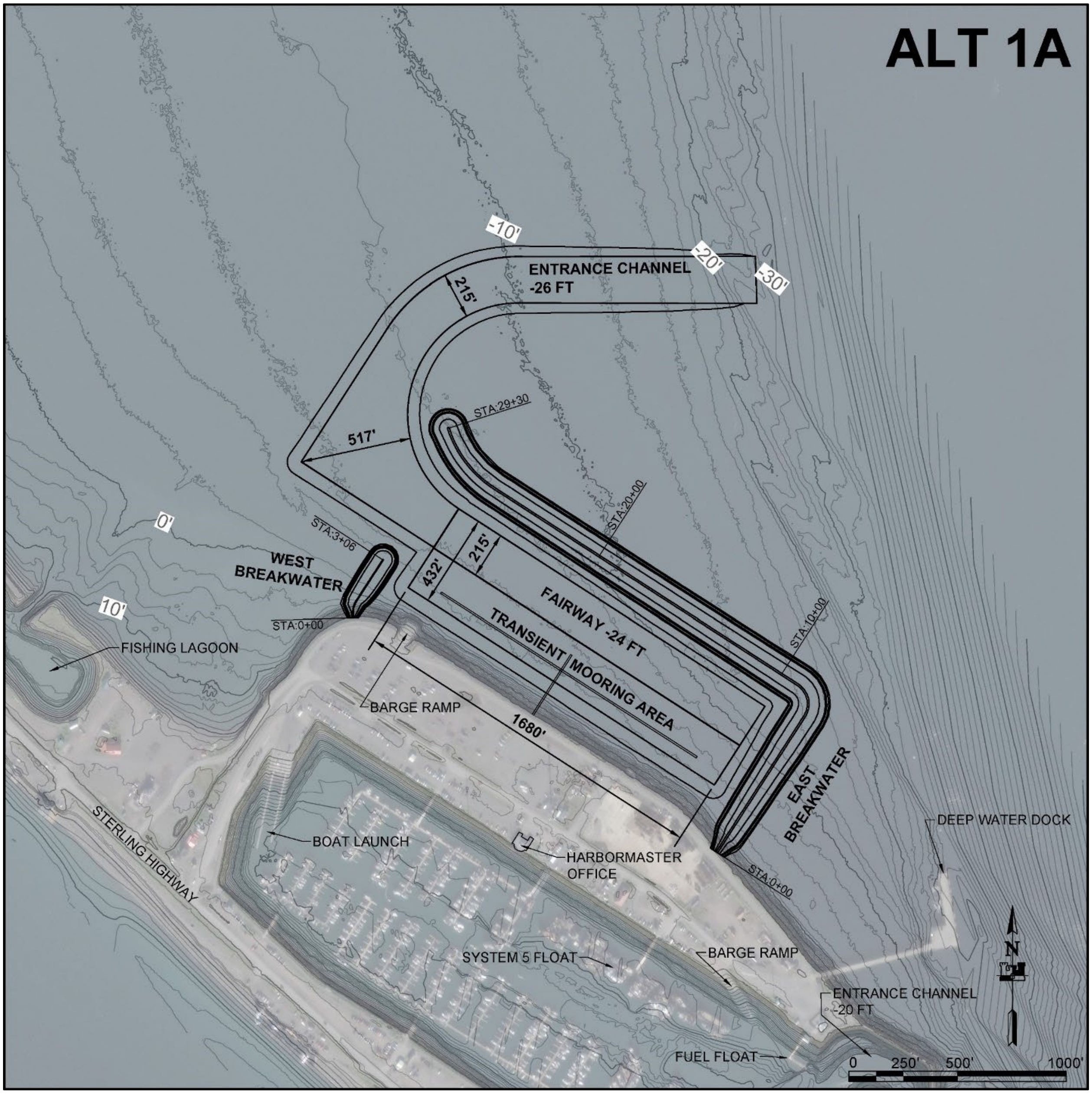
4.6.2 No Action Alternative

No federal action would be taken and conditions would remain as described in the FWOP condition.

4.6.3 Alternative 1a: Large Transient Vessel Harbor

Alternative 1a (Figure 4-5) addresses the large transient vessel fleet, which includes vessels between 85 and 225 feet in length. The expanded harbor would accommodate 64 large vessels. This alternative proposes the construction of an 8-acre transient mooring area. The east and west breakwater sections total approximately 3,200 feet.

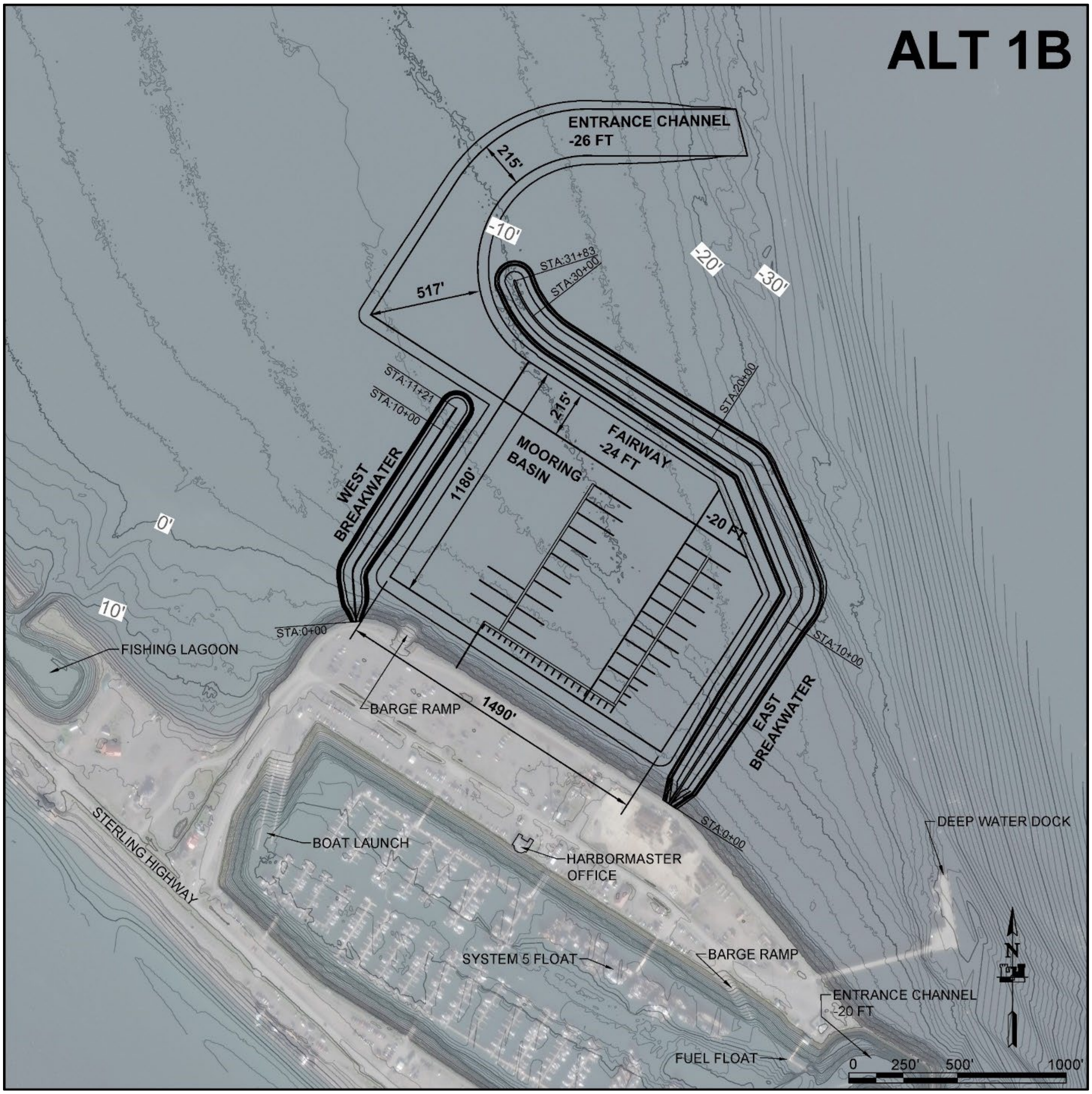
Figure 4-5. Alternative 1a



4.6.4 Alternative 1b: Transient Vessel Harbor

Alternative 1b (Figure 4-6) addresses the entire transient vessel fleet, including both the large vessels from Alternative 1a and the transient vessels under 85 feet that utilize the existing harbor. The expanded harbor would accommodate 116 vessels. This alternative proposes the construction of a 33-acre transient mooring area. The east and west breakwater sections total approximately 4,300 feet.

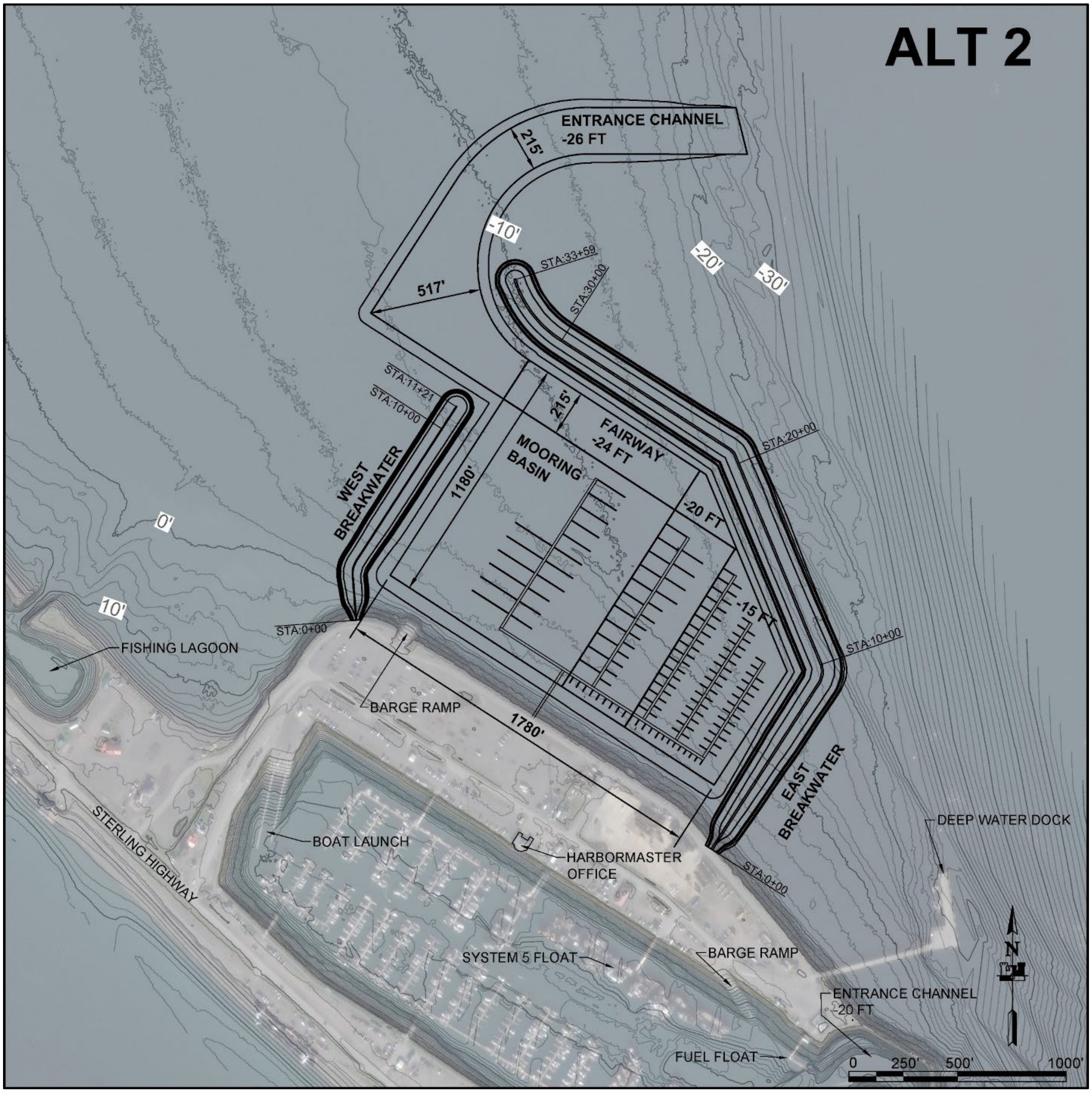
Figure 4-6. Alternative 1b



4.6.5 Alternative 2: Transient and Waitlisted Vessels Harbor

Alternative 2 (Figure 4-7) addresses the current moorage waitlist in addition to the entire transient fleet from Alternative 1b. The expanded harbor would accommodate 304 vessels. This alternative proposes the construction of a 37-acre transient mooring area. The east and west breakwater sections total approximately 4,500 feet.

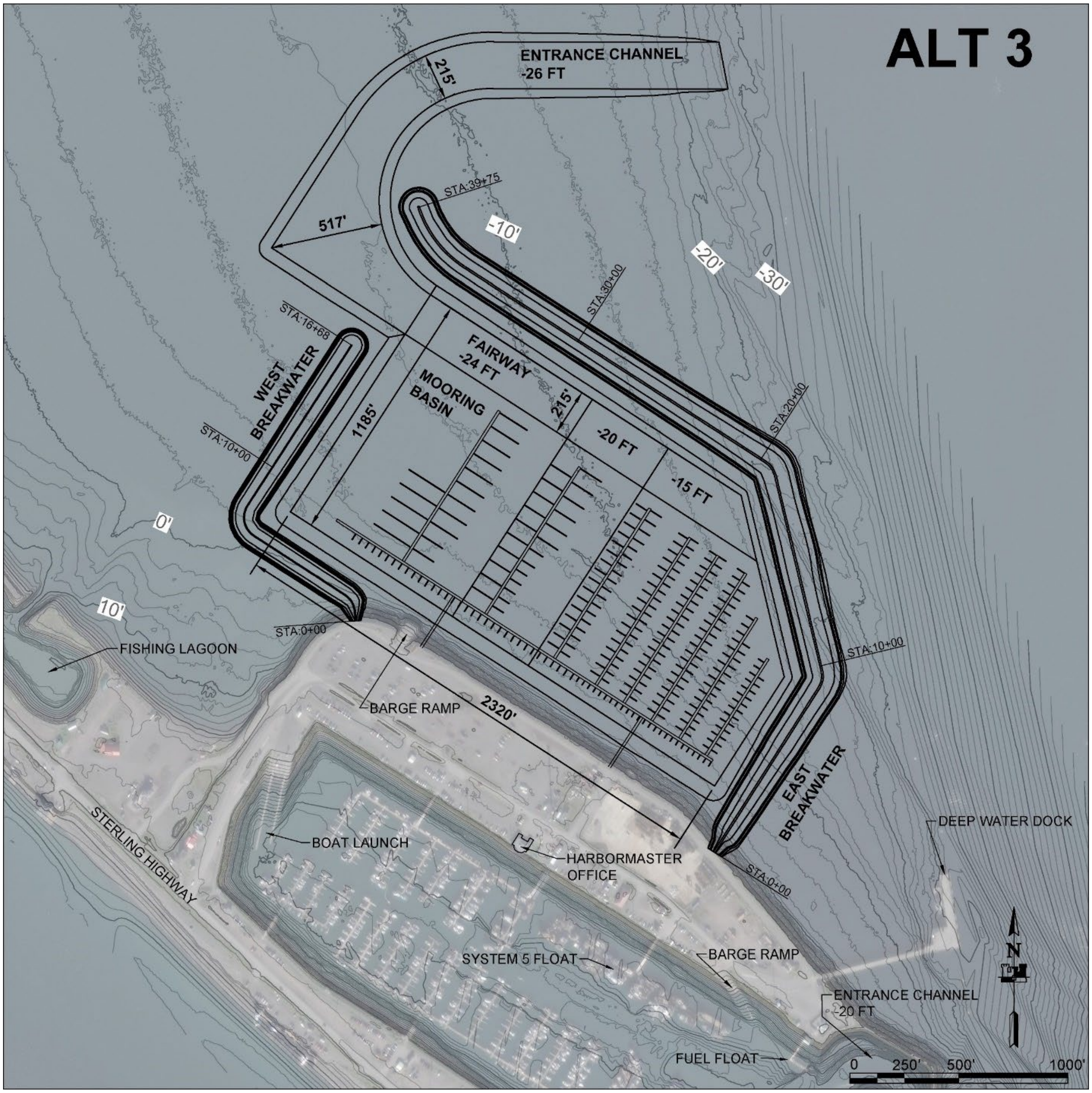
Figure 4-7. Alternative 2



4.6.6 Alternative 3: Transient, Waitlisted, and Projected Vessel Harbor

Alternative 3 (Figure 4-8) addresses projected fleet growth over the next 20 years in addition to the vessel groups included in Alternative 2. The expanded harbor would accommodate 779 vessels. This alternative proposes the construction of a 50-acre transient mooring area. The east and west breakwater sections total approximately 4,600 feet.

Figure 4-8. Alternative 3



4.7 Assumptions

This section documents key assumptions made by the PDT used in the planning process. These assumptions potentially impact alternative design and selection.

The following assumptions were made in forecasting the fleet growth over the period of analysis.

- Waitlist growth will continue at a rate similar to its historical rate between now and the beginning of the period of analysis (2034).
- The rate of waitlist growth will slow in the FWOP in the period of analysis and is not projected past 20 years from the year of most recent data (2023).
- Growth in the fleet based on the waitlist mirrors the existing reserve fleet user group distribution by vessel size.
- Under current conditions, on average, 40% of waitlisted vessels utilize transient moorage. This percentage is assumed to continue in the FWOP.
- RSLC will occur between the bounds of the predicted low and high scenarios.

If the rate of growth is faster than projected crowding, vessel delays, and vessel damages will worsen more quickly and/or more severely than expected. Conversely, if growth is slower than projected, crowding, delays, and damages in the FWOP will be overestimated in this analysis. If growth in the fleet does not mirror the existing reserve fleet, costs will be over or underestimated for different user groups. If fewer than 40% of waitlisted users utilize transient moorage, delay costs will be overestimated in this analysis, but if more than 40% of waitlisted users utilize transient moorage, delay costs will be underestimated.

Access to the harbor by land is possible by a single road that is routinely impacted by erosion as documented in Section 3.5.2. There have been a series of mitigation measures conducted by federal, state, and local efforts. It is assumed that these efforts will continue as erosion impacts arise and that access to the harbor will not be impacted.

The breakwater heights and navigable depth were evaluated based on the range of low, medium, and high RSLC scenarios projected over the 50-year project life. The analysis assumes that actual future RSLC will fall within the bounds of these scenarios.

4.8 Plan Evaluation

As initially described in Section 2 and Section 3, the USACE planning process is driven by comparison of the FWOP condition and FWP conditions. The FWP conditions are further evaluated by how well they solve identified problems, achieve opportunities, meet objectives, and avoid constraints. They are also evaluated against the National Evaluation Criteria. This section describes the process USACE used for this analysis and the results. A more detailed discussion of the FWP and environmental consequences is found in Section 5.

4.8.1 Hydraulic Analysis

HDR performed the wave modeling for this project using the total water level provided by USACE, which included tide, RSLC, and extreme water level components. The modeling suite included several MIKE 21 models: the Spectral Wave (SW FM) model to simulate regional waves, the Hydrodynamic (HD FM) model for tidal and storm surge dynamics, and the Boussinesq Wave (BW) model to simulate waves in and around the harbor. USACE performed a simplified wind-wave analysis and a comparative analysis of the existing breakwaters for verification. The resulting 2% Annual Exceedance Probability (AEP) design wave was then used to determine key harbor design elements, including breakwater height, length, and rock size, as well as the entrance channel width, depth, and turn radius.

4.8.2 Geotech Analysis

A geotechnical site investigation was conducted for this feasibility study and included eight boreholes ranging in depth from 22 to 82 feet below mudline. This investigation, combined with a suite of laboratory testing, was used to inform the geotechnical design and analysis. Geotechnical analyses pertaining to liquefaction induced settlement and lateral spreading, bearing capacity, consolidation/settlement, slope stability, and seismic stability were performed.

4.8.3 Alternative Plan Costs

USACE Alaska District cost engineers developed Rough Order of Magnitude (ROM) cost estimates for the alternatives, including construction and maintenance costs. The Cost Engineering Appendix D details the procedures and assumptions used to calculate these estimates. Cost risk contingencies were included to account for uncertainty. Project costs are in FY 2026 dollars.

Preconstruction Engineering and Design (PED) is expected to occur over a 36-month period. Construction is expected to occur over 3 years consisting of 6–8-month construction seasons, with construction complete by the end of calendar year 2033. These assumptions inform the interest during construction calculations. Initial Cost calculations currently assume three seasons for Alternative 1a, four seasons for Alternative 1b and 2, and five seasons for Alternative 3. BCR calculations currently assume three seasons with construction periods of four months for all alternatives. These assumptions will be revalidated and reconciled prior to the release of the final report.

Interest during construction (IDC) refers to the opportunity cost of capital incurred during the construction period. This is not considered a financial cost but is an NED cost.

Operations, Maintenance, Repair, Rehabilitation and Replacement (OMRR&R) costs were developed by Cost Engineering according to maintenance intervals determined by Hydraulics and Hydrology. OMRR&R for all alternatives is composed of rock replacement and maintenance dredging costs. Maintenance dredging consists of three components: mobilization and demobilization, a dredge survey, and dredging.

Costs are discounted to a base year and annualized to allow comparison with average annual benefits. Costs used in the benefit-cost analysis, also called NED costs or economic costs, differ slightly from those detailed in the Cost Engineering Appendix as NED costs include initial construction costs, interest during construction, and OMRR&R costs. The economic costs of each alternative are shown in Table 4-8.

Table 4-8. Economic Cost Summary by Alternative

Cost Component	Alt 1a	Alt 1b	Alt 2	Alt 3
Project First Costs	$303,204,000	$389,404,000	$402,124,000	$478,014,000
LSF	$23,844,000	$72,181,000	$89,952,000	$125,218,000

Cost Component	Alt 1a	Alt 1b	Alt 2	Alt 3
IDC	$16,931,000	$23,591,000	$25,101,000	$30,604,000
OMRR&R	$86,251,000	$87,009,000	$86,246,000	$86,546,000
Total Economic Cost	$430,230,000	$572,185,000	$603,423,000	$720,382,000
AAEQ* Economic Cost	$17,523,000	$23,305,000	$24,578,000	$29,341,000

(Cost Engineering Cost Estimate, May 2026)
*AAEQ = Average Annual Equivalent

4.8.3.1 Alternative Plan Cost Risk

Due to the presence of soft to very soft compressible soils in the project area settlement of breakwaters would occur. Initial settlement analysis indicates potential settlement under the breakwaters between 4.3 to 12.1 feet. Some or all of the surcharge material (such as quarry spall) would fill the space between original mudline and the consolidated soils below the breakwater. This material quantity, required to compensate for the anticipated settlement, is not included in current cost estimates but will be included in the final Feasibility cost estimate. Rough order magnitude of potential increased costs due to settlement are from $30 to $120 million.

The increase in cost across alternatives is expected to be proportional with the length of the breakwaters. Relative changes in cost would mostly be in line with relative costs currently presented. Considering the cost changes would reflect the relative length of the breakwater across alternatives, which is already the highest driver of project costs, the risk of changes in cost impacting plan evaluation and selection is low. Further information on settlement and mitigation is found in Section 7.7.1.

4.8.4 Summary of Accounts

USACE planning guidance establishes four accounts to facilitate and display the effects of alternative plans. Per ER 1105-2-103, the benefits of each alternative are evaluated according to four accounts: the National Economic Development (NED) account, the Regional Economic Development (RED) account, the Environmental Quality (EQ) account, and the Other Social Effects (OSE) account.

4.8.4.1 National Economic Development

The NED account assesses changes in the economic value of the national output of goods and services. FWP NED benefits are evaluated relative to the FWOP scenario, meaning that benefits to the project are the net difference between the FWP condition and the FWOP condition. Benefits are evaluated across a 50-year period of analysis at FY26 price levels and using the FY26 federal discount rate of 3.25%.

Benefit categories for the NED analysis are described below. These categories were evaluated for each alternative, and the results have been summarized. Benefits shown are Average Annual Equivalent (AAEQ) values, meaning the values are annualized across the period of analysis. The analysis of each benefit is discussed in greater detail in the Appendix C: Economics.

4.8.4.1.1 Recreation

Benefits to recreational harbor users were evaluated using the Unit Day method described in ER 1105-2-100, Appendix E, Section VII. Unit Day Values (UDVs) assess a water resource, in this case Homer Harbor and the Kachemak Bay area, in reference to five criteria: the recreation experience available at the location, the availability of other locations that can provide comparable recreational opportunities, the capacity of facilities at the resource, its accessibility, and environmental quality.

A focus group of recreational harbor users assessed each of these criteria and assigned point values. The sum of these points across criteria is associated with a dollar value as detailed in Engineering Guidance Memorandum (EGM) 26-03. This is considered the value per person-day of recreation at the water resource.

The Homer Port User Survey indicated average trips recreational users take annually, and the average number of people per trip to give the estimated number of person-trips per vessel per year. This is then multiplied by the recreational fleet and the UDV to find the estimated value of recreation at Homer Harbor, which is shown in Table 4-9. Recreational benefits increase in larger alternatives as more recreational vessels are able to access the harbor.

Table 4-9. FWP Expected Annual Value of Recreation at Homer Harbor

	Alt 1a	Alt 1b	Alt 2	Alt 3
AAEQ Recreation Vessel Benefits	$2,303,000	$2,312,000	$2,513,000	$4,084,000

Source: Focus group conducted October 2024; EGM 26-03

4.8.4.1.2 Fishing Charter Recreation

The UDV method can also be used to estimate the annual value of recreation to charter fishing passengers in Homer. Point assignments for UDV criteria were determined by a focus group of fishing charter operators. Passengers per charter and trips per year were also estimated from focus group responses. Recreational benefits for fishing charters increase in larger alternatives as more vessels are able to access the harbor and the number of annual passengers correspondingly increases. Fishing charter recreation benefits are shown in Table 4-10.

Table 4-10. FWP Expected Annual Value of Fishing Charter Recreation at Homer Harbor

	Alt 1a	Alt 1b	Alt 2	Alt 3
AAEQ Fishing Charter Recreation Benefits	$1,335,000	$1,366,000	$2,178,000	$3,559,000

Source: Port User Survey April 2024, Focus Group October 2024

4.8.4.1.3 Avoided Delays

This section discusses various delays experienced by harbor users and the money vessel operators could save if these delays were alleviated by an expanded and more efficient harbor. The majority of these delays are associated with rafting—the practice of having a vessel tie up to the side of another vessel rather than to the dock—which is common, especially when a harbor has insufficient transient moorage for its demand.

Other delays identified were fueling delays, assessed in this analysis for the water taxi user group, wind delays to the USCG vessel *Aspen*, and delays to large vessels entering the harbor.

In the FWP scenario, expanded transient moorage space alleviates the need for rafting and the delays associated with it, allowing vessels to operate more efficiently. It should be noted that because the fleet is expected to grow over the period of analysis, Alternatives 1a, 1b, and 2, which each accommodate part or all of the existing fleet, do not fully eliminate delay costs to users throughout the period of analysis; as the fleet grows, some crowding may return. Alternative 3, which accommodates future fleet growth, is expected to more fully alleviate crowding and associated delays throughout the period of analysis.

4.8.4.1.3.1 Fishing Charters

The Homer Port User Survey (2024) found that operators of fishing charter vessels estimated their rafting delays at 18.8 hours per vessel annually. In the FWP, as rafting is alleviated, these costs are reduced. The value of time for fishing charter vessels was estimated from operating cost data provided by focus group participants, including crew wages, fuel, and bait costs. These were used to calculate an hourly cost of time, which was multiplied by annual rafting delays experienced by the charter fleet. The expected value of avoided delays to charter vessels is shown by alternative in Table 4-11.

While Alternative 1a primarily alleviates delays to the large vessel fleet (over 85 feet in length), it also provides some additional reserve moorage for waitlisted vessels under 40 feet. This benefit category sees positive benefits under Alternative 1a when other benefit categories do not because some charter vessels that currently use transient moorage would gain access to reserve moorage and would no longer experience rafting delays in the FWP. These vessels offset expected fleet growth.

Table 4-11. FWP Expected Annual Value of Avoided Rafting Delays for Fishing Charters

	Alt 1a	Alt 1b	Alt 2	Alt 3
AAEQ Avoided Rafting Delay Costs to the Fishing Charter Fleet	$18,000	$24,000	$93,000	$164,000

Source: Focus groups, October 2024

4.8.4.1.3.2 Water Taxis

4.8.4.1.3.2.1 Rafting Delays

Focus group participants estimated that managing rafting took 10–15 minutes each morning and required 1–2 people per vessel. Participants stated that their businesses operate daily, year-round, but that they see a reduction in trips per day during the winter. This analysis estimates 350 days of operation per year, based on year-round operation with 15 days off per year for holidays and incidental maintenance. The hourly value of time for water taxis was estimated from operating cost data provided by focus group participants and passenger fares for the area advertised online. This value was multiplied by annual rafting delays experienced by the water taxi fleet. The expected value of avoided delays to water taxis is shown in Table 4-12.

While Alternative 1a primarily alleviates delays to the large vessel fleet (over 85 feet in length), it also provides some additional reserve moorage for waitlisted vessels under 40 feet. This benefit category sees positive benefits under Alternative 1a when other benefit categories do not because some water taxi vessels that currently use transient would gain access to reserve moorage and would no longer experience rafting delays in the FWP. These vessels offset expected fleet growth.

Table 4-12. FWP Expected Annual Value of Avoided Rafting Delays to Water Taxis

	Alt 1a	Alt 1b	Alt 2	Alt 3
AAEQ Avoided Rafting Delay Costs to the Water Taxi Fleet	$21,000	$141,000	$191,000	$249,000

Source: Focus groups, October 2024

4.8.4.1.3.2.2 Fueling Delays

Because the fuel dock is located near the harbor entrance, vessels queuing around it can create obstacles to traffic going in and out of the harbor. Participants in multiple focus groups reported that delays at the fuel dock can be daily occurrences in peak season. According to focus group participants, water taxis experience delays attempting to fuel 1–2 times per week during peak season, which lasts from May through September. In a FWP scenario, because all alternatives include a fuel dock in the new harbor, vessel traffic would be dispersed between multiple fueling locations, reducing delays. The length and frequency of fueling delays were multiplied by the hourly value of time for water taxis to estimate the cost of fueling delays. Avoided fueling delay benefits to water taxis are shown by alternative in Table 4-13.

Because Alternative 1a primarily alleviates crowding to the large vessel fleet, and because the overall fleet is expected to grow faster in the FWP than in the FWOP, fueling delays to water taxis are expected to worsen under Alternative 1a, and associated costs are expected to increase, leading to negative benefits for this alternative.

Table 4-13. FWP Expected Annual Value of Avoided Fueling Delays to Water Taxis

	Alt 1a	Alt 1b	Alt 2	Alt 3
AAEQ Avoided Fueling Delay Costs to the Water Taxi Fleet	($9,000)	$52,000	$57,000	$64,000

Source: Focus groups, October 2024

4.8.4.1.3.3 Large Vessels

Vessels over 85 feet long use transient moorage on float System 5, and while they are not all part of the same user group, their larger size and shared moorage location mean that their rafting patterns are more similar to each other than to smaller vessels of their respective user groups. Evaluations of delays for other user groups exclude System 5 vessels.

Because System 5 vessels are larger and require more people to move, vessel owners experience additional delays coordinating with crew and other vessel owners to facilitate moves. Focus groups described time spent actively moving vessels into and out of rafts. They also described time consumed in coordinating with the harbor and/or other vessel owners when rafted vessels need to be moved.

System 5 vessel operators also report delays entering the harbor. Entering the harbor can be risky because it requires a turn that can be challenging for long vessels. For these vessels, entering the harbor can require coordinating with harbor staff, tug assists, and can even involve clearing the harbor entrance of other vessel traffic to reduce the risk of collision.

As vessels of different types (e.g. commercial fishing, freight, research etc.) utilize System 5, this analysis estimates the value of time for System 5 vessels as a weighted average of the hourly values of time for these different groups. Data on operating cost and income was provided by focus group participants and combined with other data from NOAA and Cornell University on the value of time for commercial fishing vessels. Delay times and frequencies were multiplied with the average value of time for System 5 vessels to estimate the costs of delays.

Under a FWP, the wider and deeper harbor entrance alleviates these delays entering the harbor as well as alleviating rafting by providing more transient moorage. The expected value of avoided delays for large vessels is shown in Table 4-14.

Table 4-14. FWP Expected Annual Value of Avoided Delays to Large Vessels

	Alt 1a	Alt 1b	Alt 2	Alt 3
AAEQ Avoided Rafting Delay Costs to Large Vessels Fleet	$3,842,000	$3,842,000	$3,842,000	$4,800,000

Source: Focus groups October 2024

4.8.4.1.3.4 Commercial Fishing

While there are large commercial fishing vessels operating from Homer, they are considered in the “Large Vessel” benefit category in the previous section. This section considers commercial fishing vessels under 85 feet long. Focus group participants stated that moving vessels due to rafting generally takes 2 people 1–2 hours, and happens roughly every other day during peak season, in June and July. Vessels generally have a captain and one deckhand.

The hourly value of time for commercial fishing vessels was calculated as hourly operating costs. Operating costs included repair and maintenance, fees and insurance, miscellaneous business costs, and labor costs for the captain and crew. Maintenance, insurance, fees and miscellaneous business costs were taken from the NOAA publication *An Overview of the Social Sciences Branch Commercial Fishing Business Cost Survey in the Northeast.* The value of labor for commercial fishermen is based on estimates from a study conducted by Cornell University on the value of time for commercial fishermen in Alaska. This hourly value of time was multiplied by delay duration and frequency to estimate delay costs.

Because Alternative 1a primarily alleviates crowding to the large vessel fleet, and because the overall fleet is expected to grow faster in the FWP than in the FWOP, crowding to commercial fishing vessels is expected to worsen under Alternative 1a, and associated costs are expected to increase, leading to negative benefits for this alternative.

Alternatives 1b, 2 and 3 each alleviate crowding for transient vessels under 85 feet long, reducing costs to operators. The expected value of avoided rafting delays to commercial fishing vessels is shown in Table 4-15.

Table 4-15. FWP Expected Annual Value of Avoided Rafting Delays to Commercial Fishing Vessels

	Alt 1a	Alt 1b	Alt 2	Alt 3
AAEQ Avoided Rafting Delay Costs to the Commercial Fishing Fleet	($5,000)	$7,791,000	$8,460,000	$8,738,000

Source: Focus groups, October 2024

4.8.4.1.3.5 Coast Guard Wind Delays

The USCG buoy tender *Aspen* is permanently stationed at Homer but uses a berth outside the harbor on the Pioneer Dock, as it is too large to use the harbor. The commander of the *Aspen* has stated that 2–3 times in a year, wind conditions are such that *Aspen* is unable to moor up in its berth outside the harbor. These delays generally last about 24 hours while the vessel waits for the wind to change. When delays occur, the crew is able to continue work onboard, but delays do reduce their leave time. When *Aspen* is delayed due to wind conditions, one of the ship's generators must be kept running. This adds an additional fuel cost which would not be experienced were *Aspen* able to moor up.

Aspen would continue to moor outside the harbor in a FWP scenario because her requirements for berth specifications and uplands are beyond the scope of this project. However, she would be able to enter the harbor temporarily under such wind conditions to allow crew to disembark for leave, and to avoid additional generator use. The value of crew time and fuel saved in the FWP is shown in Table 4-16.

Table 4-16. FWP Expected Annual Value of Avoided Wind Delays to the Coast Guard

	Alt 1a	Alt 1b	Alt 2	Alt 3
AAEQ Avoided Wind Delay Costs	$10,000	$10,000	$10,000	$10,000

Source: Interview with Coast Guard, Fall 2024

4.8.4.1.4 Avoided Fuel Costs

When vessels raft, vessels on the "outside" of the raft (the side furthest from the dock) often cannot reach the dock to access shore power. Many vessels, especially working vessels, have sensitive equipment onboard that takes time to prepare to go without power, and cannot simply be turned off. Participants in the System 5 and Commercial Fishing groups stated that when they cannot reach shore power, they have to keep generators running onboard 24/7, consuming fuel that otherwise would be conserved.

Focus group participants provided estimates of gallons used per day by their generators, and fuel costs per gallon were taken from the Pacific States Marine Fisheries Commission monthly marine fuel prices.

A similar situation exists for vessels which use the Deep Water Dock because they cannot enter the harbor. When vessels that are too large to enter the harbor moor at the Deep Water Dock, they must continuously run generators because power is not available at this dock. A participant in the Deep Water Dock focus group described having 3–4 such instances per year for 1–2 days each.

Vessel counts, done daily by the harbor, provide an estimate of crowding severity throughout the year. Days when transient moorage sold exceeds the harbor's capacity can be identified, and the amount of moorage oversold can be averaged to determine by how much moorage is oversold generally. This was used to determine the average number of vessels rafting daily, and therefore the expected number of vessels running generators, as discussed.

In a FWP, as moorage space increases and rafting is reduced, the need for rafted vessels to run generators and the associated fuel costs would be alleviated. The expected value of avoided fuel costs is shown by alternative in Table 4-17.

Table 4-17. FWP Expected Annual Value of Avoided Fuel Costs Associated with Rafting

	Alt 1a	Alt 1b	Alt 2	Alt 3
AAEQ Avoided Fuel Cost Benefits	$262,000	$933,000	$933,000	$933,000

Source: Focus Groups October 2024

4.8.4.1.5 Avoided Vessel Damages

This analysis estimates annual vessel damages attributable to overcrowding conditions in Homer using focus group information and data from the 2024 Homer Port User Survey. Focus group information was used to estimate the cost of damages in an average vessel incident. This average incident cost was used in combination with Port User Survey data to estimate the annual damages per vessel experienced by harbor users.

Vessel damages are expected to be higher in the FWP than in the FWOP in Alternative 1a because the fleet grows faster in the FWP than in the FWOP, but because this alternative only alleviates crowding to the large vessel fleet (those over 85 feet), crowding and associated vessel damages worsen for smaller vessels. Under alternatives 1b, 2 and 3, as crowding is alleviated, the annual damages per vessel are expected to decrease proportionally. Avoided vessel damages are shown by alternative in Table 4-18.

Table 4-18. FWP Expected Annual Value of Avoided Vessel Damages

	Alt 1a	Alt 1b	Alt 2	Alt 3
AAEQ Avoided Vessel Damages	($47,000)	$639,000	$637,000	$697,000

Source: Focus Groups October 2024, Port User Survey April 2024

4.8.4.1.6 NED Summary

The FWP AAEQ NED benefits are summarized by alternative in Table 4-19.

Table 4-19. Summary of FWP AAEQ Expected NED Benefits

	Alt 1a	Alt 1b	Alt 2	Alt 3
Rec User UDV Benefits	$2,303,000	$2,312,000	$2,513,000	$4,084,000
Fishing Charter Recreation Benefits	$1,335,000	$1,366,000	$2,178,000	$3,559,000
Avoided Delay Costs				

	Alt 1a	Alt 1b	Alt 2	Alt 3
Fishing Charter Avoided Rafting Delay Benefits	$18,000	$24,000	$93,000	$164,000
Water Taxi Avoided Rafting Delay Benefits	$21,000	$141,000	$191,000	$249,000
Water Taxi Avoided Fueling Delay Benefits	($9,000)	$52,000	$57,000	$64,000
Large Vessel Avoided Rafting Delay Benefits	$3,842,000	$3,842,000	$3,842,000	$4,800,000
Commercial Fishing Avoided Rafting Delay Benefits	($5,000)	$7,791,000	$8,460,000	$8,738,000
Avoided Coast Guard Wind Delay Costs	$10,000	$10,000	$10,000	$10,000
Avoided Fuel Cost Benefits	$262,000	$933,000	$933,000	$933,000
Avoided Vessel Damages	($47,000)	$639,000	$637,000	$697,000
Total AAEQ NED Benefits	**$7,730,000**	**$17,110,000**	**$18,914,000**	**$23,298,000**

Table 4-20 shows the AAEQ benefits and costs for each alternative, as well as the AAEQ net benefits (the AAEQ benefits less the AAEQ costs) and the benefit to cost ratios (BCRs). BCRs below 1 indicate that an alternative has higher AAEQ costs than benefits, which is the case in all four alternatives. Alternative 1a has the lowest BCR, while the BCRs for Alternatives 1b, 2, and 3 are all relatively close, indicating that for these alternatives, benefits and costs increase at similar rates.

Table 4-20. AAEQ Net Benefits and BCRs

	Alt 1a	Alt 1b	Alt 2	Alt 3
AAEQ Benefits	$7,730,000	$17,110,000	$18,914,000	$23,298,000
AAEQ Costs	$17,523,000	$23,305,000	$24,578,000	$29,341,000
AAEQ Net Benefits	($9,793,000)	($6,195,000)	($5,664,000)	($6,043,000)
BCR	0.44	0.73	0.77	0.79

The alternative that reasonably maximizes net benefits would typically be the recommended alternative under the NED account, particularly when the BCR is greater than 1.0 (when benefits exceed costs). In this case, no alternative has NED benefits exceeding costs.

4.8.4.2 Regional Economic Development (RED)

The RED account assesses changes in the distribution of regional economic activity. These benefits do not represent an increase in overall productivity or benefits to the nation as NED benefits do, but rather assess the transfer of benefits from one region to another.

This analysis assessed RED benefits with the use of the certified planning model Regional Economic System, or RECONS, which was developed by IWR to provide estimates of regional impacts associated with Federal expenditures.

The summary of RED benefits is shown in Table 4-21.

Table 4-21. RED Benefits Summary

RED benefits	Local Capture	Output	Jobs (FTE)*	Labor Income	Value Added
Alt 1a					
First Costs	$309,979,291	$873,304,386	5,094.7	$405,621,790	$505,782,592
AAEQ OMRR&R	$3,357,944	$8,973,652	47.1	$3,913,961	$5,292,835
Alt 1b					
First Costs	$441,207,304	$1,179,066,907	6,193.5	$514,263,581	$695,436,619
AAEQ OMRR&R	$3,387,461	$9,052,531	47.6	$3,948,366	$5,339,359
Alt 2					
First Costs	$466,394,442	$1,313,972,655	7,740.6	$610,298,023	$760,999,837
AAEQ OMRR&R	$3,357,730	$8,973,080	47.1	$3,913,712	$5,292,497
Alt 3					
First Costs	$571,749,033	$1,610,788,054	9,489.2	$748,159,226	$932,903,316
AAEQ OMRR&R	$3,369,433	$9,004,356	47.3	$3,927,353	$5,310,944

Source: RECONS model, run April 2026
*FTE = full-time equivalent

4.8.4.3 Environmental Quality

The EQ account assesses both positive and negative non-monetary effects on ecological, cultural, and aesthetic resources in the study area. This analysis must distinguish between national and regional benefits and must ensure benefits are not counted more than once.

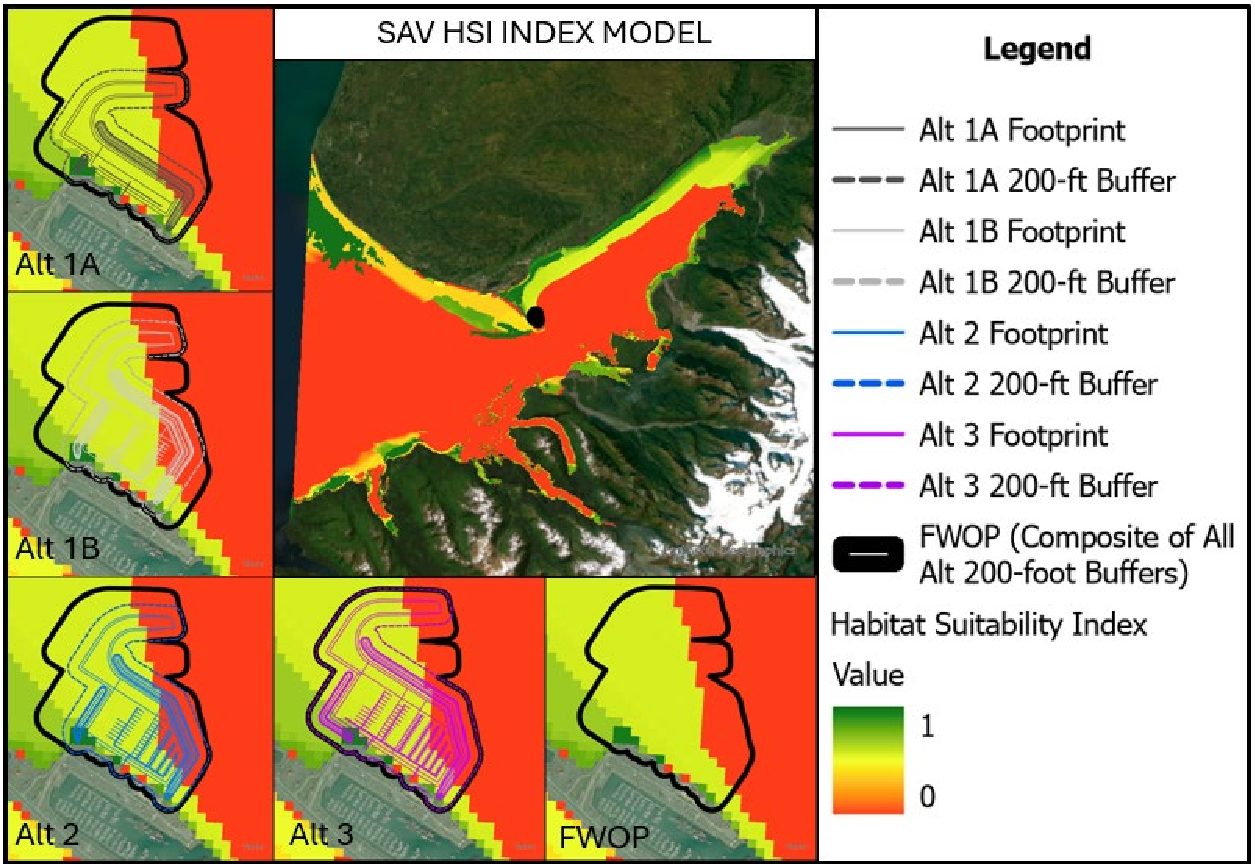
Because all FWP alternatives are located in the same area, to the east of the existing harbor, all FWP alternatives have similar environmental effects. The environmental specialist for the PDT utilized a habitat model for Kachemak Bay, which used water velocity, fetch, bathymetry, and substrate data to assess the quality of habitat for three species of SAV: canopy kelp, understory kelp, and seagrass. These types of aquatic vegetation were used as a proxy for other species in the bay because they are relied upon by many other species for food, shelter, etc.

To determine the amount and quality of habitat in the project area under existing conditions, the footprints of all alternatives were overlayed, and a 200-foot-wide buffer zone was added around the perimeter of this combined footprint to determine a zone of potential impact. Each 50-square-meter section within the FWOP and buffered alternative footprints was assigned a value between 0 and 1, where 0 corresponded to habitat that could not support SAV and 1 corresponded to optimal SAV habitat. This value is referred to as a HSI score. HSI scores were then summed to determine a cumulative habitat value for the project area under current conditions.

Figure 4-9 shows Kachemak Bay color coded by HSI score. Areas shown in red have scores closer to 0, indicating they are not suitable habitat for SAV. Areas shown in dark green indicate scores of 1, or ideal SAV habitat, and areas shown in yellow have scores between 0 and 1, meaning they are of moderate habitat quality.

Inset maps in Figure 4-9 using the NCCOS SAV HSI Model (Whippo 2026) show the footprint of each alternative (shown in colored dashed lines) overlayed onto the composite FWOP footprint, shown in bold outline. This allows the area of a given alternative to be compared to the area evaluated in the FWOP.

Figure 4-9. Ecological Model and Alternative Footprint



The cumulative HSI score for the project area under existing conditions is 152.3. In the FWOP scenario, this value is expected to remain constant. The cumulative HSI score was then determined for each alternative footprint. In a FWP scenario, alternatives are expected to convert existing HSI values to 0 within the buffered footprint. Thus, to assess the impacts of a given alternative to SAV habitat, the cumulative HSI score of the alternative's footprint was subtracted from the FWOP score. The remaining value is the Retained Cumulative HSI score, which is assumed consistent with the habitat that would remain after the construction of a given alternative. These scores are shown in Table 4-22.

Table 4-22. Retained Cumulative HSI Score by Alternative

	FWOP	Alt 1a	Alt 1b	Alt 2	Alt 3
Retained Cumulative HSI Score	152.3	60.9	47.7	44.2	9.0

The NCCOS SAV HSI Model (Whippo 2026) provided the basis for existing conditions as described in Section 3.3.3.1. This model was used to provide a preliminary evaluation of potential direct impact of alternatives to SAV. The NCCOS SAV HSI Model was used to quantify the direct loss of SAV potentially resulting from an alternative. Due to study constraints, the USACE SAV HSI Model could not be certified during the Feasibility Study to estimate indirect impacts.. USACE plans to certify the USACE SAV HSI Model in the PED Phase, should the TSP be authorized and funds for it appropriated.

4.8.4.4 Other Social Effects

The OSE account assesses the effects of an alternative on social aspects such as community resilience, public health, and life safety. In particular, this analysis considers benefits to safety, local and reginal opportunities, personal use fishing, welfare of the region, and avoided vessel delays. This analysis considers OSE benefits in the context of the benefit categories associated with the Remote and Subsistence Harbor Authority as discussed in Section 1.3.

Section 4.8.4.1 presented the NED analysis and demonstrated that there is not an NED Plan. USACE implementation guidance for the Remote and Subsistence Harbors Authority states, “If there is no NED Plan and/or the selection of a plan other than the NED Plan is based in part or whole on non-monetary units (EQ and OSE accounts), then the selection will be supported by a Cost Effectiveness/Incremental Cost Analysis consistent with ecosystem restoration evaluation procedures.” The FWP and FWOP evaluation frameworks are similar to those done for the NED analysis.

Cost-effectiveness analysis is conducted to ensure that the least cost alternative is identified for each possible level of output and that for any level of investment, the maximum level of output is identified. Incremental cost analysis identifies the additional cost per additional unit of benefit as plan size increases. This allows the PDT to consider whether larger plans are “worth it,” meaning whether the additional benefits provided by a larger alternative justify taking on the additional cost.

In a CE/ICA, a non-monetary benefit unit is developed to quantify beneficial effects of a project in terms other than dollars. This analytical tool is well-suited to the evaluation of benefits such as those permitted for consideration in the Section 2006 Authority. These benefit categories are introduced in Section 1.3.1.1, but are repeated here for convenience:

> *“In considering whether to recommend a project under subsection (a), the Secretary shall consider the benefits of the project to any of–*
>
> *(1) public health and safety of the local community and communities that are located in the region to be served by the project and that will rely on the project, including access to facilities designed to protect public health and safety;*
>
> *(2) access to natural resources for subsistence purposes;*
>
> *(3) local and regional economic opportunities;*
>
> *(4) welfare of the regional population to be served by the project; or*
>
> *(5) social and cultural value to the local community and communities that are located in the region to be served by the project and that will rely on the project.”*

These benefit categories were considered in terms of the number of vessels affected for each alternative, the number of people benefiting per vessel, and the associated impact (low, medium, or high) under each alternative. These benefits were then combined and analyzed using a CE/ICA.

Alternatives affect vessels in two primary ways. Vessel access is improved for vessels currently using transient moorage as more space alleviates crowding. Access is also improved for vessels currently using transient moorage who gain reserve slips in a given alternative. Access is created for vessels currently on the waitlist and not using transient moorage that gain slips in a given alternative, and for vessels that are able to relocate to Homer as more space is created.

4.8.4.4.1 Safety

This benefit category relates to the "public health and safety of the local community and communities that are located in the region to be served by the project and that will rely on the project, including access to facilities designed to protect public health and safety" as defined in Section 2006, as amended.

Safety concerns in Homer are closely related to vessel rafting. The crew and passengers of rafting vessels must climb over the side of the dockside vessel to access their own, leading to risk of falling. When vessels are rafted together, if a fire starts, vessels cannot move to safety until they can be unrafted, increasing the chance of fire spreading. Additionally, if multiple vessels are between the dock and the affected vessel, fire fighters may have reduced ability to address the threat. Similarly, if a medical emergency occurs on a vessel that is not dockside, it may be more difficult for emergency responders to safely reach the affected person or transport them to an ambulance. There are safety concerns associated with climbing between vessels, increased chance of fire, and reduced access for emergency response.

In addition to the three general types of hazards discussed above, the large vessels which raft on float System 5 experience additional hazards. These vessels are both longer and taller than other vessels in the harbor, with more variation from one vessel to the next. Because the decks of System 5 vessels are higher above the water, the chance of injury from falling is greater. Additionally, the deck of one vessel may be at a different height than the vessel next to it, meaning that crew may be climbing up or down between vessels. Lastly, these vessels are longer than other vessels in the harbor. All are over 85 feet long and some are as much as 180 feet long. The additional length of these vessels can make it more difficult to keep them moored steadily and can further complicate climbing between vessels.

As available transient moorage is expanded in a new harbor, the need for rafting and the degree of rafting would be reduced. As less rafting occurs, fewer crew would have to climb from one vessel to the next, vessels would be more accessible in case of emergency, and more able to move to safety in case of fire. This reduction in exposure to rafting related hazards is considered in this benefit category.

4.8.4.4.1.1 Application of Safety Benefit Framework

Vessels: This variable is the number of vessels for which access is improved in an alternative.

Weight: As discussed above, small and medium vessels experience three types of safety risk factors. Large vessels experience these, as well as three additional types of risk factors. Because large vessels have twice as many risk factors as small and medium vessels, they are assigned a weight of 3, while small and medium vessels are assigned a weight of 1.5.

Population: The affected population for each vessel is the combination of its crew and passengers.

The increase in safety was calculated by multiplying the impact weight and the population per vessel by the number of vessels in each user group for which harbor expansion reduces rafting.

The affected population and impact weights for the safety benefit category are shown by vessel type in Table 4-23.

Table 4-23. Safety Effected Population and Impact Weight by Vessel Type

Vessel User Group	Avg. Crew	Passengers	Total Population Affected	Weight
Recreation	N/A	3.77	3.77	1.5
Water Taxi	1	5	6	1.5
Freight	3.67	N/A	3.67	1.5
Commercial Fishing	3.67	N/A	3.67	1.5
System 5	5	N/A	5	3
Fishing Charters (medium)	3	22	25	1.5
Fishing Charters (small)	1.3	6	7.3	1.5

Source: Homer Port User Survey and Focus Groups, 2024

AAEQ Safety Benefits are shown by alternative in Table 4-24.

Table 4-24. AAEQ Safety Benefits by Alternative

Alternative	AAEQ Safety Benefits
Alt 1a	842
Alt 1b	7,829
Alt 2	8,183
Alt 3	9,462

4.8.4.4.2 Local and Regional Opportunities

Local and regional opportunities (LROs) are increased as access is created for additional vessels. It should be noted that access-improved does not significantly influence LROs because vessels that are presently operating in Homer are already assumed to be interacting with the local economy. This metric has two elements—

marine trades impacts and business expansion impacts. These benefits relate to the "local and regional economic opportunities" benefits category as defined by Section 2006, as amended.

4.8.4.4.2.1 Marine Trades Impacts

Homer has a significant marine trades sector, which makes it an attractive location for vessel owners (particularly owners of working vessels), because a wide variety of work can be done on a vessel in one place. Increasing the number of vessels operating in Homer increases demand for the services provided by the marine trades industry and makes this economic sector more robust, resulting in Marine Trade Impacts (MTIs). Benefits to this sector of the economy carry through to other local service industries and benefit the whole community.

Strengthening the marine trades industry also helps Homer to maintain a diversified economy, as it balances their tourism industry and contributes to economic stability. Working vessels are assumed to interact more with the marine trades industry than recreation vessels, as they are operated more frequently and consequently require more maintenance. Similarly, small and medium-sized working vessels are assumed to interact the most with the marine trades industry, as large vessels receive more of their maintenance out of state where there are facilities capable of hauling them out.

4.8.4.4.2.1.1 Application of Framework

Vessels: This variable is the number of vessels for which access is created in an alternative.

Weight: The impact of an additional vessel on the local economy is weighted.

Small and medium-sized commercial vessels have the highest impact rating (3) because these vessels are more likely to receive all or most of their maintenance in Homer. System 5 vessels have an impact rating of 2, or "medium", because while these vessels do interact regularly with the Homer marine trades industry, they must receive a more significant amount of maintenance out of state, as vessels this size cannot be hauled out in Homer. Recreation vessels have the impact rating of 1, or "low", because while additional access for these vessels would contribute to MTIs, the impact per recreation vessels is lower than for working vessels. This is because recreation vessels are not operated as frequently or under as wide a variety of conditions as working vessels and therefore do not require as much maintenance.

Population: The benefiting population for LROs is the population of Homer, which is approximately 5,500 people. As stated above, a more robust marine trades industry would help to keep the local economy diversified and benefits would carry through to other local economic sectors. Table 4-25 discusses these variables in the context of MTIs.

Table 4-25. MTI Variables

Vesel Category	Access Created (V)	MTIs of Additional Vessels (W)	Benefitting Population (P)
System 5	Vessels Turned Away, future growth	2	Homer

Vesel Category	Access Created (V)	MTIs of Additional Vessels (W)	Benefitting Population (P)
Commercial Fishing, Freight, Charters, & Water Taxis	Net waitlisted vessels; waitlist growth	3	Homer
Recreation	Net waitlisted vessels; waitlist growth	1	Homer

Table 4-26 shows the number of vessels in each user group for whom access is created in Alternative 1a, as well as the weight for each user group's impact on the marine trades sector, and the Homer population which benefits from their impacts. These numbers are multiplied to produce the MTI benefits shown in the rightmost column of the table. This demonstrates the process, using the number of vessels for which access is improved or created, the impact weight, and the benefiting population, by which the number of benefit units are determined for each benefit category.

Table 4-26. MTIs for Alternative 1a

	Marine Trades Impact Variables			MTI Benefits
Vessel User Group	Vessels*	Impact Weight	Benefiting Population	
System 5	15	2	5,500	165,000
Commercial Fishing	14	3	5,500	231,000
Charter	23	3	5,500	380,000
Water Taxi	5	3	5,500	83,000
Freight	1	3	5,500	17,000
Recreation	137	1	5,500	754,000
AAEQ MTI Benefits for Alt 1a				**1,634,000**

Note: Does not account for variation in fleet over period of analysis; approximate counts

AAEQ MTI benefits are shown by alternative in Table 4-27. Numbers are rounded.

Table 4-27. AAEQ MTI Benefits by Alternative

Alternative	AAEQ MTI Benefits
Alt 1a	1,634,000
Alt 1b	1,625,000
Alt 2	2,600,000
Alt 3	6,754,000

4.8.4.4.2.2 Business Expansion Impacts

LROs can also be expected to increase as existing marine businesses are able to expand their operations, or new ones are able to start operating.

Currently, approximately 60% of waitlisted vessels do not operate out of Homer Harbor and cannot be assumed to operate out of other harbors, due to a lack of substitute locations in the vicinity. While a portion of these inactive waitlisted vessels are projected to be recreational, others can be assumed to be commercial.

If a marine business owner in Homer wishes to expand their business by adding an additional vessel, but is unable to due to the lack of moorage, access created allows this business to expand. Similarly, if a Homer resident wishes to start a business, but is delayed in doing so due to wait times for Homer moorage, access created alleviates this barrier and allows additional businesses to form.

4.8.4.4.2.2.1 Application of Business Expansion Benefit Framework

Vessels: As above, this variable is the number of vessels for which access is created in an alternative. For Business Expansion Impacts (BEI), this does not include access created for recreational vessels, as these are not being used in new or expanding businesses. It also excludes System 5 vessels, as these vessels are not waitlisted for moorage.

Weight: System 5 vessels are weighted 0 for this category, as they do not impact it. Small and medium-sized commercial vessels for which access is created have an impact weight of 2, or “moderate”. This is to account for the variation in the impact of expansions and new enterprises between companies. For example, an expansion for one company may only require minimal staffing increases, whereas a new enterprise may require multiple support staff. Alternatively, an additional operator in a sector that already has significant competition may have relatively small local impacts, while an operator starting a new type of business may be more impactful.

Population: As above, the benefiting population for LROs is the population of Homer. If Homer residents are able to start and expand businesses more efficiently, it benefits not only the business owners and their families, but their employees, their families, and the wider local community with more jobs available and increasing employment. Table 4-28 discusses these variables in the context of (BEI).

Table 4-28. BEI Variables

Vessels Category	Access Created	Business Impact	Benefitting Population
System 5	N/A	0	N/A
Commercial Fishing, Freight, Charters, & Water Taxis	Waitlisted vessels not currently operating; waitlist growth	2	Homer
Recreation	N/A	0	N/A

AAEQ BEI benefits are shown by alternative in. Table 4-29. Numbers are rounded.

Table 4-29. AAEQ BEI Benefits by Alternative

Alternative	AAEQ BEI Benefits
Alt 1a	459,000
Alt 1b	451,000
Alt 2	1,013,000
Alt 3	3,000,000

4.8.4.4.3 Personal Use Fishing

Subsistence fishing is a benefit category listed for consideration under Section 2006. Personal use fishing (PUF) is considered technically distinct from subsistence fishing by the State of Alaska because it does not occur in places historically and culturally linked to traditional subsistence practices. However, it can be considered otherwise comparable in that its primary purpose is the harvesting of fish for consumption, rather than sport fishing for recreation.

The harbor's data system does not identify whether a vessel is used for PUF, so it cannot be clearly linked to any user group or groups. As such, an increase or improvement in moorage for a given vessel user group cannot be clearly associated with improved access to personal use fisheries. It is most likely that recreational vessels are used to access personal use fisheries, however it is also possible that commercial vessels may be used as well. It is unlikely that large working vessels such as those on System 5 would be used for this access.

Communication with ADF&G indicates that there are two personal use fisheries accessed from the Homer Harbor. These are the Kachemak Bay personal use set gillnet fishery, which requires a permit, and the China Poot Bay personal use fishery, which does not.

4.8.4.4.3.1.1 China Poot Bay Impacts

The China Poot Bay personal use fishery sees an average of 2,713 annual participants, with an average of 1.6 fishing days per person. If harbor conditions were delaying access to the fishery, we would expect to see participants require more time to reach bag limits, so this low average suggests that current users are able to access the fishery effectively within given openings. As such, improved access is not anticipated to result in improvements to personal use fishing for these users. However, access created is expected to allow use of this fishery for additional small and medium-sized vessels. The number of vessels utilizing the China Poot Bay fishery via Homer is estimated to be about 26% of the small and midsize vessel fleet.

It is not assumed that every vessel for which access is created would participate in the China Poot Bay fishery. Given that dipnets are utilized in this fishery, that it is common for multiple households to dipnet together, and that it is unlikely that all individuals participating in the fishery own vessels used to access the fishery, the assumption is made that fishermen share vessels. Recreation users reported an average of 3.77 passengers per trip. This average is used to estimate the annual number of vessels accessing this fishery at 720.

It is assumed that most, but not all, participants in this fishery access it through Homer. China Poot Bay is located on the southeastern side of Kachemak Bay, opposite the Homer Harbor. This location indicates that anyone accessing it from the majority of the Kenai Peninsula is likely doing so through Homer, while people in other communities on Kachemak Bay, such as Seldovia, likely are not. Given the smaller populations in communities on the southeastern side of Kachemak Bay, it is likely that the majority of fishery participants are accessing this fishery through Homer. This analysis considers a range from 50–90% of participants accessing through Homer, with an expected value of 75%.

If 75% of an estimated 720 vessels are accessing the fishery through Homer, this is equivalent to approximately 540 vessels, or 26% of the small- and medium-sized vessels in the Homer fleet.

It is assumed that this proportion will remain constant, and that 26% of small- and medium-sized vessels for whom access is created will utilize the China Poot Bay fishery.

Table 4-30 shows the expected China Poot Bay impacts (CPBI) by alternative.

Table 4-30. AAEQ CPBI Benefits by Alternative

Alternative	AAEQ CPBIs
1a	538
1b	538
2	761
3	1897

4.8.4.4.3.1.2 Kachemak Bay Set Gillnet Impacts

The Kachemak Bay set gillnet personal use fishery is a coho salmon fishery which requires a permit and allows a bag limit of 25 fish for the first person in a household, plus 10 fish for each additional household member. According to ADF&G, from 2019 to 2024 there was an annual average of 141 permits that reported using the fishery, and an average of 0.9 fishing days per permit.

Set gillnets can be set up near the shore, or a vessel can be used to anchor one end of a net further out in the water. Because set gillnet fishing is less common than dip netting and can require more use of space on a vessel for necessary gear, the assumption is made that groups of fishermen sharing vessels are smaller, at two per boat. Based on this, and the average annual permits issued, it is estimated that 71 vessels per year access this fishery.

Of the permits that reported participating in this fishery, 93% were issued to residents living in Homer or in communities north of Homer on the Kenai Peninsula. As such, it is assumed that 93% of participants access the fishery through Homer.

If 93% of an estimated 71 vessels access this fishery through Homer, this is equivalent to 66 vessels, or 3% of the small and medium sized Homer fleet.

It is assumed that this proportion will remain constant, and that 3% of small and medium sized vessels for whom access is created will utilize the Kachemak Bay set gillnet fishery. Table 4-31 shows the expected Kachemak Bay set gillnet impacts (KBSGI) by alternative.

Table 4-31. AAEQ KBSGI Benefits by Alternative

Alternative	AAEQ KBSGIs
1a	69
1b	69
2	98
3	243

4.8.4.4.4 Welfare of the Region

As discussed in Section 3.4.7, Homer serves as a shipping hub, contributing to the welfare of the region (WR). Its connection to the road system and ability to receive large shipments of cargo and fuel enables it to function as a distribution point for communities in the region and around Alaska which are not connected to other communities via road.

Homer Harbor staff report, based on their experience and familiarity with their users' work patterns, that over 100 non-road connected communities around Alaska receive coastal freight shipments from Homer. However, the NFS provided USACE with a list of 50 communities served by the Homer coastal freight fleet, and this list was used in the development of the initial CE/ICA metric.

The length of delay experienced by a vessel in Homer is not necessarily the length of delay experienced by a community. Delays may be made up in travel or may become exacerbated if time windows during which the receiving communities are accessible by water are missed. This is discussed further below.

Communities in Kachemak Bay are the closest to Homer and receive multiple shipments per week, which generally consist of construction materials, mail, groceries, and similar commodities. Vessels serving these communities may schedule multiple trips daily. Trip times take approximately 30–60 minutes each way. Because smaller vessels are able to serve these areas, small shipments may be contracted by individuals, who are also impacted to varying degrees by the delays experienced by these vessels. Examples of these cascading delays are discussed below.

If, for example, a person contracts to have a load of lumber taken across the bay to work on a home that is located outside the coastal town the where the delivery is being made, the delivery recipient must align the delivery window to correspond with when they can be in town to pick it up. Vessel delays could mean making a separate trip to pick a shipment up when it arrives or staying longer than planned waiting for the vessel's arrival. If the person does not live in town full time, delays could mean changing the planned return date.

Another common example is a person having a large appliance delivered who may have also needed to arrange for someone to install it or assist in moving it. A delay could mean the appliance is delivered when that assistance is no longer available and the recipient either has to find other help or wait until help becomes available again.

The Cook Inlet and Williamsport areas are served by fewer vessels than the Kachemak Bay area, as they are less sheltered and smaller vessels are unable to operate as safely.

Places in the Cook Inlet region receiving deliveries may be remote lodge businesses that rely on shipments to keep kitchens stocked and which have no access to grocery stores. Vessels out of Homer also deliver to subsistence fish camps in this area, which can function as seasonal communities. Deliveries to this area take approximately 1 day, so if a vessel is delayed for part of a day in Homer Harbor, it may not be able to start the trip from Homer until the next day.

Delays to perishable food shipments could result in food spoilage or in reduced food quality. If recipients at fish camps are waiting on delayed shipments during time they would otherwise be subsistence fishing, this could mean fewer people engaging in fishing activities, or that activities might need to be postponed until needed gear, supplies, or fuel are delivered.

Williamsport is a point of transshipment to communities on Lakes Iliamna and Clark. Goods are brought into Williamsport, hauled across a narrow strip of land between the lake and the inlet, and are put onto boats that circulate between lake communities. The trip to Williamsport from Homer is described as an overnight, meaning that vessels generally do not complete it as a day trip.

Williamsport is only accessible at very high tides that occur only a few days per month (approximately 5). If a high tide is missed, a vessel might have to wait 12 or 24 hours for the next high tide. If the original delivery was scheduled near the end of that month's tidal access window, the vessel may not be able to access Williamsport that month. Further, if a vessel is delayed getting into Williamsport from Homer, the boat scheduled to pick up goods from that vessel to transship to local communities either has to leave without those goods or be delayed itself. These delays can have further cascading effects.

For example, if a vehicle is not operational until replacement parts arrive but the delivery window for the month is missed, that person does not have the use of their vehicle for an additional month. This could reduce their ability to access work, school, or subsistence hunting and fishing areas. If a generator fails and a replacement or replacement parts are delayed, a family may go without electrical power, making them unable to run their freezer, which may render stored food unusable. If a delivery window is missed, the only store in town may not be able to restock for a month.

Kodiak, the Alaska Peninsula, and the Aleutians are generally only served by vessels 55 feet LOA or larger, as they are exposed to open ocean conditions. The trip to Kodiak from Homer is approximately 15–20 hours each way. Vessels typically make trips to a single community in Kodiak, rather than arranging trips to different communities to coincide. Vessels also frequently "back-haul" items like scrap cars on the return trip to Homer.

The trips to the Alaska Peninsula and the Aleutians take multiple days, meaning vessels must plan their departures to account for longer travel periods in which weather conditions could shift. Many of these communities have only specific tidal windows during which they are accessible, and delays getting out of Homer could result in longer delays to deliveries because of this.

The freight shipments these areas receive from Homer are less varied than other regions and are most commonly construction equipment and materials. A construction crew in position in one of these places could be unable to begin work without a piece of machinery that is delayed. Because construction windows in rural Alaska are very short, if this delay happens near the end of the season, or if this happens repeatedly throughout a season, a project might not be completed on time. Existing buildings in places this isolated are often utilized even when significantly damaged and in need of repair. Construction work delays not only apply to new projects wherein something is unfinished but may mean that a home or a school currently in use continues to be used while damages worsen due to lack of repair.

Vessels serving Western Alaska leave Homer in the spring when ports become accessible and then remain in the Western Alaska region for the summer. These vessels are able to deliver to communities on the rivers, and often have multiple deliveries scheduled. Similarly, communities like Nome and Bethel are local hubs themselves, and goods brought in are just as quickly sent out to smaller communities in the region, or upriver. In either case, one delayed vessel may result in delays to multiple others.

The most common goods delivered to Western Alaska from Homer are construction materials, equipment and fuel. Because this area is inaccessible to vessels during the winter, the fuel received in the fall must be sufficient to get a community through the winter. Fuel is not only used to operate motor vehicles, but also four-wheelers, snow machines, and skiffs which are used in subsistence and personal use hunting and to travel between communities where there are no roads. Fuel shipments also support the operation of generators, which provide electricity and heat to homes and public buildings.

A vessel delayed getting into Bethel with a fuel shipment may have other deliveries scheduled for communities upriver after it leaves Bethel. The initial delay means the vessel reaches its second destination late as well and may also have reduced access to docks or other infrastructure needed to offload cargo, because the recipient community must try to accommodate its scheduled deliveries as well as its delayed ones. This may delay the vessel further, such that fuel deliveries to communities further up the river accumulate more and more significant delays. If a community runs low on, or runs out of fuel before deliveries arrive, this could delay subsistence activities and could mean prioritizing whether a house or public building is heated.

Because communities in different parts of the state do not all receive shipments of the same type, size or frequency, and because different sizes of vessels may make shipments to some areas and not others, these 50 communities were organized by geographic region. These regions, the number of communities in each region that receive shipments from Homer, and the estimated total population of these communities, are indicated in Table 4-32.

Table 4-32. Regional Communities and Population Served by the Homer Fleet

Region	Communities Identified	Regional Population Impacted
Kachemak Bay	6	494
Cook Inlet	6	561
Williamsport	9	864
Kodiak	4	386
Alaska Peninsula	13	2,183
Aleutians	7	4,517
Western Alaska	5	13,570

There is very little access created for this user group for vessels not currently active. As such, the bulk of these benefits come from improved access. Additionally, access created, which adds more vessels to the fleet, does not increase the probability for a community relying on freight from Homer that a given shipment will arrive on time. In contrast, access improved for vessels currently operating does increase the reliability of shipments.

The benefitting population is the residents of the communities considered in each region. Regions are assigned impact weights individually according to their freight shipment patterns.

4.8.4.4.4.1 Application of Welfare of the Region Benefit Framework

Vessels: For the WR benefit category, vessels are considered for which access is improved, rather than created. As delays are reduced for freight vessels, cargo shipments become more reliable for regional populations. However, different regions have significantly different shipping patterns, and some regions receive shipments more frequently than others. As such, both the frequency of shipments and the access improved are considered in this variable.

Table 4-33 shows the number of transient vessels in the Homer fleet that make freight deliveries to each of the geographic regions served by the harbor. It should be noted that these vessel counts are not additive; for example, the 10 vessels that serve communities on Kodiak are the same 10 vessels that serve the Alaska Peninsula. The table also identifies the number of vessels serving each region for which rafting delays are alleviated by each alternative. Because Alternative 1a only alleviated crowding for vessels over 85 feet long, it impacts fewer vessels than the other alternatives.

Table 4-33. Vessels Making Freight Deliveries by Region

Region	Transient Vessels Serving Region	Vessels Impacted by:			
		Alt 1a	Alt 1b	Alt 2	Alt 3
Kachemak Bay	32	4	32	32	32
Cook Inlet	18	4	18	18	18
Williamsport	18	4	18	18	18
Kodiak	10	4	10	10	10
Alaska Peninsula	10	4	10	10	10
Aleutians	10	4	10	10	10
Western Alaska	7	4	7	7	7

Note: Vessel counts are not additive between regions.

Weight: Deliveries are weighted separately for each region based on a variety of factors which contribute generally either to the likelihood of a delay happening, or to the severity of impact for the community if a delay occurs.

Key factors that influence weighting include:

- Trip frequency: Rare trips (e.g., once per season) carry more risk than frequent ones.
- Community redundancy: If a community has alternate ports through which they can receive cargo (e.g., Anchorage, Kodiak), the weight is lower.
- Criticality of goods and services: Deliveries of food, fuel, or medical supplies are more sensitive than bulk cargo or parts.
- Seasonality: Late-season trips have higher risk due to fewer resupply options and narrow weather windows.
- Cascading delays: If a single vessel services multiple communities on one route, delay at one stop affects others and raises this weight.

Weights assigned to deliveries for each region are shown in Table 4-34. Impact severity is weighted on a 1–3 scale, with 1 indicating “low” impact and 3 indicating “high” impact.

Table 4-34. Impact Severity Weights by Region

Region	Impact Severity Weight	Impact Weight Rational
Kachemak Bay	1	Trips are short and communities are close to Homer.
Cook Inlet	2	Deliveries include perishables to isolated lodges without access to stores and fish camps with limited delivery windows.
Williamsport	3	Narrow window of delivery each month
Kodiak	2	Kodiak is further from Homer than Cook Inlet but is significantly closer than communities on the Alaska Peninsula or in Western Alaska, and has less limited delivery windows than Williamsport.
Alaska Peninsula	3	Multiple days are required to reach communities, which are more isolated and receive fewer deliveries each season.
Aleutians	3	Multiple days are required to reach communities, which are more isolated and receive fewer deliveries each season.
Western Alaska	3	Vessels stay in the region and make deliveries along river systems; one delay can lead to many others.

Population: Different sizes and types of vessels serve communities in different regions, although some sizes of vessel may serve multiple regions. The total population impacted for a given alternative is the sum of the populations of regions served by the vessels impacted by the alternative. If some, but not all, of the vessels serving a given region are impacted by an alternative, the benefiting population for that region is proportional to the percentage of vessels serving that region which are impacted by the alternative.

AAEQ WR benefits are shown by alternative in Table 4-35. Numbers are rounded.

Table 4-35. AAEQ WR Benefits by Alternative

Alternative	AAEQ WR Benefits
1a	157,000
1b	444,000
2	444,000
3	444,000

CE/ICA Model

4.8.4.4.5 Avoided Vessel Delays

In the process of developing the community benefit unit (CBUs) metric, described below, the team received direction to structure the CE/ICA as a wholistic evaluation of all project benefits. For this reason, benefits that were monetized in the NED were incorporated into the CE/ICA to allow for a more comprehensive assessment of project benefits. This includes the value to harbor users of alleviating vessel delays.

It should be noted that these benefits are not being double counted; they were previously omitted from the CE/ICA when the NED analysis was being considered in conjunction with it. Inasmuch as recent direction dictates that plan selection should not refer to the NED analysis, these benefits must be incorporated into the CE/ICA in order for them to be considered. These benefits are associated with "local and regional economic opportunities" as defined by Section 2006, as amended.

4.8.4.4.5.1 Application of Avoided Vessel Delays Benefit Framework

The NED model estimates hours of delay experienced by different user groups. To calculate Avoided Vessel Delay impacts (AVDs), the annual hours of delay experienced by a given user group were multiplied by the benefitting population per vessel, and an impact weight variable was assigned on the same 0–3 scale used in the other benefit categories.

For each user group, the benefitting population per vessel was the crew and or passengers of that vessel type. Recreation vessels received an impact weight of 1, or "low", as time impacted by delays is recreational in nature. Commercial vessels, including commercial fishing, fishing charters, water taxis, freight, and System 5 vessels were weighted 3, or "high", as delays impact business operations and by extension, livelihoods. The benefiting population for charter vessels includes a weighted average of passenger numbers for large and small charters, which range from 6 to 22 passengers. Vessel user groups, their respective benefiting populations and impact weights are shown in Table 4-36.

Table 4-36. AVD Benefitting Populations and Impact Weights by User Group

Vessel User Group	Benefitting population per vessel	Impact Weight
Recreation	3.77	1
Water Taxi	6	3
Freight	3.67	3
Commercial Fishing	3.67	3
System 5	5	3
Fishing Charters	13	3

AAEQ AVD benefits are shown by alternative in Table 4-37 . Numbers are rounded.

Table 4-37. AAEQ AVD Benefits by Alternative

Alternative	AAEQ AVD Benefits
1a	94,000
1b	398,000
2	443,000
3	501,000

4.8.4.4.6 Community Benefit Units

The individual benefit categories discussed above were combined to determine CBUs for each alternative. CBUs are shown by alternative in Table 4-38.

Table 4-38. CBUs by Alternative

	No Action	Alt 1a	Alt 1b	Alt 2	Alt 3
Safety	0	842	7,829	8,183	9,462
LROs	0	2,094,000	2,077,000	3,613,000	9,754,000
PUF	0	607	607	860	2,121
WRs	0	157,000	444,000	444,000	444,000
AVDs	0	94,000	398,000	443,000	501,000

	No Action	Alt 1a	Alt 1b	Alt 2	Alt 3
Safety	0	842	7,829	8,183	9,462
Total CBUs (rounded)	**0**	**2,346,000**	**2,926,000**	**4,508,000**	**10,710,000**

When AVD and PUF impacts are compared to benefits in other categories, it can be seen that there is an order of magnitude difference between them across alternatives. This is because the benefitting populations in the LRO and WR categories are community populations and are much larger than the vessel crews benefitting from alleviated vessel delays and the households benefitting from PUFs. Because of this, the metric suggests that LRO benefits as far more significant than AVDs. However, this misrepresents the significance of vessel delays in this analysis.

The stated objective of the study is to "provide safe and efficient navigation for commercial, private, and government users over the 50-year period of analysis." Similarly, the problems that the study identifies reference overcrowding in the harbor, navigational inefficiencies, and economic impacts stemming from these inefficiencies, as well as negative impacts to communities around the state which rely on freight shipments from Homer. Of the benefit categories discussed in this document, AVDs most directly relate to the objective of the study and the problems it was undertaken to address.

Additionally, LRO benefits, while felt broadly by the Homer population, are less direct and therefore less impactful per person than AVDs, which are direct benefits to harbor users. For these reasons, it was identified that the benefit categories contributing to CBUs (Safety, LROs, WRs, PUFs, and AVDs) could not be directly compared to each other as presented.

For these reasons, benefit units for each category were normalized for further analysis. Normalization is a statistical analysis technique which allows for multiple criteria that have values on different scales to be effectively compared to each other. There are multiple normalization techniques, however the most common is to recalculate the value for each alternative in a given criterion as a percentage of the maximum value for that criterion. For example, to normalize AAEQ AVD impacts, the benefit units for each alternative would be divided by 501,000, the value for Alternative 3, as it is the maximum value for this benefit category. This can then be carried through to other benefit categories. Normalized CBUs are shown by alternative in Table 4-39.

Table 4-39. Normalized CBUs by Alternative

	No Action	Alt 1a	Alt 1b	Alt 2	Alt 3
Safety	0	9	83	86	100
LROs	0	21	21	37	100
PUFs	0	29	29	41	100
WRs	0	35	100	100	100
AVDs	0	19	79	88	100
Total CBUs (rounded)	**0**	**113**	**312**	**352**	**500**

While the impacts of different vessel categories relative to each other are weighted in the calculation for each category, effectively the categories are also weighted relative to each other when they are added together. Normalizing the benefit units across benefit categories allows for them to be effectively compared to each other and for this implicit weighting to be more easily seen.

This is most obvious in Alternative 3, in which all benefit categories appear equally impactful. However, when we consider that the study is intended to address navigational problems of overcrowding and delays, and impacts to reliant regional communities, it does not follow that secondary economic impacts of harbor expansion are as significant to the study objectives as are those categories which directly address them (i.e., AVDs).

To account for this, a multi-disciplinary team composed of PDT members familiar with the project and representatives from the NFS weighted the categories according to impact and significance to the project. A weighting scale from 1 to 7, with 7 being the highest value, was used to allow for sufficient nuance. Normalized benefit totals for each category were multiplied by their respective weights and then summed to arrive at the final CBU value for each alternative. Weighted and unweighted CBUs are shown by alternative in Table 4-40.

Table 4-40. Unweighted and Weighted CBUs

Benefit Category	No Action	Unweighted Normalized CBUs				Weight	Weighted Normalized CBUs			
		Alt 1a	Alt 1b	Alt 2	Alt 3		Alt 1a	Alt 1b	Alt 2	Alt 3
Safety	**0**	9	83	86	100	7	62	579	605	700
LROs	0	21	21	37	100	4	86	85	148	400
PUFs	0	29	29	41	100	1	29	29	41	100
WRs	0	35	100	100	100	5	177	500	500	500
AVDs	0	19	79	88	100	7	131	555	618	700
Totals	**0**	**113**	**312**	**352**	**500**		**485**	**1,748**	**1,912**	**2400**

4.8.4.4.7 Cost Effectiveness/ Incremental Cost Analysis

Weighted normalized CBUs were analyzed in IWR Planning Suite II using a CE/ICA. Cost-effectiveness analysis is conducted to ensure that the least cost alternative is identified for each possible level of output and that for any level of investment, the maximum level of output is identified. Incremental cost analysis identifies the additional cost per additional unit of benefit as plan size increases. This allows the PDT to consider whether larger plans are “worth it,” meaning whether the additional benefits provided by a larger alternative justify taking on the additional cost.

For Homer, because alternatives are laddered so that each successive alternative contains all the benefits of prior alternatives, all alternatives were identified as Cost Effective. This means that for each alternative, no other alternative provided the same or greater benefits at a lower cost. In other words, each plan produces its level of output at the least cost.

Additionally, Alternative 3 was identified as a Best Buy plan, meaning that it provides the greatest increase in benefits for the least increase in cost. It should be noted that, because the No Action Alternative is always the lowest cost, it is also always considered a Best Buy plan. The Incremental Cost Analysis (ICA) calculates the marginal increase in cost per marginal increase in benefit between Best Buy plans. Because Alternatives 1a, 1b, and 2 are not considered in the ICA, the incremental cost per incremental benefit unit for Alternative 3 represents the incremental increases from the No Action Alternative.

ER1105-2-100 states that, “All possible plan combinations are listed and sorted in terms of increasing output. Costs and outputs of combined solutions may be additive or synergistic. It is important to document the rationale for determining which of these cases applies”. This analysis does not consider combinations of alternatives because they are mutually exclusive.

CE/ICA results are shown in Table 4-41. The IWR scatter plot shown in Figure 4-10 shows cost per benefit unit for each alternative, and the box graph shown in Figure 4-11 visually illustrates the marginal cost per marginal CBU between Best Buy plans.

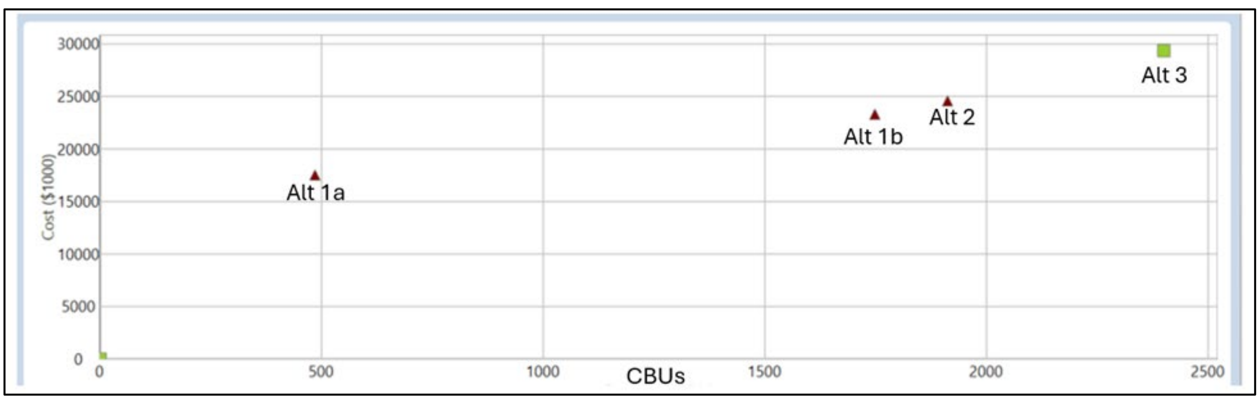
Table 4-41 shows that the number of CBUs increases from Alternative 1a to 1b, from 1b to 2, and from 2 to 3. The greatest increase in CBUs is from Alternative 1a to 1b, with the second-largest increase being from Alternative 2 to 3.

Table 4-41. CE/ICA IWR Planning Suite II Results

	No Action	Alt 1a	Alt 1b	Alt 2	Alt 3
AAEQ Costs	$0	$17,523,000	$23,305,000	$24,578,000	$29,341,000
CBUs	0	485	1,748	1,912	2400
Cost/CBU	$0	$36,100	$13,300	$12,900	$12,200
Incremental Cost/ Incremental CBU	$0	N/A			$12,200

Figure 4-10 shows a scatter plot of the per unit costs for each alternative. Alternatives 1a, 1b, and 2 are shown as triangles, indicating that these are cost effective. The No Action Alternative and Alternative 3 are shown as squares, indicating that they are Best Buy alternatives.

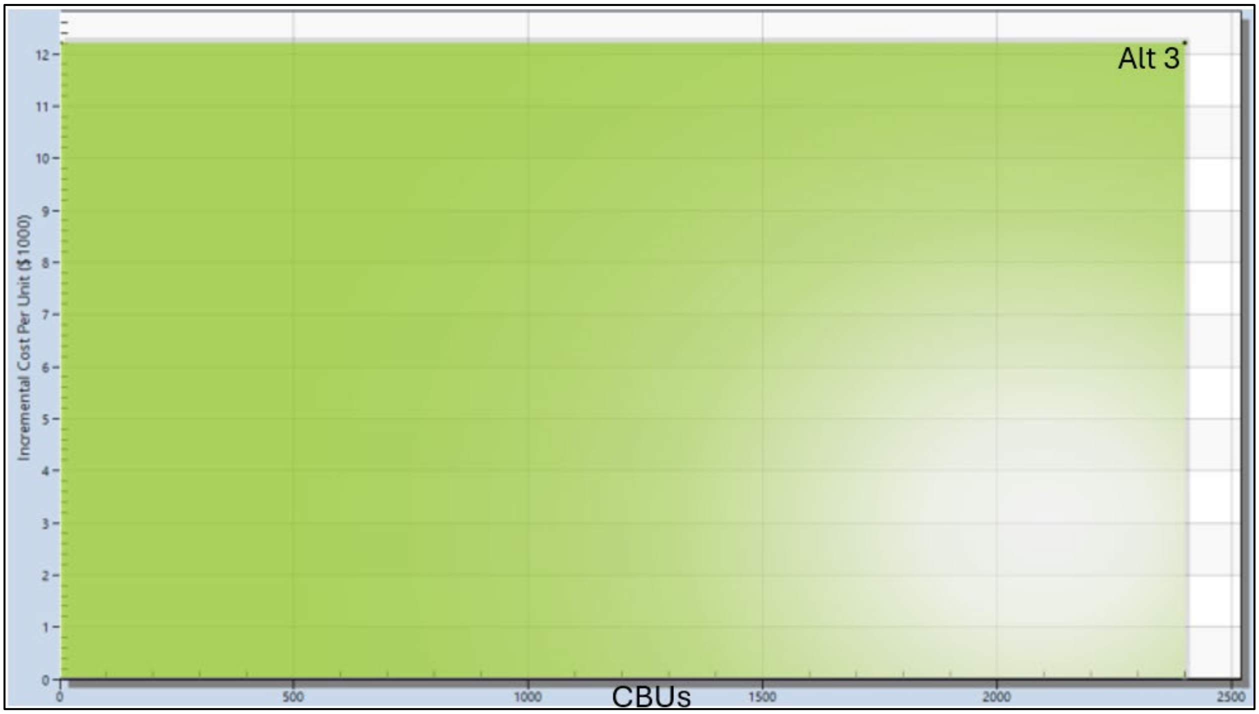
Figure 4-10. CE/ICA Scatter Plot



(IWR Planning Suite, 2026)

Figure 4-11 shows the increase in cost per increase in benefit between the two Best Buy plans. Because this analysis identifies only the No Action Alternative and Alternative 3 as Best Buy plans, the graph only considers the increase in cost per increase in benefit from the No Action Alternative to Alternative 3. In the graph, the green box represents the increase in benefit and the cost per additional benefit unit from the No Action Alternative to Alternative 3. This is the “buy up” from the No Action Alternative to Alternative 3.

Figure 4-11. Incremental Cost per Incremental Benefit Box Graph



(IWR Planning Suite, 2026)

4.8.5 Evaluation of Problems, Opportunities, Objectives, and Constraints

This section documents how alternatives meet objectives as documented in Section 2.

4.8.5.1 Problems

The problem statement from Section 2.1.1 can be distilled into three elements: inefficiencies related to overcrowding (primarily regarding rafting), the configuration of the entrance channel and the dredged depth of the moorage basin constraining the maneuverability of larger vessels, and the negative impacts experienced by non-road connected communities that Homer serves as a shipping hub. Table 4-42 shows how well each alternative solves the three problems identified.

Table 4-42. Problem Evaluation

Problem	No Action	Alt 1a	Alt 1b	Alt 2	Alt 3
Overcrowding	Problem worsens as demand increases	Solved for large vessels, persists for smaller vessels	Problem solved in short term	Problem solved in medium term	Problem solved
Channel and Basin constraints	Problem persists	Problem solved	Problem solved	Problem solved	Problem solved
Non-road connected Communities	Problem persists	Problem mitigated	Problem solved	Problem solved	Problem solved

Overcrowding is analyzed through the Homer Fleet FWOP and FWP conditions found in Sections 3.4.9.2 and 5.3.9 The FWOP condition shows increased demand which is the cause of the overcrowding indicating that the problem is likely to get worse under the No

Action alternative. Both Alternative 1b and Alternative 2 do not account for the projected growth of the Homer fleet so would only solve the overcrowding issue before growth occurs, however, Alternative 2 provides moorage to the waitlisted vessels. This extra moorage allows the harbor more opportunities to practice hot berthing and so issues related to overcrowding from rafting would take longer to appear.

The entrance channel and moorage basin for all alternatives other than the no action alternative would fully resolve the issues related to the current harbors entrance channel and moorage basin. The moorage basin and entrance channel would still prevent vessels over certain sizes accessing the harbor, but the NFS does not seek access for extremely large vessels into the harbor.

Analysis regarding negative impacts related to non-road connected communities is in the welfare of the region metric found in Section 4.8.4.4.4. As shown in Table 4-35, Alternatives 1b through 3 have the highest possible benefits for welfare of the region. Alternative 1a proves less than half the benefits of all other alternatives.

4.8.5.2 Opportunities

There were six opportunities identified in Section 2.2.

- Improve access for vessels that serve communities without road access
- Increase moorage facilities for large and small vessels
- Reduce damages to floats and docks
- Reduce vessel damages due to collisions and congestion in the harbor
- Increase NED and other social effects (OSE) economic activities
- Improved access for recreational activities may also occur

Of these six points, reduced damages to floats and docks and increases to NED and OSE activities are not evaluated in this section. NED and OSE economic activities are discussed and evaluated at length in Section 4.8.4.1 and 4.8.4.4.

Infrastructure damage is often considered as a benefit category in studies when overcrowding of moorage is a concern. This is because as crowding in a harbor worsens, infrastructure such as floats and docks can undergo additional wear and tear, which may be alleviated if crowding is reduced. This benefit category was explored for Homer; however the existing Homer Harbor has a significant amount of deferred maintenance, and it was not possible to show from harbor maintenance cost records that infrastructure was receiving additional wear and tear from crowding. Thus, the impacts to potential alternatives have on reducing damages to floats and docks cannot be meaningfully measured.

All other evaluations for alternatives for the remaining metrics are shown in Table 4-43. The opportunity statements do not have a minimum threshold to “improve” or “reduce” their respective metrics. So, while all alternatives other than No Action achieve their goal of realizing opportunities, opportunities are increasingly realized for each subsequent alternative. The one exception is for vessels that serve communities without road access. As mentioned in the preceding section, that metric is the same across Alternatives 1b through 3. In depth analysis of recreation benefits can be found in Section 4.8.4.1.1.

Table 4-43. Opportunities Evaluation

	No Action	Alt 1a	Alt 1b	Alt 2	Alt 3
Non-road connected Communities	Not achieved	Moderately Improved	Significantly Improved	Significantly Improved	Significantly Improved
Increase Moorage for Large and Small Vessels	Not achieved	Increase for large vessels	Increase for all vessels	Moorage includes waitlist	Moorage includes future growth
Reduced Vessel Damage	Not Achieved	Not Achieved	Significantly Improved	Significantly Improved	Significantly Improved
Improved Recreation	Not achieved	Achieved	Achieved	Achieved	Achieved

4.8.5.3 Objectives

The objectives statement from Section 2.3 can be separated into four elements for evaluation: safety, reliable and efficient navigation, provision of moorage for the existing fleet, and provision of moorage for the anticipated fleet. Table 4-44 shows the evaluation for each alternative of these elements.

Table 4-44. Objectives Evaluation

	No Action	Alt 1a	Alt 1b	Alt 2	Alt 3
Safety	Not achieved	Minimally Improved	Significantly Improved	Significantly Improved	Significantly Improved
Reliable and Efficient Navigation	Not achieved	Minimally Improved	Improved	Improved	Significantly Improved
Moorage for Existing Fleet	Not achieved	Achieved for large vessels	Fully Achieved	Fully Achieved	Fully Achieved
Moorage for Anticipated Fleet	Not achieved	Not Achieved	Not Achieved	Not Achieved	Fully Achieved

Safety benefits are discussed in Section 4.8.4.4.1. Reliable and Efficient Navigation is analyzed through AVDs in Sections 4.8.4.1.3 and 4.8.4.4.5. Alternative design was specifically tailored to the needs of the existing and anticipated fleet as discussed in Sections 3.4.9 and 5.3.9 respectively.

4.8.5.4 Constraints and Considerations

There are no study specific constraints but there are six considerations identified where the PDT endeavored to avoid or minimize negative impacts. Where negative impacts were unavoidable, mitigation measures were implemented whenever possible. Results from this evaluation is found on Table 4-45.

Table 4-45. Considerations Evaluation

	No Action	Alt 1a	Alt 1b	Alt 2	Alt 3
Commercial and Subsistence Fisheries	No Impact	No Impact	No Impact	No Impact	No Impact
Existing Economic Activities	No Impact	No Impact	No Impact	No Impact	No Impact

	No Action	Alt 1a	Alt 1b	Alt 2	Alt 3
Sediment Transport	No Impact	Medium Impact; Mitigation Measures	Medium Impact; Mitigation Measures	Medium Impact; Mitigation Measures	Medium Impact; Mitigation Measures
Floodplains	No Impact	Minor Impact; Mitigations Measures	Minor Impact; Mitigations Measures	Minor Impact; Mitigations Measures	Minor Impact; Mitigations Measures
Wetlands	No Impact	No Impact	No Impact	No Impact	No Impact
EFH & Anadromous Waters	No Impact	Minor Impact; Mitigations Measures	Minor Impact; Mitigations Measures	Minor Impact; Mitigations Measures	Minor Impact; Mitigations Measures
Marine Mammals	No Impact	Minor Impact; Mitigations Measures	Minor Impact; Mitigations Measures	Minor Impact; Mitigations Measures	Minor Impact; Mitigations Measures
Migratory Birds & Eagles	No Impact	Minor Impact; Mitigations Measures	Minor Impact; Mitigations Measures	Minor Impact; Mitigations Measures	Minor Impact; Mitigations Measures

There is no negative impact across all alternatives for commercial and subsistence fisheries and existing economic activities. Initial sediment transport assumptions were based on historical maintenance dredging volumes for the existing harbor. These assumptions are currently being refined with results from HDR's MIKE21 sediment transport model, as detailed in Section 4.8.1. However, it should be noted that forecasting long-term sediment transport rates involves inherent uncertainties, as these models simplify complex natural processes. While modeling employs the best available methodology, the resulting predictions of shoaling rates should be viewed as estimates. To manage the risk associated with this uncertainty, annual maintenance dredging has been included as the primary mitigation measure. The mitigation measures developed for all alternatives are discussed in depth in Section 5.

4.8.6 PR&G Criteria

This section evaluates all alternatives based on the PR&G criteria as documented in Section 2.5. The PR&G criteria definitions are listed below and their evaluation is found in Table 4-46.

Completeness: The extent to which an alternative provides and accounts for all features, investments, and/or other actions necessary to realize the planned effects, including any necessary actions by others. It does not necessarily mean that alternative actions need to be large in scope or scale.

Effectiveness: The extent to which an alternative alleviates the specified problems and achieves the specified opportunities.

Efficiency: The extent to which an alternative alleviates the specified problems and realizes the specified opportunities at the least cost.

Acceptability: The viability and appropriateness of an alternative from the perspective of the Nation's general public and consistency with existing Federal laws, authorities, and public policies. It does not include local or regional preferences for solutions or political expediency.

Table 4-46. PR&G Evaluation

	No Action	Alt 1a	Alt 1b	Alt 2	Alt 3
Completeness	Yes	Yes	Yes	Yes	Yes
Effectiveness	NA	Low	Medium	High	High
Efficiency	NA	Low	Medium	Medium	Medium
Acceptability	Yes	Yes	Yes	Yes	Yes

All alternatives are considered complete and acceptable. All measures across alternatives would be completed by either the NFS or USACE with the sole exception of the Aids to Navigation (ATONs) which are placed with the coordination of the USCG and are a standard coordination measure. All alternatives are consistent with existing Federal laws, authorities and public policies. The construction of harbors using breakwaters is a standard practice that is common for coastal communities throughout the nation.

There is variability in the evaluation of effectiveness and efficiency. The No Action alternative does not address any of the identified problems so it cannot be evaluated using these metrics.

Alternative 1a only addresses the problems caused by the large vessels and does not fully address current navigation inefficiencies or safety issues so is rated low for effectiveness.

Alternative 1b addresses current issues, but Alternatives 2 and 3 go beyond just issues facing the harbor currently and secure additional opportunities identified in Section 2.2 which warrant a higher rating.

Alternative 2 provides for moorage for waitlisted vessels and Alternative 3 provides moorage for the anticipated fleet. Efficiency was evaluated using the BCR and CE/ICA metrics as detailed in Section 4.8.4.1 and 4.8.4.4.

No alternatives have NED benefits greater than project costs so no alternative was rated as having a high efficiency. While technically only Alternative 3 is rated as a Best Buy and all other alternatives are rated Cost Effective, Figure 4-10 shows that benefits from Alternatives 1b, 2, and 3 are grouped relatively close together on the same trend line, while Alternative 1a has much lower benefits and is not close to the trendline the other alternatives follow. For these reasons the PDT ranked Alternative 1a low for efficiency and all other alternatives medium.

4.8.7 Risk and Uncertainty

There are no high risks associated with implementation of any alternative. Below are a list of low and moderate risks for alternative implementation.

4.8.7.1 Increase in Tsunami Evacuation Risk

The addition of vessels and people on the Homer Spit would minimally increase impacts from tsunamis. Historical data shows that even large distant earthquakes, such as the 8.8+ magnitude events in Japan and Chile, did not produce measurable tsunami waves in Homer. Only the 1964 local 9.2 magnitude earthquake caused a tsunami, with submarine slumping off the tip of the Spit generating 4-foot waves in Kachemak Bay within 5–10 minutes. That event also caused differential settlement of the spit, averaging 6 feet at the tip, but lowered ground levels by up to 10 feet in areas of artificial fill, such as the Salty Dog Saloon (Suleimani, et al 2005). The recurrence interval for an 8.0+ magnitude earthquake in this region is estimated to exceed 500 years. The primary risk to Homer is from a local earthquake causing underwater slope failure, which could produce a tsunami with little to no warning. All alternatives other than the No Action alternative are likely to increase the potential human presence at a given time. Given the sudden nature of such events and their infrequency, the proposed project is expected to result in only a minimal increase in tsunami evacuation risk for the Homer Spit.

4.8.7.2 Seismic Damage to Structures

A risk-informed design approach was adopted for the breakwaters' seismic stability, as detailed in Appendix B. While seismic analyses show the structures would be stable long-term after an earthquake, they do not meet standard engineering guidance for stability during a major seismic event. This deviation is considered acceptable because the breakwaters are not life-safety structures. Their failure would not pose a direct risk to human life and designing them to withstand such an event would be prohibitively expensive.

This approach accepts the risk that a large-magnitude, 1964-level earthquake could cause significant damage to the breakwaters. In such a scenario, USACE would likely be required to return to repair or reconstruct the damaged structures to restore project function, consistent with the actions taken following the 1964 event. Additionally, a major seismic event could cause tectonic subsidence or uplift, which could alter seafloor elevations and require unscheduled maintenance dredging to maintain the authorized project depth.

5.0 FUTURE WITH PROJECT / ENVIRONMENTAL CONSEQUENCES

This section discusses the potential impacts of the action alternatives (Section 4) upon the environmental resource categories described in Section 3, including the agency's TSP and the No Action Alternative, which is the FWOP (See Chapter 3). Department of Defense (DoD) NEPA Implementing Procedures require USACE to discuss "the reasonably foreseeable effects of the proposed agency action and the alternatives considered" (Part 1.5(b)(3)) to inform whether USACE should prepare a Finding of No Significant Impact (FONSI) or Environmental Impact Statement (EIS; Part 1.5(b)(3)). The scope of analysis for the EA (consistent with Part 1.5(c)) of the DoD NEPA Implementing Procedures) focuses on:

- The assessment of whether environmental effects would be significant.
- How a reasonable line was drawn between the consideration of environmental effects from the proposed action and consideration of effects outside of the geographical territory of the proposed action.
- When USACE has determined it would assist in reasoned decision-making, environmental effects of other projects separate in time, separate in place, outside DoD regulatory authority, and/or initiated by a third party.

The information and analysis presented in Section 3, Existing and Future Without Project Conditions, and this section, Section 5, Future with Project / Environmental Consequences, present the information used to inform environmental impact determinations of the considered alternatives in comparative form and is used by decision-makers to determine whether a FONSI or EIS would be prepared.

The four structural alternatives are, from an environmental perspective, quite similar to one another. This is largely due to the overlapping footprints, similar designs and planned construction activities across the three structural alternatives. Thus, these alternatives would each impact the same general location and environmental resources in a similar manner. The four structural alternatives would differ incrementally in the magnitude, extent, and duration of impacts. For this reason, environmental resource categories were addressed collectively when there is no discernable difference between the consequences of the four structural alternatives.

The magnitude of the effects upon an environmental resource considered the presumed type, context, intensity, and duration of the effect. With exception wherein there is specific statutory determination language, USACE used resource specific criteria and best professional judgement to determine the magnitude of effects. The effects are tiered as follows:

- **No Effect:** there is no potential for effects.
- **Minor:** effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.
- **Moderate:** effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
- **Major:** effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

ESA and MMPA species and habitat will be evaluated using ESA Section 7 statutory language:

- **No effect**: No expected effects.
- **May affect, not likely to adversely affect / no adverse modification**: All reasonably expected effects of an alternative will be beneficial, insignificant, or discountable.
- **May affect, likely to adversely affect / adverse modification**: Any adverse effect to a resource that occurs as a direct or indirect result of an alternative or its interrelated or interdependent actions, and the effect is not discountable or insignificant.

Cultural resources will be evaluated using NHPA Section 106 statutory language:

- **No historic properties affected**: No historic properties are present; or, historic properties are present, but the undertaking will have no effect upon them.
- **Historic properties affected**: historic properties may be affected by the undertaking.

The greatest direct impacts from project construction on evaluated resource categories would be caused by:

- Placement of rock for a rubble-mound breakwaters. The magnitude estimate for rock and fill placement for each alternative is presented in Table 5-1.
- Dredging operations to deepen and maintain dredged prisms to Federally-authorized depths. The magnitude of new dredging and maintenance dredging for each alternative is presented in Table 5-1.
- Pile driving for installation of the float system and ATONs. This evaluation presumes 18- and 24-inch diameter round steel piles requiring a combination of vibratory and impact pile driving for new harbor float system. Pile driving for ATONs would be consistent with the description provided in Section 7.6.

The alternatives and their design elements are summarized in Table 5-1.

Table 5-1. Summary of Project Alternatives and Design Elements

Feature	No Action	Alt 1a: Large Transient	Alt 1b: Transient Vessel	Alt 2: Transient & Waitlisted	Alt 3: Transient, Waitlisted & Projected
Primary Goal	Continue operations as is with the existing Port and Harbor.	Accommodate large transient vessels (85–225 ft).	Accommodate entire transient fleet.	Accommodate transient fleet & current waitlist.	Accommodate transient, waitlisted, and 20-yr projected growth.
New Moorage Basin Area	0 acres	8 acres	33 acres	37 acres	50 acres
New Vessel Capacity	0	64	116	304	779
Breakwater Length	0 ft	~3,200 ft	~4,300 ft	~4,500 ft	~4,600 ft
Dredge Prism Area	0 acres	44 acres	63 acres	68 acres	88 acres
New Work Dredging Volume	0 CY	1,029,300 CY	1,333,300 CY	1,311,800 CY	1,519,300 CY
New Work Dredging Sediment Type	*N/A*	Very soft to soft silt and clay, and loose to medium dense sand.			
Annual Maint. Dredging Volume	0 CY	17,000 CY			
Annual Maint. Dredging Sediment Type	*N/A*	Very soft silts/clays, loose sands			
Armor Rock Quantity	0 CY	92,100 CY	117,200 CY	123,100 CY	149,500 CY
B Rock Quantity	0 CY	47,900 CY	66,800 CY	66,500 CY	84,700 CY
C Rock Quantity	0 CY	199,800 CY	297,200 CY	310,800 CY	381,200 CY
Total Rock Quantity	0 CY	339,800 CY	481,200 CY	500,400 CY	615,400 CY
USCG Construction of Aids of Navigation (Section 7.6)	No	Yes	Yes	Yes	Yes
NFS Construction of LSF (Section 4.6)	No	Yes	Yes	Yes	Yes

5.1 Physical Environment

The consequences of the alternatives to physical environment resources described in Section 3.2 are evaluated in this section.

5.1.1 Sea Ice

The structural alternatives would likely have a small, highly localized effect on the formation and stability of sea ice in the immediate area of the harbor. The extended rubble-mound causeways and/or breakwater would provide a greater anchor for shorefast ice in that area, protecting it to some degree from the shearing effects of strong winds.

Mitigatory Measures: To mitigate ice impacting proposed alternatives, all harbor designs include a western breakwater intended to block drifting ice and other debris.

Magnitude of Effects: Minor.

5.1.2 Tides

Impacts to tides are not anticipated from implementing any of the four structural alternatives Tides are influenced by the interaction of the Earth and the moon and this project does not have the capacity to influence these forces.

Magnitude of Effects: No Effect.

5.1.3 Wind

The construction of the proposed harbor breakwaters, with crest elevations of +30 feet MLLW, would have a localized effect on wind conditions within the harbor basin. The breakwaters would create a sheltered environment for moored vessels, providing significant protection from the predominant strong northeast winter winds and the southwest storm winds. This effect would be localized to the harbor area, with no discernible impact on regional wind patterns.

Mitigatory Measures: The project is not expected to create adverse wind effects that would require mitigation. The breakwater structures themselves are designed to withstand local wind and wave forces.

Magnitude of Effects: Minor.

5.1.4 Currents and Sedimentation

The proposed breakwaters would interact with the local current and sediment transport pathways in the immediate project area. The structures would act as a barrier to the predominant northwestward drift of sediment along the Kachemak Bay side of the Spit, causing sediment to accumulate on the updrift (southeast) side of the new harbor. The new entrance channel would likely become a sediment sink, requiring annual maintenance dredging to maintain navigable depths, similar to the existing harbor. These effects are expected to be localized to the project footprint and the adjacent shoreline, and are not expected to significantly impact the existing harbor. Sediment transport modeling by HDR is currently ongoing to evaluate how the new project features would affect long-term sediment movement and maintenance dredging requirements.

Mitigatory Measures: The project incorporates annual maintenance dredging as a planned, recurring operational activity to manage the anticipated sedimentation within the proposed harbor entrance channel.

Magnitude of Effects: Moderate.

5.1.5 Relative Sea Level Change

The project itself would have no effect on the rate of RSLC. However, all alternatives have been designed to account for a range of potential future RSLC scenarios over the 50-year planning horizon. The breakwater crest elevations and navigational depth incorporate allowances for RSLC to ensure the harbor remains functional throughout its design life.

Magnitude of Effects: No Effect.

5.1.6 Geology/Topography

The construction of the proposed breakwaters would create new, permanent topographic features in the project area. The crests of these structures, with crest elevations of +30 feet MLLW, would be visible above the water surface, modifying the local landscape adjacent to the existing harbor. The existing harbor also includes breakwaters with crest elevations of +30 feet MLLW. These effects would be localized to the immediate harbor footprint and would not impact the broader regional topography or geology.

Mitigatory Measures: No mitigatory measures are required, as the creation of these topographic features is an intended and integral component of the harbor construction.

Magnitude of Effects: Minor.

5.1.7 Soil & Sediment

The proposed project is expected to have minor adverse and manageable effects on soils and sediment. Construction would involve dredging and filling, which would permanently alter the local sedimentary environment by removing and covering the existing seabed. The seabed is expected to stabilize after one year. While construction would cause temporary, localized turbidity, the dredged material is considered suitable for in-water placement based on chemical and physical analysis.

New work dredged material is planned for in-water disposal at the Deep Water Disposal Site (DWDS), located adjacent to the southern boundary within the area excluded from the KBCHA near the end of the Homer Spit (Appendix N). The material to be dredged is similar to the surface sediment observed at the DWDS (Appendix P). Adherence to a comprehensive Dredged Material Management Plan (DMMP) developed with regulatory agencies would ensure impacts are minimized. The project is not anticipated to cause significant long-term degradation of the sedimentary environment.

Direct, short-term impacts on soils and sediment occur during construction activities for any of the action alternatives. Dredging would physically remove soft silts and clays from the new basin and channel areas, while the construction of rock breakwaters and other fill sections would permanently cover existing seabed. These activities would cause the temporary re-suspension of sediment, but this is expected to be localized, managed through best management practices (BMPs).

Concerns raised by the ESWG regarding alterations to sediment circulation are directly addressed by the project's modeled hydrodynamic effects. Indirect, long-term effects on soils and sediment are related to the altered hydrodynamic environment of the expanded harbor. As detailed in the HDR Metocean Baseline Conditions Report (Appendix A, Attachment A), the new breakwaters would block and redirect existing currents and wave energy. This would fundamentally change local current velocities, leading to new patterns of erosion and deposition (scour and shoaling) within and adjacent to the new harbor. While these changes are modeled to be localized and stabilized, they represent the permanent alteration to the natural sediment transport patterns.

Periodic maintenance dredging would be required to maintain navigable depths. Maintenance dredging is presumed to remain consistent with current dredged material management strategy of the existing harbor (dredged material piped to an upland de-watering site that would act as a stockpile for further beneficial use on the Homer Spit; Appendix N). It is anticipated that approximately up to 17,000 CY would be dredged annually, equating to approximately 850,000 CY across the period of analysis.

The overall sedimentary environment of Kachemak Bay will continue to be dominated by large-scale natural processes. The project's contribution to these bay-wide processes would be negligible. The primary cumulative impact relates to the permanent conversion of existing soft-bottom habitat to deepened channel or armored slope and the ongoing need for maintenance dredging. However, as the dredged material has been found to be clean, its relocation is not expected to contribute to a cumulative degradation of regional sediment quality. The potential doubling of the total amount of material dredged annually to maintain Homer Harbor with the construction of the current basin is also not anticipated to contribute to regional sediment quality degradation and result in more material available for beneficial use on the Homer Spit.

Comparison of Alternatives

The primary differences in impacts on soils and sediment relate to the scale of the project's footprint. Larger alternatives involve greater volumes of dredging and a larger area of seabed being permanently covered by breakwater fill, leading to a greater degree of permanent habitat conversion and a more significant alteration of local sediment dynamics.

Table 5-2 compares the soil and sediment impacts of each alternative.

Table 5-2. Comparison of Soil and Sediment Impacts by Alternative

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
No Action	No construction impacts.	Existing shoaling and sedimentation patterns and annual maintenance dredging frequency and volume would continue. No new permanent impacts would occur.

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
1a	Adverse: Minor and the least significant removal and covering of seabed from smaller-scale new work dredging and fill placement (1,029,300 CY).	Adverse: Minor and the least permanent change to seabed habitat and local sediment transport patterns. Minor additional increase in annual maintenance dredging (17,000 CY) would be required.
1b	Adverse: Minor removal and covering of seabed from moderate-scale new work dredging and fill placement (1,333,300 CY)	Adverse: Minor permanent change to seabed habitat and local sediment transport patterns. Minor additional increase in annual maintenance dredging (17,000 CY) would be required and would be available for beneficial use on the Homer Spit.
2 (TSP)	Adverse: Minor removal and covering of seabed from moderate-scale new work dredging and fill placement (1,311,800 CY)	Adverse: Minor permanent change to seabed habitat and local sediment transport patterns. Minor additional increase in annual maintenance dredging (17,000 CY) would be required and would be available for beneficial use on the Homer Spit.
3	Adverse: Minor but the most significant removal and covering of seabed from the largest scale of new work dredging and fill (1,519,300).	Adverse: Minor but the most significant permanent change to seabed habitat and local sediment transport. Minor additional increase in annual maintenance dredging (17,000 CY) would be required and would be available for beneficial use on the Homer Spit.

Proposed Mitigatory Measures

USACE would ensure project compliance through an internal CWA Section 404(b)(1) (Draft CWA 404(b)(1) Evaluation in Appendix G) analysis and by satisfying the conditions of the CWA Section 401 WQC from ADEC. The primary mitigation for the responsible management of excavated soils and sediments involves a phased approach to material characterization. A more robust and comprehensive sediment analysis would be conducted during the PED Phase to fulfill the requirements of the Conditional 401 WQC sought during the Feasibility Phase. This detailed testing addresses stakeholder interest in ensuring dredged material is properly managed. This comprehensive PED-level testing, developed using the Draft ADMEF in coordination with EPA and ADEC, would define the material's chemical and physical properties, including grain size, total organic carbon, ammonia, sulfides, and a broad range of potential chemical constituents. The need for biological toxicity testing will be re-evaluated based on the results of this future analysis. The purpose of this characterization is to definitively confirm that the excavated soils and sediments are geotechnically and chemically appropriate for their final placement location. The sediment evaluation is critical to informing the final DMMP for the project. A Draft DMMP (Appendix N) was developed based on the currently available data and information to determine the suitability and practicability of potential dredged material management strategies.

Additional actions to minimize adverse effects for the proposed discharge new work dredged material at the DWDS, include:

- Selecting a disposal site at which the substrate is composed of material similar to that being discharged
- Screening fine-grained material from new breakwater rock

- Restricting vessel operation in shallow water
- Prohibiting vessel grounding outside the project area
- Deploying silt curtains/fences for new work dredging operations
- Placing filter material over the barge scuppers to return clear water
- Surveying and monitoring pre- and post-construction to document site recovery and assess cumulative effects.

Magnitude of Effects: Minor.

Alternative 2 would cause a direct, permanent loss of existing soils and benthic habitat within the project footprint. However, based on the preliminary 404(b)(1) analysis (Appendix G), the new work dredged material would be suitable for in-water disposal at the designated DWDS within the area excluded from the KBCHA. The phased regulatory approach, seeking a Conditional 401 WQC in the Feasibility Phase that is dependent on a more robust sediment analysis in the PED Phase, ensures that the material would be appropriately managed before construction begins. Furthermore, the modeled seabed change from this alternative is anticipated to stabilize within 1 year. The 401 WQC process and sediment transport modeling confirms that impacts on soils and sediment would be minor.

5.1.8 Bathymetry

Project construction would modify the local bathymetry within the project footprint. Dredging of the new harbor basin and entrance channel to depths of up to -26 feet MLLW would remove existing marine sediments and permanently change the seafloor's elevation. The submerged portions of the new breakwaters would also alter the existing seafloor contours. These effects are localized and would not impact regional bathymetric features.

Mitigatory Measures: No mitigatory measures are required, as the changes to local bathymetry are a planned and necessary part of constructing a navigable harbor.

Magnitude of Effects: Minor.

5.1.9 Seismicity

Construction and operation of the proposed project would not alter the underlying seismic hazard, including the frequency or intensity of regional earthquakes.

Magnitude of Effects: No Effect.

5.1.10 Air Quality

The proposed project is expected to have minor adverse and manageable effects on air quality. Project construction would cause a temporary, localized increase in emissions, which would be minimized through BMPs. The project is not anticipated to significantly degrade the region's good air quality or cause a violation of air quality standards.

Direct, short-term impacts on air quality would result from construction activities for any of the action alternatives. The operation of diesel-powered equipment and marine vessels (tugboats, dredges, etc.) would temporarily increase criteria pollutant and GHG emissions. These emissions would be highly localized to the construction area and transient, lasting only for the duration of construction.

Indirect, long-term effects on air quality are related to the future operation of the expanded harbor. The project is intended to relieve vessel congestion and accommodate larger transient vessels and those on the waitlist. While an increased number of vessels would generate more emissions, the project would also reduce emissions associated with operational inefficiencies that occur under the FWOP condition. By providing protected moorage, the project would decrease emissions from vessels that would otherwise anchor in Kachemak Bay, travel to other harbors, or idle while congested. It would also reduce particulate matter from the frequent launch and retrieval of boats stored upland. Therefore, the overall net increase in operational emissions is not anticipated to be substantial.

Criteria pollutant and GHG emissions are expected to increase over time at Homer and within Kachemak Bay due to regional growth, independent of this project. The long-term operational emissions from the project would contribute to this cumulative total. However, the project's efficiency gains are expected to offset some of the emissions that would have occurred under the FWOP condition. The resulting cumulative effects on air quality are expected to remain highly seasonal, variable, and transient, and the project is not expected to cause a significant degradation of regional air quality beyond existing trends.

Comparison of Alternatives

The primary differences in air quality impacts among the alternatives relate to the scale of construction and the ultimate capacity of the harbor. The No Action Alternative avoids construction impacts but retains long-term inefficiencies. All action alternatives (1a, 1b, 2, and 3) involve temporary construction emissions and a long-term increase in vessel capacity, with the magnitude of these impacts scaling with the size of the project. Larger alternatives generate more construction emissions but also provide greater relief from operational inefficiencies.

Table 5-3 compares the air quality impacts of each alternative.

Table 5-3. Comparison of Air Quality Impacts by Alternative

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
No Action	No construction impacts.	Emissions would increase over time with regional growth and persistent harbor inefficiencies (congestion, anchoring offshore).
1a	Adverse: Minor and least significant temporary emissions from construction.	Adverse: Provides some relief from congestion, resulting in a small net change in operational emissions. Contributes minimally to cumulative impacts.
1b	Adverse: Minor, temporary emissions from construction.	Adverse: Provides relief from congestion, resulting in a small net change in operational emissions. Contributes minimally to cumulative impacts.
2 (TSP)	Adverse: Minor, temporary emissions from construction.	Adverse: Provides relief from congestion but accommodates additional small vessels from

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
		the waitlist, resulting in a likely minor net increase in emissions.
3	Adverse: Minor but the most significant (but still temporary) emissions from the largest-scale construction.	Adverse: Accommodates the most vessels, leading to the highest potential increase in total emissions, but also offers the greatest reduction in emissions from inefficiencies.

Proposed Mitigatory Measures

Contractors would be required to use equipment that is in good repair and meets all applicable emission standards. BMPs, such as wetting work surfaces, would be applied if visible dust is generated. Post-construction emissions from increased port activity may be managed through administrative controls and infrastructure upgrades, but such measures are outside the scope of this federal study.

Magnitude of Effects: Minor.

Alternative 2 short-term, long-term, and cumulative effects on air quality would be highly seasonal, variable, and transient. While the project would contribute to an increase in criteria pollutants and GHG emissions, it is unlikely to cause a nonattainment designation for Homer or Kachemak Bay. Air quality is anticipated to retain its general good AQI with only minimal increased frequency of lower AQI days. The project is not in a CAA non-attainment area, and the conformity determination requirements of the CAA do not apply.

5.1.11 Water Quality

The proposed project is expected to have minor adverse effect on water quality. Project construction would cause a short-term increase in turbidity, which would be minimized through BMPs and adherence to permit conditions. The expanded harbor and increased vessel traffic would have long-term effects that would permanently alter local water circulation and increase the overall risk of pollution. USACE would obtain a CWA Section 401 WQC, which includes mandatory conditions to ensure compliance with state WQS.

In-water work, such as dredging, pile driving, and breakwater construction, would temporarily increase turbidity and suspended sediments. These short-term impacts would be highly localized , lasting only for the duration of in-water work.

Indirect, long-term effects on water quality are related to the future operation of the expanded harbor. The new configuration would permanently alter local water circulation and flushing patterns that are critical for maintaining ecosystem health. The project would also accommodate more vessels, which increases the chronic, low-level risk of pollution risk from vessel operations (e.g., fuel, hull paints, waste) and elevates the potential for introducing invasive marine species. The long-term operational impacts from the project, such as altered circulation and increased pollution risk, would have a cumulative impact on the marine environment. The WQC ensures that cumulative impacts would not violate state WQS.

Comparison of Alternatives

Differences in water quality impacts across the alternatives relate to in-water construction and the operational footprint. The No Action Alternative avoids new construction impacts but does not address existing infrastructure. All action alternatives (1a, 1b, 2, and 3) involve short-term impacts on turbidity and create a permanent, larger harbor footprint. The magnitude of these impacts are scaled with the size of the project.

Table 5-4 compares the water quality impacts of each alternative.

Table 5-4. Comparison of Water Quality Impacts by Alternative

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
No Action	No construction impacts.	Water quality trends would continue to be driven by environmental change and regional growth without project-related impacts.
1a	Adverse: Minor and the least significant, temporary increases in turbidity from the smallest scale of in-water work.	Adverse: Minor and the least significant alteration of local hydrodynamics and a small increase in pollution risk from continued congestion in existing harbor.
1b	Adverse: Minor, temporary increases in turbidity from dredging and construction.	Adverse: Minor alteration of local hydrodynamics and a small increase in pollution risk from continued congestion in existing harbor.
2 (TSP)	Adverse: Minor, temporary increases in turbidity from dredging and construction.	Adverse: Minor alteration of local hydrodynamics and an increased risk of pollution introduced by new small vessels from the waitlist that did not already occur in Kachemak Bay.
3	Adverse: Minor but the most significant, temporary increases in turbidity from the largest scale of in-water work.	Adverse: Moderate and most significant alteration of local hydrodynamics and the highest increased risk of pollution introduced by new vessels that did not already occur in Kachemak Bay.

Proposed Mitigatory Measures

USACE would obtain a WQC from ADEC, and complete an internal CWA Section 404(b)(1) analysis (Appendix G). The following mitigation measures would be implemented to minimize impacts on water quality:

- Spill Prevention and Control: To prevent the introduction of hazardous substances, the contractor would be required to develop and implement a comprehensive Spill Prevention, Control, and Countermeasure (SPCC) Plan. All equipment would be inspected daily for leaks, and spill response supplies would be available on-site to immediately contain and clean up any potential spills.
- Turbidity and Sediment Control: To minimize the suspension of sediment into the water column during construction, dredging would be conducted using BMPs. These may include operational controls such as regulating the speed of the dredge bucket and using silt curtains, where they are determined to be effective and feasible.

- Dredged Material Analysis: Prior to dredging, the sediment would be tested (as described in the mitigations for soils and sediment) to ensure that disturbed material would not release contaminants that could degrade water quality.

Magnitude of Effects: Minor.

Alternative 2 short-term, long-term, and cumulative effects on water quality would be localized and are not expected to change the overall attainment status of Kachemak Bay. While construction would cause temporary adverse effects, these would be minimized by adherence to the CWA Section 404 WQC permit conditions and the use of BMPs. USACE's internal 404(b)(1) analysis, combined with the WQC, would ensure the project complies with state and federal water quality regulations. Therefore, the overall impacts are considered minor.

5.1.12 Floodplain

The proposed project is expected to have minor adverse and manageable effects on the floodplain. Project construction would occur entirely within the floodplain but would not increase flood risk. The new breakwaters would have a long-term impact, and would permanently alter the local wave climate. The new breakwaters would provide beneficial reduction in wave energy in some areas, while potentially redirecting wave energy to others. The project is required to comply with E.O. 11988, Floodplain Management, which includes a formal finding to ensure the action is sited and designed responsibly. The project is not anticipated to exacerbate flood risk to the community or violate local floodplain ordinances.

Direct, short-term impacts on the floodplain are primarily related to the vulnerability of partially constructed breakwaters during construction. A severe storm event occurring before a section of the rubble-mound breakwater is fully armored and keyed-in could cause localized failure, scattering rock and other construction materials. This represents a minor, temporary construction risk within the floodplain, but does not materially alter the overall flood risk to land-based infrastructure. All work would be conducted in compliance with the standards established by FEMA and Homer City Code.

Indirect, long-term effects are related to the permanent presence of the new harbor infrastructure. The new configuration would permanently alter the local wave climate. This is expected to have a beneficial impact by absorbing and reducing wave energy. This would provide increased protection to the shoreline and infrastructure located directly behind the breakwaters. However, there is a potential for adverse impacts if the breakwaters reflect or redirect wave energy to adjacent, unarmored sections of the shoreline, which could focus wave action and worsen erosion or flooding in those specific areas. There are no chronic operational risks; the effects are entirely based on physical structure.

The floodplain of the Homer Spit will continue to be influenced by regional environmental trends, including the net effect of sea-level change and isostatic rebound. The mandatory requirement for the project to comply with E.O. 11988 ensures that cumulative impacts have been evaluated.

Comparison of Alternatives

The primary differences in floodplain impacts among the alternatives relate to the scale and alignment of the breakwaters and the resulting magnitude of their influence on the local wave climate. The No Action Alternative avoids new impacts but does nothing to alter existing conditions or provide any potential wave-reduction benefits. All action alternatives would permanently alter wave patterns, with the magnitude of these effects scaling with the size and orientation of the breakwaters.

Table 5-5 compares the floodplain impacts of each alternative.

Table 5-5. Comparison of Floodplain Impacts by Alternative

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
No Action	No construction impacts.	Floodplain vulnerability would continue to be driven by environmental change and regional trends without project-related influence.
1a	Adverse: Minor potential for instability of partially completed structures during a storm event, which could scatter construction materials. This represents the lowest short-term risk among the action alternatives.	Adverse: Minor and the least significant alteration of the local wave climate from the smallest breakwater footprint.
1b	Adverse: Minor potential for instability of partially completed structures during a storm event, which could scatter construction materials.	Adverse: Minor alteration of the local wave climate from breakwater footprint.
2 (TSP)	Adverse: Minor potential for instability of partially completed structures during a storm event, which could scatter construction materials.	Adverse: Minor alteration of the local wave climate from breakwater footprint.
3	Adverse: Minor but the most significant potential for instability of partially completed structures during a storm event, given the largest scale of construction and volume of materials.	Adverse: Minor but the most significant alteration of the local wave climate from the largest breakwater footprint.

Proposed Mitigatory Measures

The project must comply with E.O. 11988, Floodplain Management, and Homer City Code 21.41, Flood Prone Areas. The following measures would be implemented to minimize impacts on the floodplain:

- Hydraulic Analysis and Design: To minimize adverse effects and maximize beneficial ones, a detailed hydraulic analysis would be used to optimize the breakwater’s size, shape, and alignment. The goal is to maximize navigational safety and shoreline protection while ensuring the final design does not exacerbate flood risk to adjacent shorelines.
- Compliance with E.O. 11988: USACE would complete the "eight-step process" required by the order to document that there is no practicable alternative to construction in the floodplain and that all practicable measures to minimize harm

to and within the floodplain have been taken. This ensures a formal finding of compliance prior to construction.

Magnitude of Effects: Minor.

Alternative 2 short-term risks are related to standard construction vulnerabilities and are considered minor. The long-term effects are a mix of beneficial and potential adverse impacts on the local wave climate, which are not expected to change the overall flood risk profile for the Homer Spit. While the project permanently alters the shoreline, these changes would be minimized by adherence to design standards guided by hydraulic modeling. The project's compliance with E.O. 11988 ensures it is designed and executed in a manner that responsibly addresses floodplain management. Therefore, the overall impacts are considered minor.

5.1.13 Noise

The proposed harbor expansion is expected to have adverse and beneficial minor and manageable effects on the acoustic environment. Project construction, particularly pile driving for the new float system (18- and 24-inch round steel pipe piles) and USCG navigation towers (15 piles), would cause a short-term and localized increase in airborne noise, which would be minimized through BMPs and operational controls. The expanded harbor would reduce noise associated with harbor congestion. The project is not anticipated to create noise levels that exceed EPA guidelines for public health and welfare for the general public, and impacts would be minimized through mitigation.

Direct, short-term impacts on the acoustic environment would result from construction activities for any of the action alternatives. The most significant noise source would be impulsive sounds from impact pile driving, which can reach levels of 108 dBA at 50 feet. Other non-impulsive sounds from machinery and vessels would be consistent with existing noise sources in the harbor. These noise impacts would be short-term, lasting only for the duration of construction activities, and would be managed through safety protocols and timing restrictions.

Indirect, long-term effects on noise are related to the future operation of the expanded harbor. The project is intended to accommodate vessels from the existing harbor and, depending on the alternative, additional small vessels from the waitlist. Small vessels from the waitlist are expected to include vessels operating in Homer that use the ramp and new vessels. The additional new small vessels would increase the overall anthropogenic activity and associated noise on the Homer Spit. New breakwater structures may also generate more noise from wind and waves. However, the project would also reduce noise associated with operational inefficiencies that occur under the FWOP condition, such as engine noise from vessels waiting for moorage or the sounds of vessels readjusting in congested rafted groups.

The overall acoustic environment at Homer Harbor would continue to be shaped by seasonal tourism and industrial activity. The long-term operational noise from the project would contribute to this cumulative total. However, the offsetting reduction in congestion-related noise and the implementation of mitigation for the most disruptive construction activities ensure the project's cumulative contribution is minor.

Comparison of Alternatives

The primary differences in noise impacts among the alternatives relate to the duration and intensity of construction activities, particularly pile driving. The No Action Alternative avoids construction noise but retains the noise associated with long-term harbor congestion. All action alternatives (1a, 1b, 2, and 3) involve temporary construction noise, with the magnitude of these impacts scaling with the size and complexity of the project.

Table 5-6 compares the noise impacts of each alternative.

Table 5-6. Comparison of Noise Impacts by Alternative

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
No Action	No construction impacts.	Noise levels would increase over time with regional growth and persistent harbor congestion.
1a	Adverse: Minor and the least significant temporary noise increases from smaller-scale construction and pile driving.	Adverse: Minor and smallest introduction of concentrated noise in a new area. Beneficial: Minor and least relief from congestion-related noise in the existing harbor.
1b	Adverse: Minor, temporary noise increases from construction and pile driving.	Adverse: Minor introduction of concentrated noise in a new area. Beneficial: Moderate relief from congestion-related noise in the existing harbor.
2 (TSP)	Adverse: Minor, temporary noise increases from construction and pile driving.	Adverse: Minor increase in vessel-related noise through introduction of some new small vessels from the waitlist that do not already occur in Kachemak Bay, and minor introduction of concentrated noise in a new area. Beneficial: Moderate relief from congestion-related noise in the existing harbor.
3	Adverse: Minor but the most significant, temporary noise increases from the largest scale of construction and pile driving.	Adverse: The highest potential increase in noise from new vessel traffic, and minor introduction of concentrated noise in a new area. Beneficial: Moderate relief from congestion-related noise in the existing harbor.

Proposed Mitigatory Measures

The contractor would be required to ensure all personnel employ appropriate hearing protection and would restrict public access to areas where noise levels could be injurious through the use of barriers and notices. High-noise activities, such as pile driving, can also be timed to minimize impacts on the public.

Magnitude of Effects: Minor.

Alternative 2 short-term, long-term, and cumulative effects on the acoustic environment would be highly seasonal, variable, and transient. Pile driving represents the greatest potential adverse effect, but this impact is temporary and would be mitigated through worksite safety practices and scheduling. Most project-generated noise would be an incremental increase over the existing ambient noise level at Homer Harbor. The overall impacts of noise on the acoustic environment are considered minor.

5.1.14 Cultural Resources

The PDT reviewed the potential effects on aesthetic, historical, and cultural resources both directly and indirectly impacted by the proposed navigation improvements. The proposed navigation improvements at Homer Harbor do not have the potential to affect any known Historic Properties identified in the AHRS or in the NRHP. Homer Harbor (SEL-00400) is within the APE (36 CFR 800.16(d)), however, SEL-00400 has been determined not eligible for inclusion in the NRHP.

Comparison of Alternatives. The primary difference among the alternatives (1a, 1b, 2, and 3) relates to the scale and alignment of the harbor basin and breakwaters. The APE for all of the alternatives is similar and none of the proposed alternatives are anticipated to affect known or unknown historic properties or cultural resources. SEL-00400 is the only site in the APE for all of the alternatives, however, as noted, SEL-00400 was determined not eligible for inclusion in the NRHP. The No Action Alternative would have no adverse effect on historic properties (see Appendix E: Environmental Correspondence).

Mitigatory Measures: No adverse effects on historic properties or impacts on aesthetic, historical, or cultural resources are expected. If a contractor encounters potential Historic Properties or other cultural resources that may require evaluation, they would immediately halt construction activity and contact a USACE Archaeologist for further direction.

Magnitude of Effects: Minor.

USACE has determined that the proposed action would result in no historic properties affected under Section 106 of the NHPA [36 CFR § 800.4(d)(1)]. The Alaska State Historic Preservation Officer (SHPO) (concurrence pending) with a determination of no historic properties adversely affected (USACE 2026; see Appendix E: Environmental Correspondence). The proposed undertaking would not alter or lead to the alteration of any important attribute of historical or cultural resources. Government-to-Government consultations regarding Tribal trust resources, conducted outside of the NHPA or NEPA context, are discussed in Section 8.4.

The action alternatives all are similar in design and size. The project location north of the existing harbor is all uplands created from the expansion of the existing harbor. Any ground disturbing construction activities in this area are not likely to have an adverse effect on historic properties. USACE identified the APE for the TSP, alternative 2, in accordance with 36 CFR § 800.4(a)(1).

5.1.14.1 Area of Potential Effect

In accordance with 36 CFR § 800.4(a), USACE has identified the proposed undertaking's APE. It includes the System 5 floats in the existing harbor basin, the dredge prism on the northeast side of the Homer Harbor, the Alternative 2 harbor basin, three ATONs five pile towers, an offshore disposal area on the southern tip of the Homer Spit, utilities areas, and two staging areas. A review of the AHRS, BOEM database, and NOAA Wrecks & Obstruction Mapper revealed multiple known AHRS sites and shipwreck locations within the project vicinity, however, only SEL-00400 which has been determined to be not eligible for inclusion in the NRHP is directly in the APE.

The BOEM Database identified 14 shipwreck locations within the general vicinity of the Homer Spit. These shipwreck locations are not located in the APE, nor do they seem to be in the vicinity of the Homer Spit or the heavily used waterways within that area of Kachemak Bay.

The NOAA Wrecks and Obstructions Mapper shows no wrecks in or obstructions in the immediate project area. Three visible wrecks are shown just northwest of the harbor outside the APE; the vessels are listed as always dry and the coordinates place them on land. However, updated Google Earth imagery (2022) shows that the wrecks are no longer visible. A site visit (2025) confirmed that these vessels are no longer present and the area is designated as a large vessel haul out and repair location managed by the Homer Harbormaster’s office.

5.2 Natural Environment

The consequences of the alternatives to natural resources described in Section 3.3 are evaluated in this section.

5.2.1 Terrestrial Habitat

The proposed project is expected to have minor adverse effects on terrestrial habitat. Project construction would require the use of upland areas on the Homer Spit for staging, storage, and access, primarily utilizing the existing disturbed and developed landscape. While some ground disturbance is unavoidable and may impact small patches of existing vegetation, the project would not affect high-value terrestrial habitat. With mitigation to control the spread of invasive species, long-term impacts are not anticipated to be significant.

Direct, short-term impacts on terrestrial habitat would result from construction activities, involving ground disturbance, soil compaction, and potential vegetation removal from the use of upland areas for staging and storage. These actions create bare ground, temporarily increasing the risk for invasive species.

Long-term impacts are not anticipated, as the project is marine-based. The only permanent impact would be the loss of any small, vegetated parcels converted for project infrastructure.

The project contributes to the developed footprint of the Homer Spit, continuing the long-term trend of converting the Spit's natural or semi-natural state to one dominated by industrial and port-related uses.

Comparison of Alternatives

The primary difference in terrestrial habitat impacts across the alternatives is the scale of the construction effort. Larger alternatives require more equipment, materials, and longer construction schedules. This would likely require a larger terrestrial footprint for staging and support activities.

Table 5-7 compares the terrestrial habitat impacts of each alternative.

Table 5-7. Comparison of Terrestrial Habitat Impacts by Alternative

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
No Action	No construction impacts.	Existing land use patterns would continue, with the potential for incremental loss of vegetated parcels from other activities.
1a	Adverse: Minor and the least ground disturbance and vegetation removal from the use of upland staging areas.	Adverse: Minor and the least contribution to the cumulative developed footprint of the Homer Spit.
1b	Adverse: Minor ground disturbance and vegetation removal from the use of upland staging areas.	Adverse: Minor contribution to the cumulative developed footprint of the Homer Spit.
2 (TSP)	Adverse: Minor ground disturbance and vegetation removal from the use of upland staging areas.	Adverse: Minor contribution to the cumulative developed footprint of the Homer Spit.
3	Adverse: Minor but the most significant ground disturbance and vegetation removal to support the largest construction effort.	Adverse: Moderate and the most significant contribution to the cumulative developed footprint of the Homer Spit.

Proposed Mitigatory Measures

USACE would require the contractor to develop a site management plan to minimize impacts on terrestrial resources. This plan would prioritize the use of existing paved or previously disturbed areas for all staging, storage, and office needs. Construction boundaries would be clearly delineated to prevent unnecessary encroachment into remaining vegetated parcels. Following construction, any temporarily disturbed areas would be regraded and may be re-seeded with a native, erosion-control seed mix, where appropriate, to discourage the establishment of invasive species.

Magnitude of Effects: Minor.

Alternative 2 would primarily use the existing, heavily modified anthropogenic landscape of the Homer Spit. The direct loss of the small, fragmented patches of low-quality habitat is not considered a significant impact in a regional context. The implementation of mitigation measures to limit the construction footprint and manage disturbed areas post-construction would further reduce impacts.

5.2.2 Marine Habitat

The proposed project is expected to have minor but permanent adverse and beneficial effects on marine habitat. Project construction would involve the direct removal and permanent conversion of existing, productive soft-bottom and mixed-substrate habitat to deep-water channel or an armored breakwater. This includes the direct loss of foraging grounds and the permanent conversion of habitat where stakeholders have observed herring spawning and sea pens. While lower-quality habitat would be created on the surfaces of the new breakwaters, the overall loss of natural seabed is unavoidable. The effects on the broader marine ecosystem of Kachemak Bay are not expected to be significant.

Direct, short-term impacts on marine habitat would occur during construction activities. Dredging would physically remove the existing soft-bottom habitat and its associated infaunal community. The construction of rock breakwaters would permanently cover and convert both soft-bottom and mixed-substrate intertidal habitats, including any eelgrass patches or vegetated cobble areas within the project footprint. These actions represent a direct and permanent loss of the existing habitat structure and biological community in the affected area.

Indirect, long-term effects on marine habitat would be twofold. The primary indirect impact is the permanent habitat conversion; the area dredged would become a permanently submerged, deep-water habitat, while the breakwater footprint would become a hard, rocky intertidal and subtidal habitat. This new rock habitat would be colonized over time by a different suite of organisms (e.g., barnacles, mussels, rockweed), creating an artificial reef effect, though this is generally considered a lower-quality habitat than the complex, mixed-substrate environment it replaces. Secondly, the altered hydrodynamics around the new structures would change local patterns of erosion and sediment deposition, which could indirectly alter the substrate and character of adjacent, undisturbed habitats over time.

The cumulative impact of the project is the incremental loss of productive nearshore marine habitat within the Homer Harbor area. This action continues a long-term trend of converting the natural shoreline and seabed of the Homer Spit into hardened, developed port infrastructure, contributing to the overall cumulative loss of natural estuarine habitat in this localized area.

Comparison of Alternatives

The primary difference in marine habitat impacts among the alternatives relate directly to the physical footprint of dredging and fill. Larger alternatives require greater volumes of dredging and cover a larger area of seabed with breakwater fill, resulting in a greater permanent loss of the existing productive marine habitat.

Table 5-8 compares the marine habitat impacts of each alternative.

Table 5-8. Comparison of Marine Habitat Impacts by Alternative

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
No Action	No construction impacts.	Existing marine habitat would persist, subject to natural processes. No new habitat loss would occur.

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
1a	Adverse: Minor and the least significant permanent loss of marine habitat due to smaller construction footprint (i.e., smaller-scale breakwater and dredge prism; approximately 3,200 feet of breakwater and a 44-acre dredged prism).).	Adverse: Minor and the smallest permanent conversion of natural habitat to anthropogenically modified habitat (i.e., breakwater and dredged prism remaining in water) and contribution to cumulative habitat quality loss (i.e., breakwater extending outside of the water). Beneficial: Minor and smallest permanent increase in habitat diversification.
1b	Adverse: Minor permanent loss of marine habitat from moderate-scale construction footprint (approximately 4,300 feet of breakwater and a 63-acre dredged prism).	Adverse: Minor permanent conversion of natural habitat to anthropogenically modified habitat and contribution to cumulative habitat quality loss. Beneficial: Minor permanent increase in habitat diversification.
2 (TSP)	Adverse: Minor permanent loss of marine habitat from moderate-scale construction footprint (approximately 4,500 feet of breakwater and a 68-acre dredged prism).	Adverse: Minor permanent conversion of natural habitat to anthropogenically modified habitat and contribution to cumulative habitat quality loss. Beneficial: Minor permanent increase in habitat diversification.
3	Adverse: Minor but the most significant permanent loss of marine habitat from the largest scale construction footprint (approximately 4,600 feet of breakwater and an 88-acre dredged prism).	Adverse: Minor but the greatest significant permanent conversion of natural habitat to anthropogenically modified habitat and contribution to cumulative habitat quality loss. Beneficial: Minor and greatest permanent increase in habitat diversification.

Proposed Mitigatory Measures

Given that the primary impact is the unavoidable, direct loss of habitat within the project footprint, mitigation focuses on avoidance and minimization during the design phase. The alternatives development process considered various configurations to reduce the dredging and fill footprint to the minimum necessary to meet the project's purpose and need. No additional operational mitigation measures are proposed, as the habitat loss is a permanent outcome of the project's construction.

Magnitude of Effects: Minor.

Alternative 2 would cause a direct and permanent loss of productive marine habitat, including soft-bottom and mixed-substrate communities. However, this habitat type is not unique and is well-represented throughout the broader Kachemak Bay area. Thus, benefits would be derived from habitat diversification.. USACE would coordinate with ADF&G for its planned construction activities in the KBCHA. ADF&G recommends the NFS pursue a long-term administrative solution to permanently exclude the project's full footprint from the KBCHA.

5.2.3 Primary Productivity

This section evaluates the project's effects on primary productivity, focusing on impacts to intertidal mudflats and intertidal and subtidal vegetated shallows. The wetlands depicted in the project footprint on the NWI meet the definition of a deepwater habitat and not a wetland. Thus, E.O. 11990 does not apply. However, high primary productivity of eelgrass and kelp in this area do provide critical beneficial value, and USACE developed an Eelgrass Mitigation Assessment (Appendix M) evaluating the loss of eelgrass within the context of Kachemak Bay.

The proposed harbor expansion is expected to have minor but permanent adverse effects on primary productivity. The project has focused on avoiding and minimizing impacts to these sensitive areas to the greatest extent practicable. The project design avoids and minimizes potential impacts to the area's special aquatic sites. USACE fieldwork identified the project area and adjacent areas consisted of primarily tidal mudflats and vegetated shallows (i.e., eelgrass). Given the quantity of these productive habitats present throughout Kachemak Bay, the project's impact on primary productivity is not considered significant.

Direct, short-term impacts on primary productivity would occur during construction activities. The physical removal of kelp, eelgrass, and benthic microalgae within the dredge and fill footprint represents a permanent loss of these specific primary producers. Additionally, dredging and placement of material would increase suspended sediments, creating a turbidity plume that would temporarily reduce the amount of light penetrating the water column. This would lower the rate of photosynthesis for nearby phytoplankton, kelp, and eelgrass that are outside the direct footprint but within the affected area.

Indirect, long-term effects on primary productivity would result from the permanent changes to the seabed. The area dredged would be deeper, potentially limiting the re-establishment of kelp and eelgrass if depths exceed their photic limits. The new rock breakwaters would provide new substrate for colonization by different species of macroalgae over time, but this artificial habitat is generally considered less productive than the complex, mixed-substrate habitat it replaces.

The cumulative impact of the project is the incremental loss of the bay's overall capacity for primary production. This action adds to the cumulative loss of highly productive special aquatic sites (vegetated shallows, mudflats) in the localized area of the Homer Spit, continuing a long-term trend of converting natural, productive estuarine habitat into hardened port infrastructure.

Comparison of Alternatives

The primary differences in impacts on primary productivity among the alternatives relate directly to the physical footprint of dredging and fill. Direct loss of SAV (eelgrass, understory kelp, canopy kelp) was determined by calculating the total Habitat Units (HU) within a 200-foot buffered footprint for each alternative. HU was calculated based on the equation: HU = "Habitat Quality (HSI Score)" × "Area". Utilizing this equation, the total HUs lost were calculated by taking the cumulative HSI score within an alternative's footprint and multiplying it by 50 square meters (the area assigned to each HSI score in the model). Table 5-9 represents the detailed calculations for each alternative, while Table 5-10 provides a qualitative summary of the primary productivity impacts by alternative. The HSI values used in this analysis were generated by the NCCOS SAV HSI Model (Whippo 2026). As this model is still under development, the resulting HU calculations should be interpreted as preliminary estimates of potential direct loss of SAV habitat. The model provides a valid and uniform methodology for comparing the relative direct impacts of each project alternative.

Table 5-9. SAV Habitat Direct Impact Estimations by Alternative in Comparison with Existing Conditions

Value	Kachemak Bay Existing SAV Habitat	Alternative SAV Habitat Loss				
		No Action	1a	1b	2	3
Submerged Aquatic Vegetation						
Cumulative HSI Score	79,930.4	0	31.6	27.8	28.6	37.5
meter-squared-HUs	3,996,520	0	1,580	1,390	1,430	1,875
acre-HU	987.56	0	0.39	0.34	0.35	0.46
Eelgrass						
Cumulative HSI Score	31,343.6	0	14.0	11.9	12.2	17.2
meter-squared-HUs	1,567,180	0	700	595	610	860
acre-HU	387.24	0	0.17	0.15	0.15	0.21
Understory Kelp						
Cumulative HSI Score	56,855.7	0	31.3	27.6	28.3	37.2
meter-squared-HUs	2,842,785	0	1,565	1,380	1,415	1,860
acre-HU	702.47	0	0.39	0.34	0.35	0.46
Canopy Kelp						
Cumulative HSI Score	23,330.8	0	0	0	0	0
meter-squared-HUs	1,166,540	0	0	0	0	0
acre-HU	288.26	0	0	0	0	0

Table 5-10. Comparison of Primary Productivity Impacts by Alternative

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
No Action	No construction impacts.	Existing productive habitats would persist, subject to natural and regional environmental pressures. No new habitat loss would occur.
1a	Adverse: Minor direct loss of SAV habitat (approximately 0.39 acre-HU) with respect to the Kachemak Bay system and temporary reduction in photosynthesis from turbidity.	Adverse: Minor contribution to the cumulative loss of primary production in the project area.
1b	Adverse: Minor and the least significant direct loss of SAV habitat (approximately 0.34 acre-HU) and temporary reduction in photosynthesis from turbidity.	Adverse: Minor and the least significant contribution to the cumulative loss of primary production in the project area.
2 (TSP)	Adverse: Minor direct loss of SAV habitat (approximately 0.35 acre-HU) and temporary reduction in photosynthesis from turbidity.	Adverse: Minor contribution to the cumulative loss of primary production in the project area.

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
3	Adverse: Minor but the most significant direct loss of SAV habitat (approximately 0.46 acre-HU) and temporary reduction in photosynthesis from turbidity.	Adverse: Minor but the most significant contribution to the cumulative loss of primary production in the project area.

Proposed Mitigatory Measures

During the alternative development process, the project design was refined to reduce the dredging and fill footprint to the minimum necessary, thereby avoiding and minimizing potential impacts to sensitive habitats to the greatest extent practicable. Although the primary remaining impact is the unavoidable, direct loss of productive habitat within the project footprint, preliminary evaluations indicate this loss does not exceed the threshold of negligible adverse impact (33 U.S.C. 2283).

Therefore, the proposed project's environmental strategy focuses on rigorous avoidance, minimization, and impact validation throughout the PED, Construction, and Post-Construction Phases. To validate the determination of negligible impacts and ensure no further compensatory mitigation plan is required, USACE would implement the following measures:

- Habitat-Based Modeling: USACE would certify the USACE SAV HSI Spreadsheet Model and use it in conjunction with the NCCOS SAV HSI Model and HDR sediment transportation modeling (Appendix A, Attachment A). This habitat-based methodology would inform final design decisions and further minimize potential impacts to SAV.
- Stakeholder Collaboration: During the PED Phase, USACE would conduct a workshop in Homer, Alaska, to develop a comprehensive Ecological Survey and Monitoring Plan with direct input from participating environmental stakeholders.
- Pre- and Post-Construction Surveys: In accordance with the Ecological Survey and Monitoring Plan, USACE would conduct rigorous on-the-ground surveys to establish a baseline SAV inventory immediately prior to construction. Post-construction surveys would subsequently occur at years 0, 1, 3, and 5 to monitor SAV status, track natural recovery in the project vicinity, and validate the actual impacts. Eelgrass would be a primary focus of this monitoring effort, as detailed in Appendix M.

Through this combination of predictive modeling and empirical surveys, USACE would continuously validate the environmental impact assessment from the PED Phase through five years post-construction. Should the monitoring data indicate that adverse impacts to fish, wildlife, and ecological resources (e.g., SAV like eelgrass) are non-negligible, USACE would determine the necessary subsequent actions and mitigation requirements.

Magnitude of Effects: Minor.

Alternative 2 would cause a direct and permanent loss of habitat that supports primary production, including the removal of some kelp and eelgrass. There is no practicable alternative to this action that would avoid impacts to special aquatic sites (Appendix G). However, impacts to "special aquatic sites" would be minimized to the greatest extent practicable, and the amount of habitat affected is small relative to the total highly quantity of similar productive habitat available throughout Kachemak Bay. Impacts to special aquatic sites, such as eelgrass (the predominant SAV in the construction footprint), were determined not to be significant (Appendix M). This is further supported by USACE's internal CWA Section 404(b)(1) analysis (Appendix G), which identifies the permanent loss as insignificant in the context of the Kachemak Bay ecosystem. Therefore, the overall effects on primary productivity are considered minor.

The project footprint does not contain wetlands. The habitat present consists of deepwater habitat and impacts predominantly impact vegetated shallows that do not meet the criteria for a wetland. Therefore, E.O. 11990 is not applicable to this project, as no wetlands would be destroyed, lost, or degraded.

5.2.4 Marine Fish and Invertebrates

The proposed project is expected to have minor adverse and beneficial and manageable effects on marine fish and invertebrates. Construction would cause temporary behavioral disturbance to fish and invertebrates. Construction would result in a direct, permanent loss of benthic habitat and sessile organisms within the project footprint. In the long-term, the project would convert productive soft-bottom habitat to a deep-water basin and hard-substrate breakwater. This change in habitat would shift the community composition of marine fish and invertebrates. Mitigation measures designed to control turbidity, underwater noise, and construction timing windows would minimize the overall effects on the broader fish and invertebrate community. The cumulative effects are not expected to be significant.

Direct, short-term impacts on marine fish and invertebrates would result from construction activities. Underwater noise and vibration from pile driving and dredging would cause temporary behavioral disturbance, causing fish and invertebrates to leave the immediate project area. Increased turbidity from these activities can interfere with foraging for visual predators and may stress filter-feeding organisms like clams and mussels. The most direct and permanent impact is the physical removal and burial of the existing benthic community within the dredge and fill footprint. This would result in the loss of sessile organisms bivalves, and any other organisms unable to relocate. It would also destroy any herring eggs that may have been deposited on the substrate being removed or where infrastructure would be built (herring spawning peaks during late April to May) and has potential to impact the migration of salmon smolt in the Fishing Lagoon.

Indirect, long-term effects on marine fish and invertebrates would be primarily driven by habitat conversion. The removal of soft-bottom habitat eliminates foraging grounds for species that prey on infaunal organisms. Conversely, and as a key long-term change, the creation of new, hard-substrate breakwaters would function as an artificial reef. This new habitat would be colonized by a different biological community, likely including barnacles, mussels, and various algae, which in turn would provide food and shelter for species such as rockfish, greenling, and certain crabs. This new structure could also provide a new substrate for herring to spawn upon in the future. The deeper, dredged basin would provide a different type of habitat that may be favored by some of the deep-water species identified in trawl surveys.

The cumulative impact of the project is an incremental increase in habitat conversion and disturbance within the Homer Harbor area. The creation of new hard-substrate habitat may partially offset the loss of soft-bottom habitat for certain species. Given that the impacted habitat types are common throughout Kachemak Bay and that specific mitigation measures would be implemented, the project's cumulative effect on marine fish and invertebrates is expected to be minor.

Comparison of Alternatives

The level of impacts on marine fish and invertebrates is related to the scale of the project's footprint. Larger alternatives involve greater volumes of dredging and a larger area of seabed being permanently converted, leading to a greater direct loss of the existing benthic community but also creating a larger area of new, hard-substrate habitat.

Table 5-11 compares the marine fish and invertebrates impacts of each alternative.

Table 5-11. Comparison of Marine Fish and Invertebrates Impacts by Alternative

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
No Action	No construction impacts.	Existing disturbance patterns and population trends, including depressed state of clam and mussel populations would continue.
1a	Adverse: Minor and the least significant temporary displacement from noise/turbidity and direct habitat loss due to the smallest construction footprint (44-acre basin and approximately 3,200 feet of breakwater).	Adverse: Minor and the least significant permanent conversion of soft-bottom habitat. Beneficial: Minor and the least significant creation of new hard-substrate habitat of the constructed breakwater.
1b	Adverse: Minor temporary displacement and habitat loss from moderate-scale construction footprint (63-acre basin and approximately 4,300 feet of breakwater).	Adverse: Minor permanent conversion of soft-bottom habitat. Beneficial: Minor creation of new hard-substrate habitat of the constructed breakwater.
2 (TSP)	Adverse: Minor temporary displacement and habitat loss from moderate-scale construction footprint (68-acre basin and approximately 4,500 feet of breakwater).	Adverse: Minor permanent conversion of soft-bottom habitat. Beneficial: Minor creation of new hard-substrate habitat of the constructed breakwater.
3	Adverse: Minor but the most significant temporary displacement and habitat loss due to the largest construction footprint (88-acre basin and approximately 4,600 feet of breakwater).	Adverse: Minor but the most significant permanent conversion of soft-bottom habitat. Beneficial: The greatest amount of new hard-substrate habitat would be created during the construction of the breakwater.

Proposed Mitigatory Measures

General project and activity-specific mitigation measures were developed for marine fish and invertebrates. USACE would complete EFH consultation requirements with NMFS pursuant to MSA and is concurrently consulting with NMFS under ESA Section 7. Through these processes, NMFS may recommend additional mitigations for USACE to adopt to protect EFH. USACE would formalize the recommendation mitigation decisions through a formal response letter to NMFS.

Proposed mitigations are described by general measures applied across the whole of the project activities and specific measures by the following project components; (1) dredging operations, (2) pile driving operations, (3) discharge of fill, and (4) harbor infrastructure, docking facilities, and vessel operations.

General Mitigation Measures that would be implemented to the greatest extent practicable and are proposed for application across all project activities include:

- seasonal restrictions to avoid impacts to ADF&G salmon smolt stocking of the Fishing Lagoon. USACE would coordinate with ADF&G to determine the appropriate fish window through the Special Area Permitting process.
- Requiring the contractor and on-site protected species observers (PSOs) to immediately notify USACE should an abnormal extent of dead fish be observed during construction activities.
- Requiring the contractor to develop comprehensive invasive species protocols in an Environmental Protection Plan (EPP) that would include: biofouling removal, ballast water management, and the use of certified weed-free materials. During construction, visual inspections, designated cleaning stations, and an Early Detection and Rapid Response (EDRR) protocol for suspected sightings would be implemented to prevent invasive species introduction and spread.
- Reasonable precautions and controls to prevent incidental and accidental discharge of petroleum products or other hazardous substances, including the preparation of an Oil Spill Prevention and Control Plan by the contractor.
- Siting and conducting fuel storage and handling activities for equipment so there is no petroleum contamination of the ground, surface runoff, or waterbodies. The contractor would be required to inspect equipment on a daily basis for leaks. If leaks are found, the equipment would not be used and pulled from service until repaired.
- Requiring the contractor to make available and use immediately spill response equipment and supplies such as sorbent pads to contain and clean up oil, fuel, hydraulic fluid, antifreeze, or other pollutant spills during construction. Spills would be reported in accordance with Discharge Notification and Reporting Requirements (AS 46.03.755 and 18 AAC 75 Article 3).
- Utilizing modeling results in final design and mitigation (e.g., sediment transportation and SAV HSI modeling) to avoid and/or minimize adverse impacts to SAV.
- Coordinating with ADF&G regarding construction activities within the KBCHA.

- Holding a stakeholder workshop to develop a formal Ecological Survey and Monitoring Plan for assessing pre-construction conditions and post-construction (Year 0, 1, 3, and 5) impacts to fish habitat (e.g., eelgrass; Appendix M).

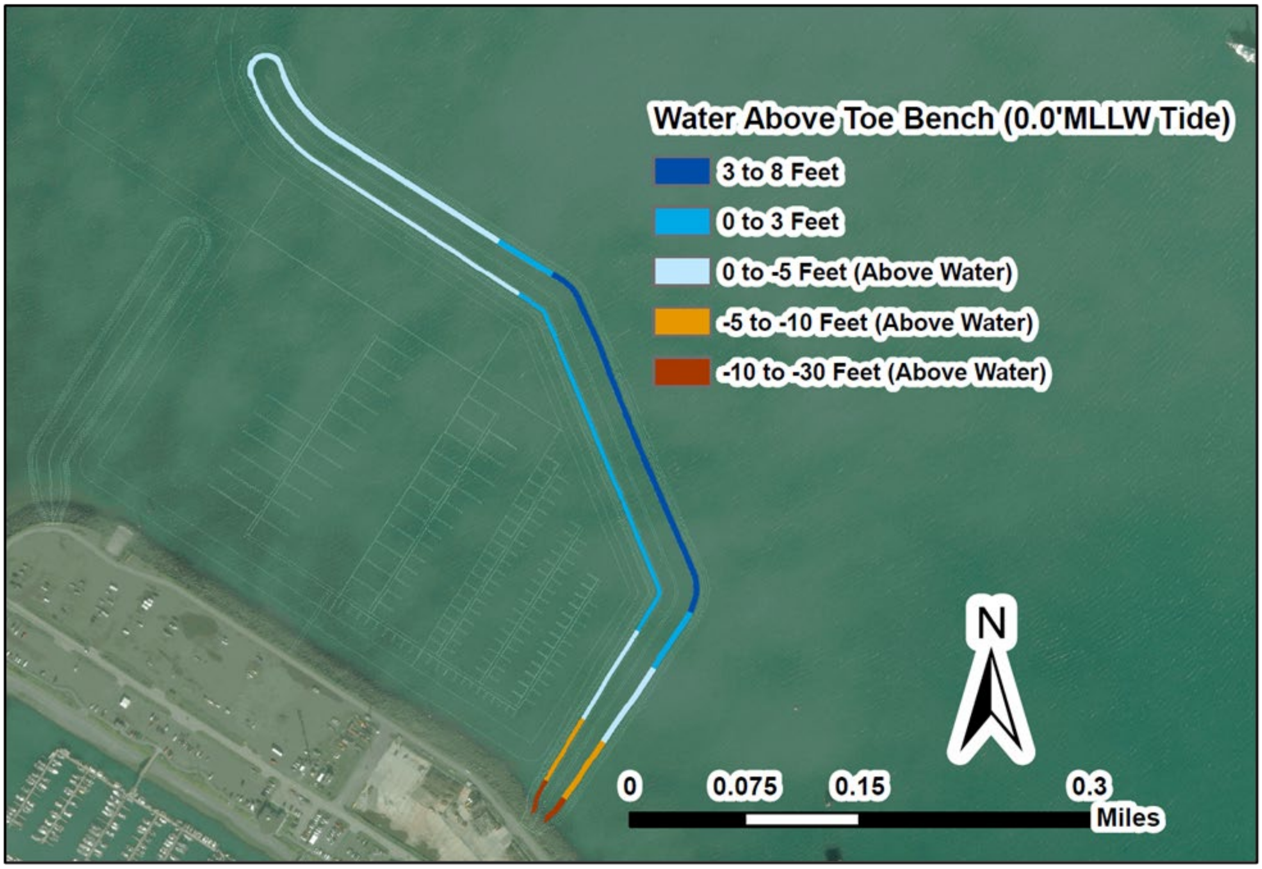
Dredging mitigation measures that are proposed for implementation to the greatest extent practicable under the project for new work and/or maintenance dredging, including the discharge of dredged material include:

- Requiring the contractor to use silt fences/curtains (or similar functioning method) during new work dredging operations to control turbidity and sedimentation.
- Minimizing the area and volume of material to be dredged through informed design.
- Using a hydraulic dredge for maintenance dredging operations to minimize turbidity and sediment.
- Conducting sediment analyses before commencing dredging operations to assess contaminants of concern against applicable screening levels. The scope and frequency of these analyses would be established in coordination with ADEC and EPA to sufficiently validate the suitability of the selected dredged material management strategy.

Discharge of fill mitigation measures that are proposed for implementation to the greatest extent practicable under the project for placement of breakwater rock and fill include:

- Minimizing the extent (area, height, and volume) of fill material through informed design.
- Requiring the contractor to use clean fill materials within the neutral range of 7.5 to 8.4 power of hydrogen.
- Promoting post-construction aquatic organism movement and migration through informed design by appropriate slope considerations into breakwater design. Current design has portions of the breakwater toe that would serve as shallow shelves or “fish benches” (Figure 5-1).

Figure 5-1. Breakwater toe depths associated with MLLW.



Pile driving operations mitigation measures that are recommended by USACE to the NFS and USCG for implementation to the greatest extent practicable under the project for installation, adjustment, and removal of piles for the proposed float systems include:

- Specific to pile removal: requiring the contractor remove the pile completely from the substrate at a minimal rate of speed or the contractor would use silt curtain/fences to reduce resuspended sediment and turbidity increases.
- Requiring the contractor utilize an air bubble curtain system (or similar functioning method) to attenuate noise during pile driving operations.
- Requiring the contractor maximize use of vibratory hammer for the installation and removal of pilings before implementing impact hammer methods or direct pull and clamshell methods.
- Requiring the contractor use an impact hammer with an adjustable energy level if impact pile driving cannot be avoided.
- Conduct Sound Source Verification (SSV) during pile driving operations to assess the sufficiency of mitigation measures. Then implement mitigation measures given SSV data for remaining work, if necessary.
- Requiring the contractor to complete each bass of the clamshell bucket if it is used to remove pile.

Harbor infrastructure, docking facilities, and marine vessel operations mitigation measures that are proposed for implementation to the greatest extent practicable under the project for potential future LSF and marine vessel harbor access and use include:

- Using existing Homer Harbor infrastructure and facilities to reduce the overall shoreline development required to support the project.
- Recommending the NFS increase ambient light transmission under the float system through the use of reflective material on underside of docks and artificial light and consideration during final alignment decisions.
- Recommending that the NFS incorporate low-wake vessel technology and other wave attenuation structures, establish low speed requirements for vessels in and near the harbor, and designate no-wake zones near sensitive habitats.
- Recommending the NFS develop catchment basins for collecting and storing surface runoff from upland repair facilities, parking lots, and other impervious surfaces adjacent to the project infrastructure to remove contaminants prior to delivery to any receiving waters.
- Recommending the NFS design harbor facilities to include BMPs for reducing, containing, and cleaning up petroleum spills.

Magnitude of Effects: Minor.

Alternative 2 would cause a direct, permanent loss of benthic habitat and temporary disturbance to mobile fish and invertebrate species. However, the habitat type being impacted is common throughout Kachemak Bay, and the project incorporates extensive mitigation measures. These include turbidity controls for new work dredging (silt curtains), noise attenuation for pile driving (bubble curtains), and operational windows to protect marine fishes. These measures, combined with consultations with NMFS and ADF&G, would ensure that impacts to the overall marine fish and invertebrate community, including EFH, would be minor. A more detailed analysis of Alternative 2 impacts to EFH is incorporated into the project's EFH Assessment (Appendix H).

5.2.5 Avian Species

The proposed project is expected to have minor adverse and beneficial and manageable effects on avian species. Based on the habitats identified by the ESWG and other sources, construction would cause temporary noise and activity, leading to short-term displacement of foraging shorebirds, seabirds, and bald eagles from the immediate project area. For the ESA-listed Steller's eider, which winters in Kachemak Bay but forages in areas largely outside the project footprint, these effects are anticipated to be insignificant due to the project's location and the implementation of specific protective measures.

Direct, short-term impacts on avian species would be caused by construction activities. Noise and vibration from machinery, particularly pile driving, and increased human presence would likely cause birds to temporarily avoid the project vicinity. This includes foraging shorebirds that use the intertidal area and surf zones. Bald eagles and other seabirds that, as the ESWG noted, use the existing harbor infrastructure for nest sites, roosting, or perching. These birds are expected to move to adjacent, undisturbed areas. The extensive tidal flats of Mud Bay, identified as a crucial feeding area, would not be directly affected by construction. For Steller's eiders, construction noise is not expected to cause any behavioral response, which would likely be limited to temporary avoidance of the immediate construction area. Increased turbidity from dredging is not expected to significantly affect their ability to forage.

Indirect, long-term effects on avian species are expected to be minimal. The new rock breakwaters would convert soft-bottom habitat into artificial, hard-substrate foraging habitat. Building on the ESWG's observation that birds already use existing riprap, this would create additional foraging opportunities that may benefit specialized shorebirds like surfbirds, black turnstones, and rock sandpipers, while also providing new nesting, roosting, and perching sites for various seabirds and bald eagles. For Steller's eiders, the project results in a minor loss of potential foraging habitat within the project footprint; however, this area is not a primary or concentrated foraging location for the species, and abundant similar habitat exists throughout Kachemak Bay. The permanent presence of the new breakwaters is not expected to alter their wintering patterns.

The cumulative impact of the project is a minor incremental increase in the overall level of human activity and development within the Kachemak Bay IBA. This action does not significantly remove or degrade the key habitats (e.g., Mud Bay) that give the Kachemak Bay IBA its importance.

Comparison of Alternatives

The primary differences in impacts on avian species relate to the duration and intensity of construction. Larger alternatives require longer construction schedules and more intensive activity, leading to a longer period of temporary noise and disturbance-related displacement.

Table 5-12 compares the avian species impacts of each alternative.

Table 5-12. Comparison of Avian Species Impacts by Alternative

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
No Action	No construction impacts.	Existing disturbance patterns would continue. No new impacts would occur.
1a	Adverse: Minor and the least significant temporary displacement of birds due to noise and activity from smaller-scale construction.	Adverse: Minor but least significant increase in permanent human activity in area. Beneficial: Minor but least creation of new rock foraging habitat.
1b	Adverse: Minor temporary displacement of birds due to noise and activity.	Adverse: Minor increase in permanent human activity in area. Beneficial: Minor creation of new rock foraging habitat.
2 (TSP)	Adverse: Minor temporary displacement of birds due to noise and activity.	Adverse: Minor increase in permanent human activity in area to include small vessels activity increase from introduction of vessels from the waitlist not already operating in Homer. Beneficial: Minor creation of new rock foraging habitat.

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
3	Adverse: Minor but the most significant temporary displacement of birds due to the largest scale and longest duration of construction.	Adverse: Minor but the most significant increase in permanent human activity in area and greatest introduction of new vessels. Beneficial: Minor but the most new rock foraging habitat created.

Proposed Mitigatory Measures

USACE would implement a multi-faceted mitigation approach to protect avian species, addressing general construction practices, specific requirements under the MBTA and BGEPA, and protections for ESA-listed species.

- **General Construction and Design Measures:** General navigation features would be designed to minimize bird hazards. USACE would recommend this measure and the use of downward-shielding, non-glare lighting in the features to the NFS and USCG. To avoid attracting avian predators to nest sites, all food waste and trash would be stored in covered, wildlife-proof containers and removed from the site regularly. The contractor would be required to immediately notify USACE if a downed-bird event is observed. Furthermore, the mitigation measures for soils, water quality, and primary productivity would also serve to minimize indirect effects on avian species.
- **MBTA and BGEPA Compliance:** To protect nesting birds as identified by the ESWG as a key use of existing structures, USACE or its contractor would conduct bird nest surveys prior to construction. If active nests are found, they would be clearly marked with high-visibility flagging and signage to prevent accidental intrusion. If impacts to eagles or their nests cannot be avoided, USACE would consult with the USFWS to determine if a permit under the BGEPA is required.
- **Steller's Eider (ESA) Protection:** USACE would complete ESA Section 7 consultation with the USFWS during the feasibility study, which may result in additional or modified mitigation measures. The Draft Biological Assessment for ESA Section 7 consultation with USFWS is in Appendix I. To protect the wintering population identified as a critical resource by the ESWG, the following measures would be implemented for Steller's eiders:
  - **Vessel Speed Reduction:** Project-specific construction vessels transiting within the range of Steller's eiders would reduce speed to 8 knots or less and avoid individuals or congregations, within the limits of safe navigation.
  - **Acoustic Shutdown Zones:** During the period when Steller's eiders may be present (October–May), work would cease if the species enters a designated shutdown zone. The minimum zones are a 660-foot radius (standoff distance for eagle nests [50 CFR 22.280])) for in-air noise and the established underwater acoustic shutdown zones for diving birds as proposed in Appendix I. Final shutdown zones for Steller's eiders are subject to change based on ESA Section 7 consultation with USFWS.

Magnitude of Effects: Minor.

Alternative 2 would cause temporary disturbance and displacement of birds during construction. However, similar habitat is available immediately adjacent to the project area. For the ESA-listed Steller's eider, the project "may affect, not likely to adversely affect" the species due to the implementation of vessel speed restrictions and acoustic shutdown zones. For other migratory birds protected under MBTA and eagles protected under BGEPA, pre-construction nest surveys and site management practices would avoid direct impacts to nests and minimize disturbance to these species. Given these comprehensive mitigation measures, the overall effects on all avian species are considered minor.

5.2.6 Marine Mammals

The proposed project is expected to have minor adverse and manageable effects on marine mammals. The ESA defined Action Area (described in Section 5.2) is located within designated critical habitat for the CIBW and is near critical habitat for the Western U.S. DPS of Steller sea lion. The potential impacts are temporary behavioral disturbances from underwater noise during construction (particularly from installation of piles for the float system and ATONs), temporary effects on the essential features of critical habitat (e.g., prey availability and acoustic quality), and a minor long-term increase in vessel traffic. Due to the implementation of mandatory acoustic shutdown zones, vessel speed restrictions, and continuous monitoring by PSOs, any potential effects are anticipated to be insignificant for all ESA-listed marine mammal species.

Direct, short-term impacts on marine mammals would be primarily from underwater noise generated by construction. Impulsive noise from impact pile driving and non-impulsive noise from dredging and vessel operations have the potential to cause temporary behavioral harassment, such as startling or causing animals to temporarily avoid the immediate project area. These same activities would also temporarily affect the essential features of critical habitat. Increased turbidity from dredging could briefly reduce the availability of fish prey for marine mammals by causing fish to temporarily leave the immediate area. Underwater noise would temporarily diminish the acoustic quality of the habitat, which is particularly important for cetaceans that rely on sound for communication and foraging. However, these effects are localized to the construction zone and transient in nature. With the required mitigation, these effects are not expected to rise to the level of harassment that would constitute a "take;" like hearing damage (Temporary or Permanent Threshold Shift), which would be minimized by the required use of noise attenuation systems (e.g., bubble curtains) and mandatory shutdown zones. Increased vessel traffic during construction also presents a minor, temporary increase in the risk of vessel strikes, which would be managed through speed restrictions and observer protocols.

Indirect, long-term effects are related to the future operation of the expanded harbor. The project would accommodate more vessels, which would incrementally increase the ambient underwater noise level in the harbor and slightly increase the overall risk of vessel strikes within Kachemak Bay. The permanent conversion of soft-bottom seafloor to deep-water channel and armored breakwater represents a loss of foraging habitat. For species like the northern sea otter that forage in these areas, this loss is considered negligible relative to the vast, similar habitat available throughout the rest of Kachemak

Bay. Furthermore, the permanent structures are not expected to create a barrier to any marine mammal species and thus would not affect the migratory corridors in their critical habitat.

The project contributes incrementally to the cumulative increase in anthropogenic noise and vessel activity in Kachemak Bay, which is already influenced by tourism, fishing, and shipping. Currently USACE does not anticipate an Incidental Take Authorization under MMPA would be required. Should USACE determine an Incidental Take Authorization under MMPA is necessary to complete the construction of the project, a comprehensive mitigation plan would be developed and reviewed by NMFS and USFWS to ensure ESA compliance and avoidance of unauthorized take under MMPA. The project's contribution to cumulative stressors on marine mammals is not significant.

Comparison of Alternatives

The primary differences in impacts on marine mammals and their critical habitat relate to the duration and intensity of construction activities. Larger alternatives involve longer periods of underwater noise generation and a larger direct footprint of habitat conversion.

Table 5-13 compares the marine mammal impacts of each alternative.

Table 5-13. Comparison of Marine Mammal Impacts by Alternative

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
No Action	No construction impacts.	Existing risks to marine mammals (vessel strikes, acoustic disturbance from congestion) would continue and likely increase with regional growth.
1a	Adverse: Minor and the least significant risk of temporary behavioral disturbance from underwater noise due to the smallest construction footprint and shortest duration.	Adverse: Minor and the least significant long-term increase of marine mammal stressors through introduction of new harbor infrastructure and least significant conversion and loss of marine habitat.
1b	Adverse: Minor risk of temporary behavioral disturbance from underwater noise during moderate-scale construction.	Adverse: Minor long-term increase of marine mammal stressors through introduction of new harbor infrastructure and conversion and loss of marine habitat.
2 (TSP)	Adverse: Minor risk of temporary behavioral disturbance from underwater noise during moderate-scale construction.	Adverse: Minor long-term increase to marine mammal stressors through introduction of new harbor infrastructure and small marine vessels and conversion and loss of marine habitat.
3	Adverse: Minor but the most significant risk of temporary behavioral disturbance due to the largest construction footprint and longest duration of underwater noise.	Adverse: Minor but the most significant long-term increase of marine mammal stressors through introduction of new harbor infrastructure and most new vessels and conversion and loss of marine habitat.

Proposed Mitigatory Measures

General project and activity-specific mitigation measures were developed for marine mammals. Specific to marine mammals, USACE would complete ESA Section 7 consultation requirements. Through these processes, NMFS may require USACE to adopt additional mitigations to protect marine mammals. USACE would incorporate such mitigations into the contract specifications or other applicable means to ensure compliance.

To mitigate potential project adverse impacts to marine mammal species and critical habitat, USACE and, as appropriate, the contractor would adhere to the mitigation measures described herein. Safety would override mitigations wherein determined necessary to ensure safe operating conditions for working personnel and the public.

General mitigation measures that would be implemented to the greatest extent practicable and are proposed for application across all project activities include:

- USACE would inform NMFS via email of in-water construction activities a minimum of one week prior to the onset of those activities.
- USACE would incorporate seasonal restrictions required for environmental compliance from applicable regulatory agencies into contract specifications to minimize and/or avoid impacts to marine mammal species during critical life history stages.
- Consistent with AS 46.06.080, trash would be disposed of in accordance with State law. In addition, USACE and its contractors would ensure that all closed loops (e.g., packing straps, rings, bands) would be cut prior to disposal, and USACE and its contractors would secure all ropes, nets, and other potential entanglement hazards, so they cannot enter public waterways.
- USACE design decisions would be informed by available modeling (e.g., for sediment transportation and SAV HSI) developed during the project's Feasibility Study to avoid and minimize ecological impacts.
- USACE would require the contractor to develop comprehensive invasive species protocols in an EPP that would include: biofouling removal, ballast water management, and the use of certified weed-free materials. During construction, visual inspections, designated cleaning stations, and an EDRR protocol for suspected sightings would be implemented to prevent invasive species introduction and spread.
- USACE would hold a stakeholder workshop to develop a formal Ecological Survey and Monitoring Plan for assessing pre-construction conditions and post-construction (Year 0, 1, 3, and 5) impacts to marine habitat (e.g., eelgrass; Appendix M).
- USACE and/or its contractor would develop and implement BMPs to prevent or minimize contamination from ship bilge waters, antifouling paints, shipboard accidents, shipyard work, maintenance dredging and disposal, and nonpoint source contaminants from upland facilities related to marine vessel operations.
- USACE and/or its contractor would stage oil spill response equipment at several planned locations throughout the shipping route to facilitate any accidental spillage of marine vessel cargo or fuels.
- Underwater and in-air noise shutdown zones would be implemented for marine mammals to avoid unauthorized take (see Appendix I for proposed shutdown zones). Final shutdown zones for marine mammals are subject to change based on ESA Section 7 consultation with NMFS.

The marine vessel movement mitigation measures that would be applied, to the extent practicable, would only apply to the project-dedicated marine vessels under control of USACE and its contractors. This would not include regular scheduled marine vessel movements that the project could utilize to transport equipment, supplies, or personnel. These mitigations include considerations for species outside the Action Area to take into account project-dedicated marine vessel transit to and from ports outside the Action Area.

- Marine vessel operators would:
    - Maintain a watch for marine mammal species at all times while underway.
    - Remain at least 460 meters (500 yards) away from ESA-listed North Pacific right whales and at least 91 meters (100 yards) away from all other listed marine mammals species.
    - Travel at less than 5 knots (9 kilometers/hour) when within 274 meters (300 yards) of a whale.
    - Avoid changes in direction and speed when within 274 meters (300 yards) of a whale, unless doing so is necessary for maritime safety.
    - Not position marine vessel(s) in the path of a whale, and not cut in front of a whale in a way or at a distance that causes the whale to change direction of travel or behavior (including breathing/surfacing pattern)
    - Check the waters immediately adjacent to the marine vessel(s) to ensure that no whales will be injured when the propellers are engaged.
    - Reduce marine vessel speed to 10 knots or less when weather conditions reduce visibility to 1.6 kilometer (1 mile) or less.
    - Take reasonable steps to alert other marine vessels in the vicinity of whale(s).
    - Not allow lines to remain in the water unless both ends are under tension and affixed to marine vessels or gear. No materials capable of becoming entangled around marine mammal species will be discarded into marine waters.
    - Adhere to the Alaska Humpback Whale Approach Regulations when marine vessels are transiting to and from the Project Area; see 50 CFR §§ 216.18, 223.214, and 224.103(b) (note: these regulations apply to all humpback whales). Specifically, pilot and crew would **not**:
        - Approach, by any means, including by interception (i.e., placing a marine vessel in the path of an oncoming humpback whale), within 100 yards of any humpback whale.
        - Cause a vessel or other object to approach within 100 yards of a humpback whale.
        - Disrupt the normal behavior or prior activity of a whale by any other act or omission.
- If a whale’s course and speed are such that it would likely cross in front of a vessel that is underway, or approach within 91 meters (100 yards) of the marine vessel, and if maritime conditions safely allow, the marine vessel operator would put the engine in neutral and the whale will be allowed to pass beyond the marine vessel, except for North Pacific right whales. Marine vessels would remain 460 meters (500 yards) from North Pacific right whales.

- In the event of Marine Vessel Transit within Range of North Pacific Right Whales and their Critical Habitat, marine vessel operators would:
  - Remain at least 460 meters (500 yards) from North Pacific right whales.
  - Avoid transiting through designated North Pacific right whale critical habitat if practicable (50 CFR 226.215). If traveling through North Pacific right whale critical habitat cannot be avoided, marine vessels would:
    - Travel through North Pacific right whale critical habitat at 5 knots or less; or at 10 knots or less while a crew member maintains a constant watch for marine mammals from the bridge.
    - Maintain a log indicating the time and geographic coordinates at which marine vessels enter and exit North Pacific right whale critical habitat.
- Marine Vessel Transit within Range of CIBWs and their Critical Habitat:
  - Project marine vessel(s) operating in the Cook Inlet would maintain a distance of at least 1.5 miles south of the MLLW line between the Little Susitna River and Beluga River
- Marine Vessel Transit within Range of Western U.S. DPS Steller Sea Lions and their Critical Habitat:
  - Project marine vessels would not approach within 5.5 kilometers (3 nautical miles) of a haulout, or rookery site listed in (50 CFR § 224.103(d)), if possible.
  - In instances where approaching within 3 nautical miles of a major Steller sea lion haulout or rookery is unavoidable, marine vessels would reduce speed to 8 knots or less.
- Marine Vessel Transit within Range of Southwest Alaska DPS Northern Sea Otters and their Critical Habitat:
  - In instances of approaching individual or congregations of northern sea otters, project marine vessels would reduce speed to 8 knots or less and avoid these individuals or aggregations within the limits of safe navigation.

Dredging mitigation measures that are proposed for implementation to the greatest extent practicable under the project for new work and/or maintenance dredging, including the discharge of dredged material include:

- Dredging, excavating, and screeding activities would cease when any marine mammal species enters the designated shutdown zone of a construction activity. These activities include active dredging, transfer, and disposal of dredged material.
  - A PSO with the authority to suspend activities until the animal(s) have left the applicable shutdown radius would monitor these activities.
  - This shutdown zone radius is subject to change through ESA consultation with NMFS.
- The contractor would be required to utilize silt fences/curtains (or similar functioning method) during new work dredging operations to control turbidity and sedimentation.
- The area and volume of material to be dredged would be reduced to the maximum extent practicable through informed design.
- USACE would recommend the utilization of a hydraulic dredge for maintenance dredging operations to minimize turbidity and sediment.

- Before commencing dredging operations, sediment analyses would be conducted to assess contaminants of concern against applicable screening levels. The scope and frequency of these analyses would be established in coordination with the ADEC and EPA to sufficiently validate the suitability of the selected dredged material management strategy.

Before commencing dredging operations, sediment analyses would be conducted to assess contaminants of concern against applicable screening levels. The scope and frequency of these analyses would be established in coordination with the ADEC and EPA to sufficiently validate the suitability of the selected dredged material management strategy.

Discharge of fill mitigation measures are proposed for implementation to the greatest extent practicable under the project for placement of breakwater rock and fill:

- The contractor would cease breakwater rock placement or fill operations when any marine mammal species enters a 50-meter shutdown zone radius around the area where rock or fill is being placed directly in water to eliminate any risk of harming any marine mammal species during these activities.
    - These activities would be monitored by a PSO with the authority to suspend rock placement or fill activities until the animal(s) have left the applicable shutdown zone radius.
    - This shutdown zone radius is subject to change through ESA consultation with NMFS.
- The extent (area, height, and volume) of fill material would be minimized to the maximum extent practicable through informed design.
- Fill materials used would be clean and test within the neutral range of 7.5 to 8.4 power of hydrogen (pH).

Pile driving operation mitigation measures are recommended by USACE to the NFS and USCG for implementation to the greatest extent practicable under the project for installation, adjustment, and removal of piles for the proposed float systems:

- Pile driving activities would cease when any marine mammal species enters the applicable shutdown zone radius around the activity. These activities include the active installation, adjustment, and removal of a pile.
    - A PSO with the authority to suspend activities until the animal(s) have left the applicable radius would monitor these activities.
    - This shutdown zone radius is subject to change through ESA consultation with NMFS.
- A PSO would monitor the full expanse of in-water and over-water activities associated with pile driving with potential to take an marine mammal species and suspend activities if a marine mammal species enters within a 10-meter radius.
- Specific to pile removal, the pile would either be removed completely from the substrate at a minimal rate of speed or the contractor would use silt curtain/fences to reduce resuspended sediment and turbidity increases.
- The contractor would be required to:
    - Use an air bubble curtain system (or similar functioning method) to attenuate noise during pile driving operations.

  - Maximize use of vibratory hammer for the installation and removal of pilings before implementing impact hammer methods or direct pull and clamshell methods.
  - Use an impact hammer with adjustable energy level if impact pile driving cannot be avoided.
- Conduct SSV at the beginning of pile driving operations to assess the sufficiency of mitigation measures. Then implement practical mitigation measures for the remaining work if necessary, based on SSV results.
- If a clamshell bucket is used to remove pile, the contractor would be required to complete each pass of the clamshell.

Harbor infrastructure, docking facilities, and marine vessel operations mitigation measures are proposed for implementation to the greatest extent practicable under the project for potential future LSF and marine vessel harbor access and use:

- Existing Homer Harbor infrastructure and facilities would be used to reduce the overall shoreline development required to support the project.
- USACE would recommend the NFS increase ambient light transmission under the float system through the use of reflective material on underside of docks and artificial light and consideration during final alignment decisions.
- The extent (area, height, and volume) of fill material would be minimized through informed design.
- USACE would recommend that the NFS incorporate low-wake vessel technology and other wave attenuation structures, establish low speed requirements for vessels in and near the harbor, and designate no-wake zones near sensitive habitats.
- USACE would recommend the NFS develop catchment basins for collecting and storing surface runoff from upland repair facilities, parking lots, and other impervious surfaces adjacent to the project infrastructure to remove contaminants prior to delivery to any receiving waters.
- USACE would recommend the NFS design harbor facilities to include BMPs for reducing, containing, and cleaning up petroleum spills

Magnitude of Effects: Minor.

Alternative 2 would have potential to cause temporary disturbance to marine mammals during construction. However, the project's formal effect determination under the ESA for all applicable listed marine mammal species, including the CIBW, fin whale, humpback whale, and the Western U.S. DPS of Steller sea lion, is “may affect, not likely to adversely affect.” This determination is based on the conclusion that any potential effects would be insignificant due to the comprehensive and non-discretionary mitigation measures that would be implemented. These measures, such as mandatory shutdown zones, are designed to prevent injury and ensure that any behavioral responses are minor and brief. Therefore, the overall effects on marine mammal populations and their habitats are considered minor. USACE has drafted a Biological Assessment (Appendix I) that will be submitted to NMFS for their review and concurrence determination under ESA Section 7 during the feasibility study.

5.2.7 Invasive Species

The proposed project is expected to have minor adverse effects related to the risk of introducing invasive species. The project would accommodate more vessels over the long term, which inherently increases the overall risk of new introductions to the region. However, construction activities themselves pose a low risk, and the project presents an opportunity to incorporate modern design features and management practices that can help monitor and control invasive species.

Direct, short-term impacts from construction are primarily related to the potential introduction of new species or the spread of existing ones. Construction equipment and vessels, if brought in from other regions, pose a risk of introducing new species if not properly cleaned. Dredging activities could also disturb and re-suspend fragments of any established invasive tunicates that stakeholders identified, potentially facilitating their spread to new areas within Kachemak Bay.

Indirect, long-term effects are related to the operation of the expanded harbor. By providing moorage for more vessels, including those on the waitlist and potentially larger transient vessels, the project increases the number of potential vectors for introduction through ballast water discharge and hull fouling. This represents a minor, incremental increase in the overall, long-term risk of new invasive species being introduced to Kachemak Bay.

The cumulative impact of the project is a minor contribution to the overall risk of invasive species introductions in the region, which is driven by all forms of marine vessel traffic. The project incrementally increases this risk by expanding the capacity of an important port facility.

Comparison of Alternatives

The primary differences in impacts among the alternatives relate to the ultimate capacity of the expanded harbor. Larger alternatives can accommodate more vessels, thereby incrementally increasing the long-term risk of new introductions.

Table 5-14 compares the invasive species impacts of each alternative.

Table 5-14. Comparison of Invasive Species Impacts by Alternative

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
No Action	No new construction-related impacts.	The risk of new introductions would continue to grow with regional vessel traffic and environmental changes without project influence.
1a	Adverse: Minor risk of spreading existing invasive species during smaller-scale construction.	Adverse: Minor and the least significant increase in long-term risk due to the additional moorage area for invasive species introduction.
1b	Adverse: Minor risk of spreading existing invasive species during construction.	Adverse: Minor increase in long-term risk due to the additional moorage area for invasive species introduction.

Alternative	Short-Term Construction Impacts	Long-Term Operational & Cumulative Impacts
2 (TSP)	Adverse: Minor risk of spreading existing invasive species during construction.	Adverse: Minor increase in long-term risk due to the additional moorage area for invasive species introduction and introduction of new waitlisted vessels that do not currently operate in Kachemak Bay.
3	Adverse: Minor but most significant risk of spreading existing invasive species during the largest scale of construction.	Adverse: Minor but the most significant increase in long-term risk due to accommodating the largest number of new vessels.

Proposed Mitigatory Measures

To prevent the introduction and spread of invasive species, the following measures would be implemented during each project phase:

- **Pre-Construction:** Strict invasive species prevention protocols would be mandated in the construction contract, requiring the contractor to submit a detailed EPP. This EPP would cover protocols for removing biofouling from hulls and all submerged parts; procedures for mid-ocean ballast water exchange or approved treatment, compliant with all regulations; confirmation that all fill and rock materials are from a certified, weed-free source; and mandatory training for all project personnel on invasive species identification and prevention.
- **Construction:** A qualified environmental inspector would visually inspect all vessels and equipment upon arrival and before deployment, rejecting any equipment with visible biofouling until it is cleaned at a designated, contained location. BMPs would be implemented, including designated equipment wash stations. An EDRR protocol would be maintained for immediate reporting of any suspected invasive species sightings to USACE and other relevant agencies.
- **Post-Construction & Operations:** USACE would coordinate with the NFS to install permanent educational signage at boat launches and harbor offices to inform the public about preventing the spread of invasive species (e.g., "Clean, Drain, Dry"). USACE would also recommend the adoption of long-term harbor policies requiring transient vessels to document recent hull cleaning and proper ballast water management. During operations, the project would comply with all federal and state regulations regarding ballast water management as stipulated by NISA.

Magnitude of Effects: Minor.

Alternative 2 would result in a minor, incremental increase in the long-term risk of invasive species introductions by expanding harbor capacity. This risk, however, is not unique to the project and is an inherent part of all marine vessel activity in the region. The implementation of mitigation measures, such as cleaning construction equipment and complying with all ballast water regulations, minimize project-specific risks. The overall contribution of the project to the regional risk of invasive species introductions is not considered significant.

5.3 Socio-Economic Environment

This section documents the expected economic conditions under the FWP.

5.3.1 Population

As discussed in Section 3.4.1, population projections for the City of Homer are not available, but the population of the KPB is expected to begin declining in 2035, close to the beginning of the period of analysis in 2034. It is possible that the population of Homer will decrease as the wider borough population decreases, however, Homer has shown a trend of positive population growth over the last 40 years. Additionally, Homer is one of the larger population centers in the KPB and may gain population as smaller communities become smaller. This analysis continues the assumption from the FWOP that Homer's population will remain stable throughout the period of analysis. The project is expected to have no impact on Homer's population.

5.3.2 Employment

In the FWP, employment in Homer is expected to continue to be focused in the commercial fishing, marine trades, and tourism sectors. All alternatives enable additional vessels to operate in Homer, which is expected to positively benefit the local economy.

Many businesses in Homer utilize vessels, whether for commercial fishing, boat tours, charters etc. Some of these businesses would be able to expand in a FWP, and other businesses may be able to begin operating, increasing local employment. Similarly, with more vessels operating in the area, businesses which provide maintenance services for vessels are also likely to see increased demand and may need to increase staff accordingly. These impacts are discussed further in Section 4.8.4.4.2. The project is expected to have a moderate effect on employment in Homer at most.

5.3.3 Marine Trades

All alternatives create access for additional vessels, although the number of vessels varies by alternative. As access is created for new vessels to operate in Homer, the number of vessels seeking services from the local marine trades industry would increase. As the marine trades industry gains additional clients, business activities would increase. Secondary effects of this increased business would carry through to other local economic sectors such as service industries, ultimately benefiting the town as a whole. Alternatives 1a and 1b are expected to have a minor effect on the marine trades industry, while Alternatives 2 and 3 are expected to have a moderate effect at most.

5.3.4 Tourism on the Homer Spit

Homer is expected to continue to be a tourist destination, and tourist activity on the Spit is expected to continue under the FWP. As the Homer fleet expands, it is probable that some of the expansion would be commercial in nature, and that some of these businesses would be tourism-related, such as fishing charters, water taxis, sightseeing vessels, etc. As such, tourism on the Homer Spit is expected to increase in the FWP. Alternatives 1a and 1b are expected to have a minor effect on tourism, while Alternatives 2 and 3 are expected to have a moderate effect at most.

5.3.5 Traffic on the Homer Spit

As the number of vessels operating out of Homer increases, the number of vehicles needing to park near the harbor is also expected to increase. Based on the parking space currently available on the Spit relative to the size of the existing fleet, this report estimates the amount of parking needed to avoid worsening parking conditions on the Spit for each alternative. As larger alternatives create access for more vessels, they also necessitate more parking space. As uplands are not included in the design of the TSP, it is left to the sponsor to identify how best to address expected parking needs in the FWP. The estimated parking space needed under each alternative and the expected effects are shown in Table 5-15.

Table 5-15. Estimated Parking Needs by Alternative (acres)

	Alt 1a	Alt 1b	Alt 2	Alt 3
Parking Needed (equivalent in acres)	1	3	6	13
Expected effect	moderate	moderate	moderate	major

5.3.6 Personal Use Fishing Activities

Personal use fishing in Homer is expected to continue in FWP. For the two personal use fisheries considered in this analysis, the China Poot Bay fishery and the Kachemak Bay set gillnet fishery, the number of vessels accessing each fishery is expected to increase. It is considered unlikely that large vessels participate in these fisheries, so only small and midsized vessels (under 85 feet) are considered in this analysis.

Each alternative increases access for small and medium-sized vessels. Alternatives 1a and 1b each replace float System 5 in the existing harbor with reserve moorage for 24-foot and 32-foot-long vessels on the existing waitlist. Alternatives 2 and 3 do this as well, while also creating moorage for waitlisted vessels over 32 feet and expected future growth respectively.

Not all small and medium-sized vessels for which access is created are expected to utilize these personal use fisheries. Currently, the number of vessels utilizing the China Poot Bay fishery via Homer is estimated to be about 26% of the small and midsize vessel fleet. The set gillnet fishery is utilized by about 3% of the Homer small and midsize fleet. These percentages are expected to continue in a FWP, meaning that for each alternative, approximately 26% of small and medium-sized vessels that gain moorage in Homer are expected to participate in the China Poot Bay fishery, and about 3% are expected to participate in the Kachemak Bay set gillnet fishery. Effects to these fisheries are considered minor under Alternatives 1a and 1b, and moderate under Alternatives 2 and 3.

5.3.7 Road Connectivity

Homer's significance as the southern-most point on the Sterling Highway and its connectivity to both the Port of Anchorage and, through the Homer Harbor, to dozens of regional off-road communities is expected to continue in the FWP. However, as the project does not impact Homer's presence on the road system, the project is considered to have no impact to road connectivity.

It is expected that Homer will continue to function as a key hub of regional freight transport to these communities, and in a FWP, freight deliveries are expected to become more reliable as crowding and associated delays on Homer Harbor are alleviated.

Alternative 1a is expected to improve the reliability of freight deliveries made by large vessels, which tend to serve communities on the west coast of Alaska and in the Aleutian Islands. Alternatives 1b, 2 and 3 all alleviate crowding to the existing transient fleet, and as such are expected to also improve the reliability of shipments made by small and medium-sized vessels as well, which tend to serve communities in the vicinity of Cook Inlet, Williamsport, and Kodiak Island.

5.3.8 Cruise Ships

Under the FWP, the cruise ships currently visiting Homer would be too large to enter the new harbor. Because the TSP is designed for the vessels that commonly use or seek to use Homer Harbor currently, but is not designed for the smaller cruise ships which visit occasionally, it does not increase access for these vessels. Because there is no change in access for cruise ships, no change in cruise ship behavior is expected. The type of cruise ships currently visiting Homer are expected to continue to visit in the FWP, at approximately the frequency they visit now, and there is no expectation that larger cruise ships will begin to visit Homer, as there is no infrastructure there to accommodate them. The project is expected to have no impact on cruise ship operations.

5.3.9 Homer Fleet

5.3.9.1 Growth in Reserve Moorage Demand

Projected growth in reserve moorage demand in the FWP is also based on HDR's waitlist analysis discussed in Section 3.4.9.2, however, where the FWOP makes the assumption that growth in demand will slow over time, the FWP assumes that it will continue at a steady rate. Like the FWOP, demand growth is not projected beyond 20 years from the year of most recent data (2023).

In the FWP, the expected scenario used in this analysis assumes growth in reserve moorage demand of 400 vessels over the next 20 years, the midpoint of the high and low projections identified by HDR. Because these projections are based on growth in the waitlist, this demand is met or partially met by some alternatives and is unmet by others.

Based on the HDR report, it is estimated that 50% of the growth in demand over 20 years will be for 32-foot slips, 20% will be for 24-foot slips, 20% for 40-foot slips and 10% for 50-foot slips. Expected projections of reserve moorage demand growth are shown in Table 5-16.

Table 5-16. Expected Waitlist Growth by Vessel Size

Vessel/Slip Size	Expected Vessels
Waitlist	
24’	80
32’	200
40’	80

Vessel/Slip Size	Expected Vessels
50’	40
Total Waitlist Growth	*400*

Of the vessels currently waitlisted for moorage in Homer, approximately 40% use transient moorage while reserve moorage is not available. In a FWP, this is expected to continue, meaning that approximately 40% of the estimated 400 vessels of expected waitlist growth are expected to use transient moorage while they wait for slips.

5.3.9.2 Increase in Large Vessel Moorage Demand

Reserve moorage is not available at Homer Harbor for vessels over 85 feet long. Transient moorage is available at daily, monthly, semi-annual, and annual rates. While overall purchases of moorage for large vessels have not shown a trend in recent years, there has been an increase in sales of annual transient moorage of 60% between 2019 and 2023. Because large vessels do not have access to reserve moorage, annual transient moorage is the closest available substitute. This analysis treats annual transient moorage sales for large vessels as a proxy for reserve moorage demand. If the trend in annual transient moorage sales continues, this would be an increase of 14 vessels over 20 years.

The effect of the project on the Homer fleet varies by alternative. Because Alternative 1a addresses crowding to only the large vessel fleet, its expected effect on the fleet as a whole is moderate. Alternatives 1b, 2 and 3 are expected to have positive major effects.

5.4 Built Environment

5.4.1 Homer Harbor

5.4.1.1 Maintenance Dredging

Annual maintenance dredging performed by the Federal Government and maintenance dredging of the current harbor would continue with no expected change. Maintenance dredging efforts are likely to combined with current operations and necessary maintenance dredging of the new harbor.

Magnitude of Effects: No effect.

5.4.1.2 Float Systems

As noted in Section 3.5.1.2, the System 5 float system would need to be replaced in the next 10 years. In the FWP condition the replacement would be with finger floats to accommodate smaller vessels rather than a replacement of an in-kind float system. The harbor is already considered a built system so this would not have any significant effect.

Magnitude of Effects: Minor.

5.4.1.3 Boat Launch

All alternatives primarily address large vessels. It is assumed that there would not be any impacts to the boat launch.

Magnitude of Effects: No effect.

5.4.1.4 Barge Ramp

The project footprint is not within the barge ramp area.

Magnitude of Effects: Minor.

5.4.1.5 Fuel Docks

LSF of all alternatives include construction of a new fuel dock in the expanded harbor. This would alleviate traffic, wait times, and risk of accidents for the two currently existing fuel docks in the harbor.

Magnitude of Effects: Moderate positive effect.

5.4.1.6 Fish Dock

The economic analysis concluded that the benefits of constructing an additional fish dock or similar facility with cranes in the new harbor would not have benefits in excess of costs of construction. Vessels using the expanded harbor would still need to access the fish dock in the current harbor if they require such services. This results in additional delays as harbor users increase.

Magnitude of Effects: Moderate.

5.4.1.7 Deep Water Dock

Use of the Deep Water Dock would increase as larger vessels are able to more easily call on Homer harbor. The Deep Water Dock is not a point of congestion and the increase in larger vessels is not large enough to warrant a significant effect.

Magnitude of Effects: Minor.

5.4.1.8 Pioneer Dock

The final array of alternatives would not have any effect on the Pioneer Dock.

Magnitude of Effects: No Effect.

5.4.2 Sterling Highway – Alaska Route 1

Increased activity on the Homer Spit associated with the harbor expansion from alternatives would result in additional wear along the only access road to the harbor. The road may require an increase in maintenance.

Magnitude of Effects: Moderate.

5.5 Other Required Analyses

5.5.1 Protected Tribal Resources

The Executive Memorandum on Government-to-Government Relations with Native American Tribal Governments of 1994, the Department of Defense American Indian and Alaska Native Policy of 1998, and the DA Memorandum on American Indian and Alaska Native Policy of 2012 require that USACE assess the impact that Federal projects may have on protected tribal resources and assure that the rights and concerns of Federally Recognized Tribes are considered during the development of such projects. Protected

Tribal Resources are defined by the DA as those natural resources and properties of traditional or customary religious or cultural importance, either on or off Tribal lands, retained by, or reserved by or for Federally Recognized Tribes through treaties, statutes, judicial decisions, or E.O.s. The Federal government's trust responsibility, deriving from the Federal Trust Doctrine and other sources, for these protected tribal resources is independent of their association with tribal lands.

This Trust responsibility is discharged in this report through compliance with multiple statutes affecting Protected Tribal Resources (Table 5-17). The U.S. Government has no treaties with any Alaska Native Tribes. Therefore, in this report, Protected Tribal Resources are generally understood to include natural resources, cultural resources, and access to subsistence resources. At this time, no specific resource(s) have been identified by the Federally Recognized Tribes in the area.

Table 5-17. Protected Tribal Resources Compliance Table

Topic	Report Section	Statute(s)	Potential Effects
Natural Resources	Sections 5.2.3-5.2.7	Migratory Bird Treaty Act, Marine Mammal Protection Act, Clean Water Act, Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act	No significant impact on resource health or availability. Project impacts (e.g., habitat loss, water quality changes) are minor, localized, and not expected to affect the overall population health, abundance, or distribution of fish, bird, or marine mammal stocks in the broader Kachemak Bay ecosystem.
Cultural Resources	Section 5.1.14	National Historic Preservation Act of 1966, American Indian Religious Freedom Act of 1978, Abandoned Shipwreck Act of 1988, E.O. 13007 "Indian Sacred Sites"	No historic properties affected. The project is confined to a previously disturbed, man-made harbor and land form. No historic properties, sacred sites, or other cultural resources of tribal importance have been identified within the project's Area of Potential Effect.
Subsistence Use	Section 3.4.6	Marine Mammal Protection Act, Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, Migratory Bird Treaty Act	No effect on subsistence use. Homer is located in a designated non-subsistence zone, meaning that the area does not have an historical or cultural association with subsistence practices.

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5.5.2 Determination under E.O. 13045

E.O. 13045, Protection of Children from Environmental Health Risks and Safety Risks, directs Federal agencies to identify and address environmental health and safety risks that may disproportionally affect children, to the greatest extent practicable and permitted by law.

The proposed action is removed from major population centers or areas such as schools that have higher concentrations of children. USACE has determined that there would be no disproportionate health or safety risks to children as a result of the proposed action.

5.5.3 Cumulative & Long-term Impacts

This section analyzes the cumulative effects and long-term impacts of the TSP. The potential cumulative effects of the project will be evaluated to ensure full compliance with the statutory requirements of the NEPA of 1969 (42 U.S.C. 4321 et seq.).

The DoD NEPA Implementing Procedures require evaluation of “reasonably foreseeable effects of the proposed agency action and the alternatives considered” (Part 1.5(b)(3)) to inform whether a FONSI or EIS (Part 1.5(b)(3)) should be prepared. Thus, this section will evaluate cumulative impacts to environmental resources with consideration of other foreseeable actions determined necessary to inform reasoned decision-making under this IFR/EA, and the analysis will rely on the statutory text of NEPA and established federal judicial precedent.

A cumulative impact is the environmental effect resulting from the incremental impact of the project when added to the impacts of other past, present, and reasonably foreseeable future actions, regardless of the agency or person undertaking them. Assessing cumulative effects ensures that USACE considers whether individually minor actions could become collectively significant over time. Long-term impacts are those effects that persist for a substantial portion or the entirety of the project's 50-year period of analysis.

5.5.3.1 Scope of the Cumulative Impacts Analysis

The scope of this cumulative effects analysis considers the incremental environmental impacts of the TSP in combination with other relevant actions within a defined geographic and temporal boundary.

- Geographic Scope: The geographic area considered for cumulative effects is the Homer Spit and the adjacent nearshore waters of Kachemak Bay. This area encompasses the locations where the direct and indirect effects of the project are concentrated and where they are most likely to overlap with the effects of other actions.
- Temporal Scope: The temporal scope extends from past actions that have shaped the existing environment (e.g., the original harbor construction) through the 50-year period of analysis for this project (2034–2084), which includes present and reasonably foreseeable future actions.

5.5.3.2 Past, Present, and Reasonably Foreseeable Future Actions

The following actions and trends contribute to the cumulative effects context for the TSP:

- Past Actions: The most significant past actions shaping the current environment are the historical construction and subsequent expansions of the Homer Harbor (1960s–1980s), the development of associated upland areas and port facilities (e.g., Deep Water Dock, Pioneer Dock), and the progressive armoring of the Sterling Highway along the Homer Spit.

- Present Actions: Ongoing activities that contribute to the environmental baseline include commercial and recreational vessel traffic, commercial fishing, port operations, tourism-related activities, and periodic maintenance dredging of the existing harbor and USCG berth.
- Reasonably Foreseeable Future Actions: Reasonably foreseeable future actions include a general increase in regional maritime traffic (commercial, industrial, and recreational) consistent with economic projections, continued private and commercial development on the Homer Spit, and ongoing actions by the State of Alaska to maintain and protect the Sterling Highway from coastal erosion.

5.5.3.3 Cumulative Impact Analysis by Resource

The resources evaluated represent the environmental components most likely to be affected by the project's primary activities; dredging, filling, and long-term harbor operation. This includes resources with direct physical impacts, such as Marine Habitat and Floodplains, which are permanently altered by the project's footprint. It also includes resources susceptible to operational effects, such as Water Quality, Fish and EFH, Marine Mammals, and Noise, which are affected by construction activities and the long-term increase in vessel traffic. Finally, Vessel Navigation and Safety was included to provide a complete picture by analyzing the project's beneficial cumulative impact, as the project's primary purpose is to alleviate existing and future negative cumulative effects of harbor congestion. Resources with no or negligible project-related impacts were not carried forward into this cumulative analysis, allowing for a more concentrated and relevant assessment of the project's incremental contribution to the broader environmental landscape.

The cumulative and long-term impacts to the resource most likely to be affected by the TSP’s primary activities are summarized in Table 5-18.

Table 5-18. Summary of Cumulative and Long-term Impacts of the Tentatively Selected Plan.

Resource	Cumulative Effects from Other Actions	Incremental Contribution of the TSP	Significance of Cumulative Effect
Marine Habitat & Primary Productivity	Past and present coastal development and shoreline armoring have resulted in the cumulative loss and fragmentation of natural soft-bottom and intertidal habitats in the developed portions of the Homer Spit.	Long-term/Incremental Impact: Permanently converts approximately 68 acres of productive benthic habitat and its associated primary producers into a deep-water basin and armored breakwater.	Not Significant. While the habitat loss is permanent and adverse, the habitat type is abundant throughout the greater Kachemak Bay. The project's incremental contribution to the overall loss of this habitat type in the region is minor.

Resource	Cumulative Effects from Other Actions	Incremental Contribution of the TSP	Significance of Cumulative Effect
Water Quality	Ongoing vessel traffic, stormwater runoff from upland developed areas, and regional atmospheric deposition contribute to the cumulative risk of pollution and nutrient loading in Kachemak Bay.	Long-term/Incremental Impact: Accommodates an increased number of vessels, which incrementally adds to the long-term statistical risk of minor spills and contaminant loading.	Not Significant. The project must comply with a WQC, which contains mandatory conditions to prevent violations of state WQS, ensuring the project's contribution is not significant.
Fish & Essential Fish Habitat	Regional vessel traffic, fishing pressure, and coastal development create cumulative stressors on fish populations and EFH through habitat alteration, underwater noise, and pollution risk.	Long-term/Incremental Impact: Permanently eliminates benthic habitat that functions as EFH and creates temporary construction-related noise and turbidity that may displace fish. Mitigation measures (noise attenuation, seasonal windows for salmon) would minimize these impacts.	Not Significant. The permanent habitat loss is minor in a regional context, and temporary disturbances will not have a lasting effect on fish populations or the function of EFH in the broader Kachemak Bay.
Marine Mammals	Ongoing vessel traffic from all sectors creates a cumulative underwater noise environment and a persistent risk of vessel strikes throughout Kachemak Bay.	Long-term/Incremental Impact: Adds a minor increment of underwater noise during construction and a minor long-term increase in vessel traffic.	Not Significant. The implementation of mandatory mitigation measures (e.g., shutdown zones, vessel speed protocols) ensures the project's incremental contribution is discountable or insignificant for all protected species.
Noise (Human Environment)	The existing acoustic environment is shaped by the cumulative noise from ongoing harbor operations, vehicle traffic on the Spit, and seasonal tourism activities.	Long-term/Incremental Impact: Temporarily increases noise during construction (pile driving) and adds a minor increment to the long-term operational noise from increased vessel activity. These increases are offset by reductions in noise from harbor congestion.	Not Significant. Construction noise is temporary and would be managed. The net change in long-term operational noise is minor and would not significantly alter the overall acoustic environment of the busy and developed Homer Spit.
Floodplains & Coastal Processes	Past construction of revetments, docks, and the original harbor has cumulatively "hardened" the Homer Spit shoreline, altering natural coastal processes and sediment transport in localized areas.	Long-term/Incremental Impact: Permanently alters the local wave climate in the immediate project vicinity, creating both beneficial wave reduction and potential adverse wave reflection.	Not Significant. Compliance with E.O. 11988 and the use of detailed hydraulic modeling in the design phase ensure the project does not significantly exacerbate regional flood risk or negatively impact shoreline stability.

Resource	Cumulative Effects from Other Actions	Incremental Contribution of the TSP	Significance of Cumulative Effect
Vessel Navigation & Safety	Past development limitations and ongoing growth in regional vessel traffic have led to a cumulative increase in harbor overcrowding, congestion in navigation channels, and associated safety risks.	Long-term/Incremental Impact: Beneficial Cumulative Impact. Directly counteracts negative cumulative trends by providing sufficient moorage to alleviate rafting and creating a safer, more efficient entrance channel.	Beneficial. The project contributes positively to the long-term safety and efficiency of the regional maritime transportation system.

5.5.3.4 Conclusion on Cumulative Effects

The TSP would result in permanent, long-term impacts, primarily the conversion of marine habitat, and would contribute incrementally to cumulative environmental changes in the Homer area. However, after a thorough review of past, present, and reasonably foreseeable future actions, and with the implementation of regulatory requirements and proposed mitigation measures, it is determined that the TSP's incremental contributions to cumulative effects are not significant for any resource category. The project would also result in beneficial cumulative effects related to navigation and safety.

5.5.4 Unavoidable Adverse Impacts

This section identifies the adverse environmental impacts of the TSP that cannot be avoided. The NEPA implementing regulations from the Council on Environmental Quality have been rescinded, this analysis is conducted in accordance with the DoD established NEPA Implementing Procedures. These procedures require a full disclosure of residual adverse effects to inform the decision-making process and to determine whether the impacts of the proposed action are significant, thereby dictating the need for an EIS or a FONSI.

For the TSP, the following unavoidable adverse impacts have been identified after the application of all practicable mitigation measures:

- **Permanent Conversion of Benthic Habitat and Associated Primary Productivity.** The placement of approximately 4,500 feet of breakwater and the dredging of a 68-acre mooring basin would result in the direct, permanent, and unavoidable conversion of existing soft-bottom and mixed-substrate seafloor. This action would eliminate the existing benthic biological community and its associated primary productivity within the project footprint. While the new breakwater would provide new hard-substrate habitat, this does not constitute replacement for the lost natural habitat and its specific ecological functions.
- **Temporary Displacement of Fish and Wildlife during Construction.** Construction activities would generate temporary and localized underwater noise and physical disturbance. This would unavoidably cause mobile species, including fish, marine mammals, and birds, to temporarily alter their behavior and move away from the immediate construction area. Although mitigation measures such as acoustic shutdown zones are designed to prevent injury, they do not eliminate temporary behavioral responses.

- **Temporary, Localized Degradation of Water Quality.** The mechanical disturbance of the seabed during dredging and breakwater construction would unavoidably cause the temporary suspension of sediments, resulting in a localized turbidity plume. While BMPs would be implemented to contain this plume to the extent practicable, some degradation of water quality in the immediate vicinity of the work is an unavoidable short-term impact.
- **Permanent Alteration of Local Hydrodynamics.** The physical presence of the new breakwater structures represents a permanent and unavoidable alteration of the local wave and current regime immediately adjacent to the harbor. This would result in new, localized patterns of sediment erosion and deposition that would require periodic maintenance dredging over the life of the project.
- **Incremental Increase in Long-Term Operational Risk.** The successful operation of an expanded harbor would unavoidably accommodate an increased volume of vessel traffic. This creates a minor, incremental, and unavoidable increase in the long-term, statistical risk of accidental pollutant spills and the introduction of aquatic invasive species.

The context and intensity of these unavoidable adverse impacts has been analyzed throughout this IFR/EA. It has been determined that, with the implementation of the proposed mitigation measures, none of these effects, individually or cumulatively, are significant within the context of the greater area of Kachemak Bay.

5.5.5 Incomplete or Unavailable Information

Information that would be required before construction of the TSP, but has been unavailable during the Feasibility Phase, includes:

- Project-specific chemical and physical characterization of the material to be dredged that meets the standards of the ADMEF to inform in issuance of the WQC. USACE notified ADEC of its intent to pursue a WQC on August 29, 2024 (Appendix E), and would request a Conditional Section 401 WQC from ADEC with intention to fulfill characterization requirements in the PED Phase.
- Analysis of the ability to utilize dredged material in alignment with its environmental stewardship mission and beneficial use goals. USACE would leverage its ERDC Dredging Operations Technical Support Program to further investigate beneficial use alternatives for the dredged material. This effort supports the national policy goal established in the WRDA of 2020 to achieve a 70% beneficial use rate nationwide.
- USACE would conduct surveys prior to construction based on the final design to validate the total eelgrass loss from construction to determine if further action is necessary.
- The USACE SAV HSI Model would be certified in the PED Phase to inform the refinement of the final design to be built.
- Turbidity Analysis. USACE would model the turbidity likely to be experienced from discharge of new work dredged material. These data would be used to finalize the DWDS final design size and shape, as a means to avoid or minimize impacts to the KBCHA.

- Additional geotechnical investigations to validate current assumptions regarding the amount of settlement to occur for construction of the breakwater. Cone penetrating testing would occur during the PED Phase.

6.0 PLAN COMPARISON AND SELECTION

This section documents the decision-making process of the PDT for plan comparison and selection. The basis of the decision-making process comes from the analysis conducted in plan evaluation in Section 4 and impact evaluation in Section 5. For any alternative to be selected it must be preferable to the No Action alternative as well as any other alternative and the reasoning behind that determination must be documented.

6.1 Plan Comparison

To facilitate plan comparison discussion, the PDT constructed a matrix to represent key evaluations critical in determining which alternative is the most optimal plan. The metrics used in the matrix are broken across four sections. The first three sections come from the summary of accounts analysis in Section 4.8.3.1: NED, OSE, and EQ.

The NED is broken into four elements. Benefits, Costs, Net Benefits, and BCR. OSE is represented by the cost effectiveness of each plan as determined by the CE/ICA as described in Section 4.8.4.4. The EQ section uses the Cumulative SAV HSI Score as described in Sections 3.3.3.1, 4.8.4.3, and 5.2.3. The last section is from the PR&G as evaluated in Section 4.8.6. Completeness and Acceptability are not represented in the matrix as they are the same across all alternatives and thus not useful for alternative comparison.

The PDT color coded the matrix in Table 6-1 to easily compare alternatives—Green for optimal values, Red for suboptimal values, and Orange for intermediate values. The No Action Alternative values are not color-coded, but alternatives are always compared against the No Action alternative.

Table 6-1. Alternative Comparison Matrix

	Metrics	NED: AAEQ Benefits (Millions)	NED: AAEQ Costs (Millions)	NED: AAEQ Net Benefits (Millions)	NED: BCR	OSE: Cost Effectiveness	EQ: Cumulative SAV HSI Score	PR&G: Effective (H/M/L)	PR&G: Efficient (H/M/L)
Alternatives	**No Action Alternative**	0	0	0	N/A	Best Buy	152	NA	NA
Alternatives	**Alternative 1a:** Large transient vessels	$8	$18	($9.79)	0.44	Cost Effective	60.9	L	L
Alternatives	**Alternative 1b:** Transient vessels	$17	$23	($6.20)	0.73	Cost Effective	47.7	M	M
Alternatives	**Alternative 2:** Transient and waitlisted vessels	$19	$25	($5.66)	0.77	Cost Effective	44.2	H	M
Alternatives	**Alternative 3:** Transient, waitlisted, projected future vessels	$23	$29	($6.04)	0.79	Best Buy	9	H	M

6.1.1 NED Comparison

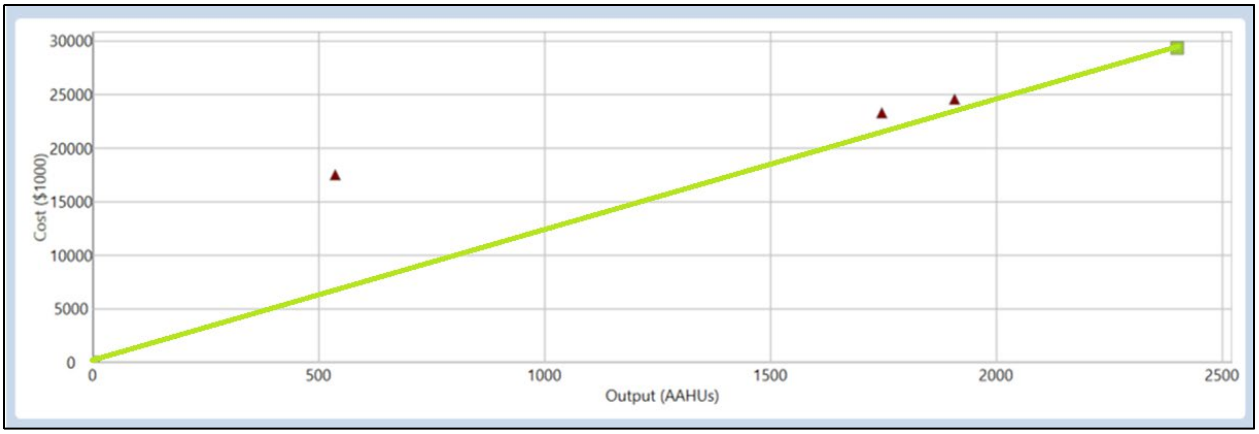
No alternative has positive net benefits or a BCR above 1. This means in terms of NED evaluation the No Action Alternative is preferable and there is no NED justified alternative. Alternatives 1b–3 have comparable net benefits and BCRs. Alternative 1a has much higher negative net benefits and a much lower BCR. Alternative 1b and 2 are comparable in terms of annualized benefits and costs, while Alternative 1a and 3 have high and low values in each of those areas.

6.1.2 OSE Comparison

As discussed in Sections 1.3.1 and 4.8.4.4, Section 2006, as amended, allows the Secretary of the Army to recommend a project without demonstrating NED benefits for remote and subsistence harbors. A thorough discussion of the CE/ICA and how it relates to the benefits defined by Section 2006 is found in Section 4.8.4.4 and Appendix C: Economics.

Alternative 3 is the only Best Buy alternative other than the No Action Alternative. However, when a trendline is overlaid on the CE/ICA scatter plot as shown in Figure 6-1, it is clear that Alternative 1b and Alternative 2 are very close to trendline of benefits output per cost that Alternative 3 has. Alternative 1a, however, has much higher costs relative to its benefit output.

Figure 6-1. CE/ICA Scatter Plot with added trendline



6.1.3 EQ Comparison

While the only element in the matrix for EQ is the cumulative SAV HSI scores, environmental impacts documented in Section 5 were thoroughly discussed and considered by the PDT. However, for a simple visual representation, the HSI scores are a useful representation that in general, the environmental impacts between projects are quite similar due to the overlapping footprints, similar designs, and similar activities across the structural alternatives. Each would impact the same general environmental location and resources, in a similar manner, differing incrementally in the magnitude, extent, and duration of those impacts.

Due to the similar nature of environmental impacts across alternatives, no HSI scores were color coded as low or high in the matrix. As documented in Section 5, there were no major impacts from any alternatives that would affect alternative selection.

6.1.4 PR&G Comparison

The full PR&G evaluation is found in Section 4.8.6. Alternative 1a has the lowest effectiveness rating since it does not meet all objectives of the current fleet. Alternative 1b meets objectives for the current fleet. While Alternative 2 and Alternative 3 were both evaluated as high since both provided benefits beyond the immediate needs of the current fleet, only Alternative 3 fully meets all objectives by also providing moorage for the anticipated fleet.

As no plan had positive NED benefits, the PDT did not evaluate any alternative as highly efficient. All alternatives were at least Cost Effective when analyzed using the CE/ICA so no alternatives were screened out, but Alternative 1a has both a significantly lower BCR and lower CE/ICA output ratio than other alternatives which warranted a lower evaluation.

6.2 Plan Selection and Total Net Benefits Determination

According to ER 1105-2-100, Appendix E, “ordinarily, the plan that reasonably maximizes net benefits, known as the NED plan, is recommended.” Because all alternatives have negative net NED benefits, it was determined that there was no NED plan. However, a plan may be recommended on the basis of non-NED benefits utilizing the factors in the Remote and Subsistence Harbor Authority (see Section 1.3.1).

Under the March 2026 implementation guidance for Section 2006, “the selection of a plan shall be supported by a […] CE/ICA”, and studies are required to “identify the least cost alternative that minimally meets the requirements of long-term community viability”. The guidance states further that, “if this alternative is not the recommended plan, then explicit incremental justification shall be provided.”

As discussed in Section 4.8.4.4.6, Alternative 3 was identified as the “Best Buy” plan, meaning that it has the lowest cost per benefit unit among the four alternatives. However, this does not automatically imply that Alternative 3 is “the least cost plan which minimally meets the requirements of long-term community viability”. Indeed, Alternative 3 is the most expensive alternative, at an estimated total economic cost of over $720 million.

Because the other three alternatives were all found to be Cost Effective, they could all be considered for recommendation under the CE/ICA. While Alternative 1a is the least cost plan, the PDT determined that it did not “minimally meet the requirements of long-term community viability”. This can be seen in Figure 6-1 and in Table 4-41, which show that Alternative 1a only provides 28% of the benefits provided by the next largest alternative (1b), but at 75% of the cost. In other words, Alternative 1a provides significantly fewer benefits than the next largest alternative, but costs almost as much. Given these reasons, the PDT determined that Alternative 1a does not sufficiently resolve the problems experienced by Homer Harbor users.

Alternatives 1b and 2 were then considered for recommendation. Of the two, Alternative 1b is the lower cost plan, however Alternative 2 has the lower cost per benefit unit. To determine which plan “minimally meets the requirements of long-term community viability,” the PDT considered the historical context of the Homer Harbor. This is discussed in greater detail in Section 3.5.1 and Appendix A: Hydraulic Design, however, since its original construction in the early 1960s, the harbor has already been expanded four times: once by the local community and three times by USACE. Additionally, since its last expansion, USACE has conducted a feasibility study and a PAS technical assistance effort to consider further expansion. This historical context demonstrates a pattern of expansions that the harbor goes on to outgrow, requiring the repetition of analysis and the continued commitment of local and federal resources.

The primary difference between Alternative 1b and 2 is that Alternative 2 is intended to accommodate waitlisted vessels not included in Alternative 1b. These vessels are not forecasted future growth; they are a current reality. Additionally, while Alternative 2 has a total project cost of just over $31 million more than Alternative 1b, the majority of the cost difference comes from additional LSF features and is borne by the NFS. The federal cost difference is limited to approximately $10 million. In consideration of the limited increase in federal cost, and in light of the historical pattern of federal studies and expansions in Homer Harbor, Alternative 2 was determined to “minimally meet requirements” and was identified as both the plan that reasonably maximizes total net benefits across all benefit categories and the plan that reasonably maximizes net benefits consistent with the study purpose only per ER 1105-2-103. As there is no NED alternative with positive net benefits, Alternative 2 was selected as the TSP.

7.0 TENTATIVELY SELECTED PLAN

7.1 Plan Accomplishments

The TSP, Alternative 2, provides sufficient transient moorage to alleviate crowding and associated delays, damages, and costs to small, medium, and large transient vessels operating in Homer Harbor. Additionally, it provides sufficient reserve moorage for the existing waitlist.

The creation of additional moorage allows existing businesses to operate more efficiently, in some cases saving vessel crews time and in others allowing saved time to be put towards further business operations. Furthermore, increased moorage may allow local businesses to expand or to start up, increasing employment and contributing to overall economic activity.

The reduction in crowding improves recreational experiences for both private vessels owners and charter passengers. More significantly, reduced rafting of vessels removes hazards, increasing safety for both vessel crews and passengers. Reduced delays in Homer mean that communities that rely on freight shipments would receive food, fuel, building materials, and household goods more reliably.

The AAEQ NED benefits of the TSP are discussed in Table 7-1 and NED benefits and costs are summarized in Table 7-2. Non-monetary benefits are discussed in Table 7-3 and summarized with costs in Table 7-4.

Table 7-1. AAEQ NED Benefits of the Tentatively Selected Plan

Benefit Category	TSP
Rec User UDV Benefits	$2,513,000
Fishing Charter UDV Benefits	$2,178,000
Fishing Charter Avoided Rafting Delay Benefits	$93,000
Water Taxi Avoided Rafting Delay Benefits	$191,000
Water Taxi Avoided Fueling Delay Benefits	$57,000
Large Vessel Avoided Rafting Delay Benefits	$3,842,000
Commercial Fishing Avoided Rafting Delay Benefits	$8,460,000
Avoided Fuel Cost Benefits	$933,000
Avoided Coast Guard Wind Delay Costs	$10,000
Avoided Vessel Damages	$637,000
Total AAEQ NED Benefits	**$18,914,000**

Table 7-2. NED Benefit and Cost Summary

	TSP
AAEQ Benefits	$18,914,000
AAEQ Costs	$24,578,000
AAEQ Net Benefits	($5,664,000)
BCR	0.77

Table 7-3. Non-Monetary Benefits of the Tentatively Selected Plan

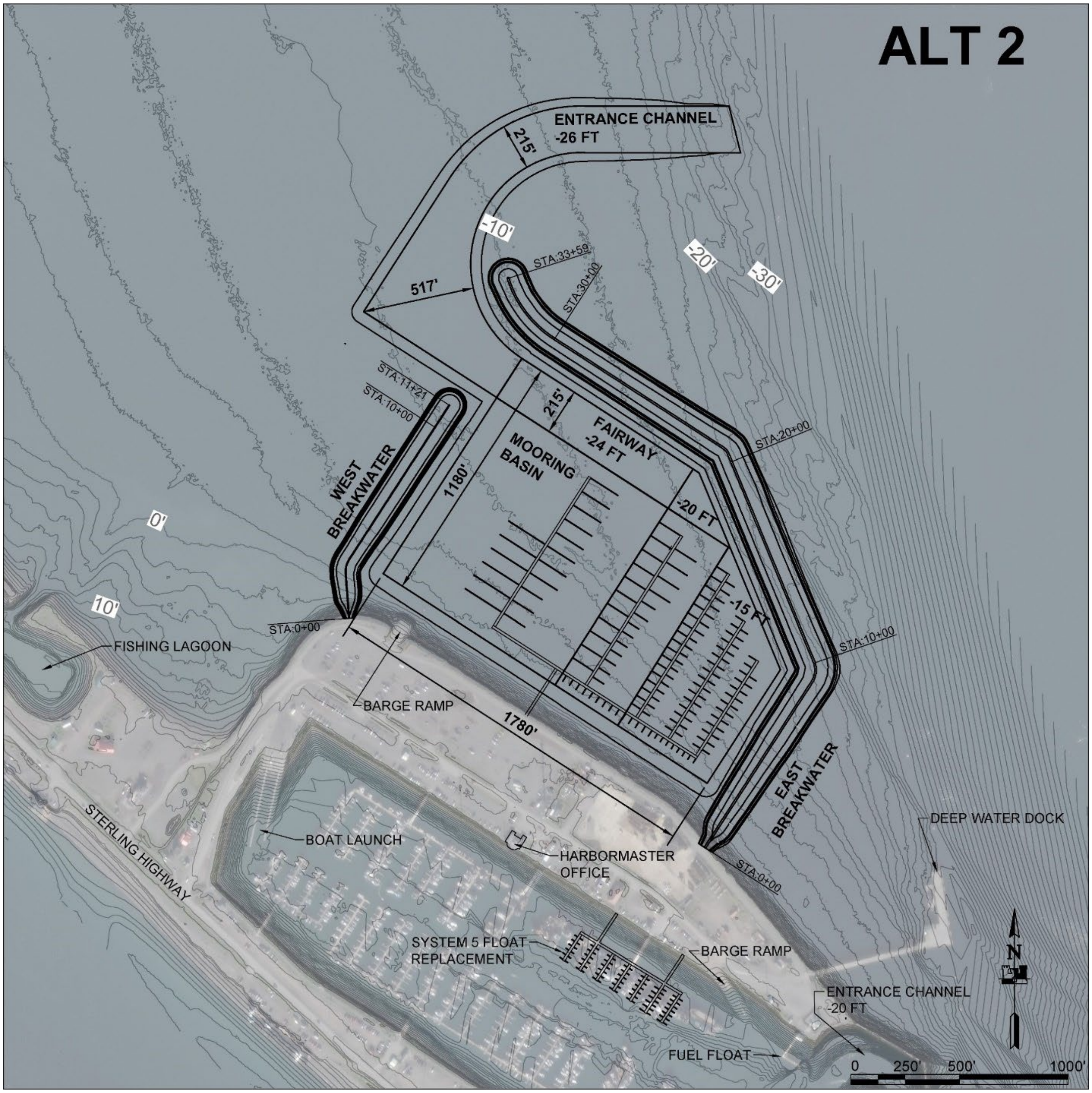
Benefit Category	TSP
Safety	605
LROs	148
PUFs	41
WRs	500
AVDs	618
Totals	**1,912**

Table 7-4. Summary of Costs and Non-Monetary Benefits of Tentatively Selected Plan

	TSP
AAEQ Costs	$24,578,000
CBUs	1,912
Cost/CBU	$12,900

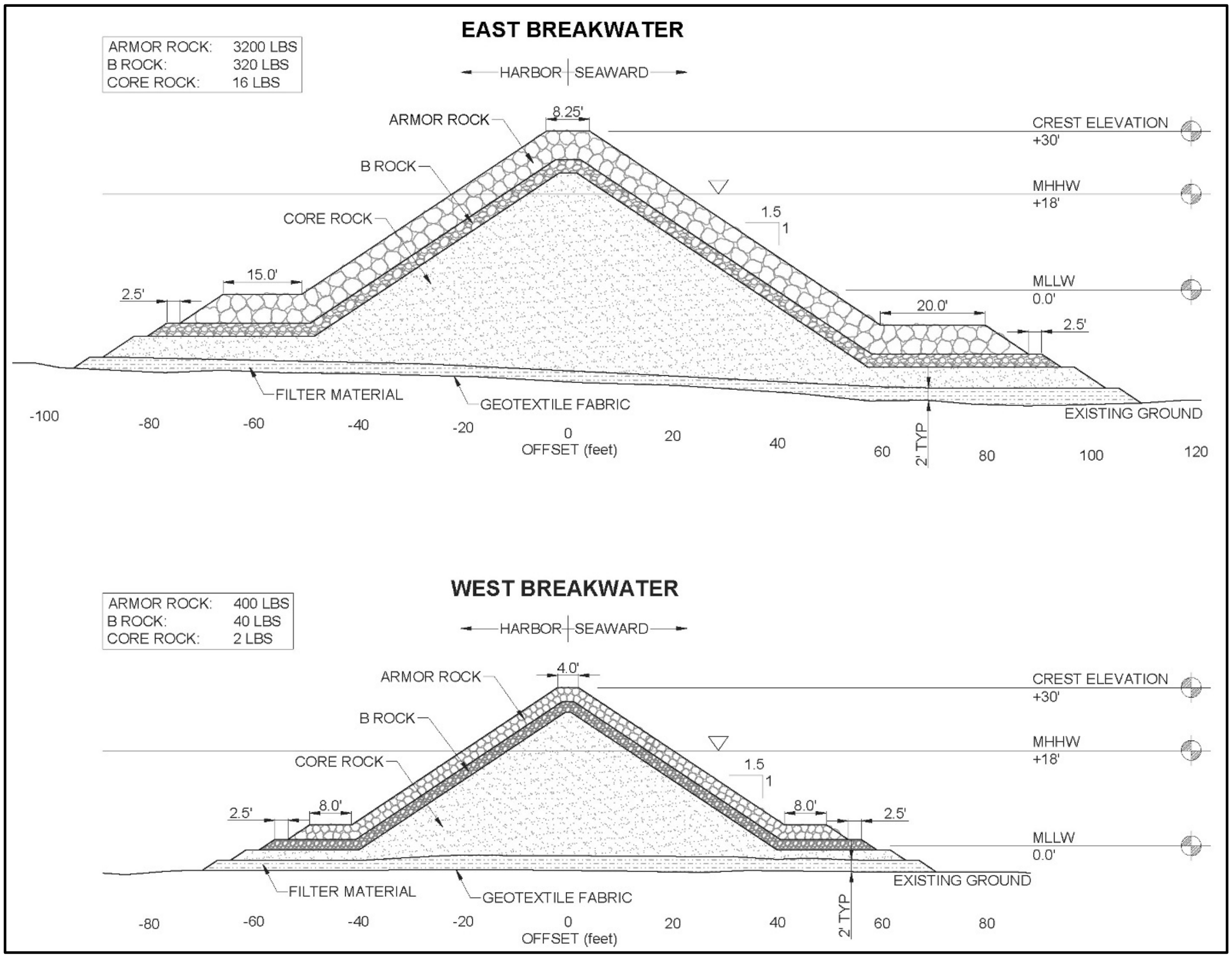
7.2 Plan Components

Figure 7-1. Tentatively Selected Plan



The TSP includes the construction of a 37-acre mooring area on the northeast side of the current harbor. This harbor basin would be protected by a new rubble-mound breakwater, with east and west sections totaling approximately 4,500 feet. The breakwater crests would be constructed to an elevation of +30 feet MLLW, matching the height of the existing harbor breakwaters.

Figure 7-2. Breakwater Dimensions



Alternative 2 provides moorage sufficient for 304 vessels in a combination of slips and side-tie. The plan includes dredging a 215-foot-wide entrance channel to a depth of -26 feet MLLW, with the adjoining fairway and mooring area dredged to -24 feet MLLW. Dredged quantities are 497,340 cubic yards for the entrance channel and fairway and 814,461 cubic yards for the moorage basin. Supporting LSF for the harbor includes a new float system for the expanded basin (complete with gangways, finger floats, and electrical utilities) and the construction of a new fuel dock.

The System 5 float in the current harbor would be removed and replaced with a new float system providing moorage for 40 vessels at 24 feet in length and 132 vessels at 32 feet in length. Supporting LSF for Alternative 2 includes a new float system for the expanded basin (complete with gangways, finger floats, and electrical utilities) and the construction of a new fuel dock.

7.3 Project Cost

USACE Alaska District cost engineers developed Rough Order of Magnitude (ROM) cost estimates for the alternatives, including construction and maintenance costs. Appendix D: Cost Engineering details the procedures and assumptions used to calculate these estimates. Cost risk contingencies were included to account for uncertainty. Project costs are in FY 2026 dollars.

Preconstruction Engineering and Design (PED) would be expected to occur over a 36-month period. Construction is expected to occur over 3 years, consisting of 6–8-month construction seasons, with construction complete by the end of calendar year 2033. These assumptions inform the interest during construction calculations.

Interest during construction (IDC) refers to the opportunity cost of capital incurred during the construction period. This is not considered a financial cost, but is an NED cost.

Operations, Maintenance, Repair, Rehabilitation and Replacement (OMRR&R) costs were developed by Cost Engineering according to maintenance intervals determined by Hydraulics and Hydrology. OMRR&R for all alternatives is composed of rock replacement and maintenance dredging costs. Maintenance dredging consists of three components: mobilization and demobilization, a dredge survey, and dredging.

Costs are discounted to a base year and annualized to allow comparison with average annual benefits. Costs used in the benefit-cost analysis, also called NED costs or economic costs, differ slightly from those detailed in the Costs Engineering Appendix as NED costs include initial construction costs, interest during construction, and OMRR&R costs. The economic costs of the selected alternative are shown in Table 7-5.

Table 7-5. Economic Cost Summary for Alternative 2

Cost Component	Alt 2
Project First Costs	$402,124,000
LSF	$89,952,000
IDC	$25,101,000
OMRR&R	$86,246,000
Total Economic Cost	$603,423,000
AAEQ Economic Cost	$24,578,000

Source: Cost Engineering Cost Estimate, May 2025

7.4 Real Estate Considerations

The City of Homer, as the NFS, owns all the necessary land, eliminating the need for land acquisition and keeping real estate costs low, limited to an estimated $18,750 for administrative expenses. The U.S. Government would utilize its "navigation servitude" right for work in the tidelands below the Mean High Water mark, which allows the use of these submerged lands for navigation purposes without purchasing them.

The project is not expected to require any relocations of utilities, businesses, or residents, nor is it anticipated to cause any flooding. However, the plan notes the potential for contamination from hazardous, toxic, or radioactive waste (HTRW) due to the site's history, which may warrant further investigation. Overall, the City of Homer is deemed "highly capable" of managing these responsibilities, and the project has public support.

7.5 Operations, Maintenance, Repair, Replacement & Rehabilitation

7.5.1 Maintenance Dredging

For the cost estimate, an annual maintenance dredging volume of approximately 17,000 CY was assumed for all alternatives. This volume was calculated by scaling the historical maintenance dredging (~3,000 CY per year) performed in the existing entrance channel to the larger area of the proposed entrance channel, which has a consistent size across all alternatives. It is anticipated that the majority of shoaling would occur in the entrance channel, as this is what occurs in the existing harbor.

A refined maintenance estimate would be developed for the TSP, Alternative 2, to inform the final Class III cost estimate. This analysis utilizes results from the BOUSS-2D sediment transport model currently under development by HDR. Modeling would be performed only for the TSP because all alternatives are in the same location and differ only in basin size; therefore, the variance in sediment transport is expected to be minimal.

It is important to acknowledge the inherent limitations of sediment transport models like BOUSS-2D. Such models rely on simplified equations to represent complex natural processes, and actual shoaling rates may deviate from model predictions. While numerical modeling is the best available tool for forecasting sedimentation, there can be a significant difference between the model's predictions and real-world results.

7.6 Aids to Navigation

Initial coordination with USCG has indicated that the final plan must account for navigation aids at the end of each breakwater nose. For this project, the current concept includes installation of two towers at the end of each breakwater, along with three additional five-pile towers to mark the entrance channel—two located near the end of the entrance channel as a “gated pair” and one marking the northeast corner of the dredged channel just outside the breakwaters (D. Seris, USCG, email communication, May 21, 2025). In total, 15 piles would be driven

USCG would provide the towers and pilings and contract the installation work to a commercial entity, with the intent of scheduling the work to coincide with new harbor construction. On past projects, USACE has included 10-foot by 10-foot pre-poured concrete pads in breakwater designs to support Federal ATONs. Coordination with USCG would continue during the preparation of plans, specifications, and construction.

7.7 Risk and Uncertainty

This section details any residual risks and uncertainties related to project development, implementation and outcomes.

7.7.1 Breakwater Settlement

Preliminary geotechnical analysis confirms the proposed breakwater designs are feasible. Due to the presence of soft to very soft compressible soils in the project area, ground improvement consisting of wick drains and staged construction would be required. Initial settlement analysis indicates potential settlement under the breakwaters between 4.3 to 12.1 feet. Installation of wick drains and staged construction sequencing would reduce the time required to reach 90% consolidation (t90) from 2,058 days (5.6 years) to less than 1 year. Some or all of the surcharge material (such as quarry spall) would fill the space between original mudline and the consolidated soils below the breakwater. This material quantity, required to compensate for the anticipated settlement, would be included in the final Feasibility cost estimate. During PED, the construction sequencing and minimum settlement time between stages would be evaluated, and a detailed settlement model would be developed to refine the consolidation analysis for the breakwater cross-sections. The PDT would continue to optimize the harbor design through Feasibility and PED to help mitigate overall project costs. Because the costs associated with settlement are not currently captured in preliminary cost estimates and the potential cost is substantial, this risk is rated high. Once a final cost estimated is produced to include settlement the risk would drop to moderate.

7.7.2 Maintenance Dredging

The current project cost estimate assumes an annual maintenance dredging volume of approximately 17,000 CY for all alternatives. This preliminary figure was derived by scaling the historical dredging rate of the existing harbor to the larger area of the proposed entrance channel, where most shoaling is expected to occur. A refined estimate would be developed for the TSP using the BOUSS-2D sediment transport model.

However, a risk remains that the actual dredging volume would differ from both the preliminary estimate and the future model prediction. Numerical models are the best available tool but rely on simplified representations of complex natural processes, and real-world shoaling rates can deviate significantly from their forecasts. Therefore, the final maintenance dredging quantity and its associated cost represent a project uncertainty. This risk is currently moderate. Once the BOUSS-2D sediment transport model is complete and the cost estimate is updated to reflect the results, this risk would drop to low.

7.7.3 Increase in Tsunami Evacuation Risk

The addition of vessels and people on the Homer Spit would minimally increase risk of loss of life and damages from tsunamis. Historical data shows that even large distant earthquakes, such as the 8.8+ magnitude events in Japan and Chile, did not produce measurable tsunami waves in Homer. Only the 1964 local 9.2 magnitude earthquake caused a tsunami, with submarine slumping off the tip of the Spit generating 4-foot waves in Kachemak Bay within 5–10 minutes. That event also caused differential settlement of the spit, averaging 6 feet at the tip, but lowered ground levels by up to 10 feet in areas of artificial fill, such as near the Salty Dog Saloon.

The recurrence interval for an 8.0+ magnitude earthquake in this region is estimated to exceed 500 years. The primary risk to Homer is from a local earthquake causing underwater slope failure, which could produce a tsunami with little to no warning. All alternatives other than the no action alternative are likely to increase the potential human presence at a given time. Given the sudden nature of such events and their infrequency, the proposed project is expected to result in only a minimal increase in tsunami evacuation risk for the Homer Spit.

7.8 Cost Apportionment

Construction of the project would be apportioned in accordance with the Water Resources Development Act of 1986, as amended. GNF is cost-shared between the Federal Government and the NFS. LSF features are solely the responsibility of the NFS. The cost-share summary is based on the project's first cost with contingency. Section 101. Harbors, of the Water Resources Development Act 1986, Cost Sharing provisions, as amended, provides the cost sharing requirements for the project.

(1) 10 % of the cost of design and construction of the general navigation features attributable to dredging to a depth, not in excess of -20 feet mean lower low water (MLLW), plus

(2) 25 % of the cost of design and construction of the general navigation features attributable to dredging to a depth in excess of -20 feet MLLW but not in excess of -50 feet MLLW.

Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the general navigation features, an additional amount equal to 10 % of the total cost of construction of the Federally Recommended Plan's general navigation features less the amount of credit afforded by the Federal government for the value of the lands, easements, rights-of-way, and relocations, including utility relocations, provided by the NFS for the general navigation features. If the amount of credit afforded by the Federal government for the value of lands, easements, rights-of-way, and relocations, including utility relocations, provided by the NFS equals or exceeds 10 % of the total cost of construction of the general navigation features, the NFS shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of lands, easements, rights-of-way, and relocations, including utility relocations, in excess of 10 % of the total costs of construction of the general navigation features;

The ROM cost estimate provided by Cost Engineering and referenced previously was used to estimate the Federal and Non-Federal cost shares of the TSP. These costs do not reflect interest due on the 10% payback of GNF, and will be updated in the final report when a certified cost estimate is available. Estimated cost shares are shown in Table 7-6.

Table 7-6. Estimated Cost Share of Tentatively Selected Plan

Cost Component	Total	Federal	Non-Federal
General Navigation Features (GNF)	$385,562,000	$345,720,000	$39,841,000
Pre-construction Engineering /Design	$6,996,000	$6,296,000	$700,000
Construction Management	$8,256,000	$7,430,000	$826,000
Eelgrass Mitigation	$1,310,000	$1,179,000	$131,000
Total Project First Costs	**$402,123,600**	**$360,626,000**	**$41,497,000**
Local Service Facilities	$89,952,000		$89,952,000

Cost Component	Total	Federal	Non-Federal
Real Estate Requirements for GNF	$0	$0	$0
Additional 10% payback of GNF	$38,556,000		$38,556,000
Total Cost Share		**$360,626,000**	**$170,006,000**

7.9 Design and Construction Timeline

Design from 35% to 100% is expected to be completed over a 2-year period, with 35% design maturity at the conclusion of the Feasibility Study. Construction is expected to be phased over 3 years of 6–8-month construction seasons. In-water work is expected to occur during the summer months due to frequent winter storms. For this project, the construction season is assumed to start in early April and end in late October. The type of equipment used to perform the work would not be specified in the contract. A contractor would be responsible for developing the means and methods. To attract multiple offerors, early engagement with potential contractors through industry days would be utilized.

The sequence of construction would depend on the components that make up the final plan, but several construction sequencing requirements dictate the construction schedule. Typically, breakwaters would be constructed first to provide a tranquil environment for dredging the mooring basin. Dredging of the entrance channel could occur concurrently with construction of the breakwaters as this area is unprotected.

New work dredging was estimated based on Unalaska (Dutch Harbor) Channel Navigation Improvements, which dredged approximately 173,310 CY of new work material over 59 days for an average rate of 2,937 CY per day. Dredging operations for this project were typically 24-hour dredging operations but at a greater depth of -58 feet MLLW, so a recommended rate of dredging for this project is estimated at 2,000 CY per day.

Specific environmental windows and administrative restrictions on construction activities would be established to limit operations, thereby avoiding and minimizing potential environmental impacts to the maximum extent practicable. Any additional environmental windows or construction restrictions identified during subsequent project phases would be integrated directly into the final plans and specifications.

To enforce the environmental compliance measures outlined in this IFR/EA, USACE would execute an Ecological Survey and Monitoring Plan to validate the initial impact determinations. Because current assessments do not anticipate significant adverse impacts, formal compensatory mitigation and adaptive management plans are not required at this time. However, an adaptive management plan would be developed should ongoing USACE survey and monitoring efforts indicate an unidentified significant adverse impact requiring further action. This plan would provide a structured framework for implementing mitigation and responding to the unanticipated environmental outcomes identified.

7.10 Environmental Commitments

In accordance with the DOD NEPA Implementing Procedures, the USACE commits to implementing a range of measures to avoid, minimize, and mitigate potential adverse environmental effects of the TSP. These commitments, derived from regulatory requirements, agency coordination, and BMPs, would be incorporated into the project's final design, plans, and specifications.

7.10.1 Least Damaging Practicable Alternative

In compliance with the CWA under Section 404 (Title 40, Part 230 of the CFR (40 CFR Part 230)), the TSP would follow all guidelines for disposal sites for dredged or fill material. The TSP currently proposes in-water disposal of new work dredged material; however, USACE is continuing to evaluate beneficial use opportunities for new work dredged material management. Maintenance dredging is expected to be used beneficially in a similar manner as current maintenance dredge material from the existing harbor. This is described in greater detail in Appendices G and N.

7.10.2 Fish and Wildlife Coordination Act

As part of the planning process, USACE coordinated with the USFWS, NMFS, and the ADF&G under the authority of the FWCA. The USFWS provided a Planning Aid Letter (Appendix J) dated August 16, 2023, containing four primary recommendations. A formal FWCAR was not provided. The USFWS recommendations and the USACE responses are summarized in Table 7-7.

Table 7-7. Summary of FWCA Recommendations and USACE Commitments

USFWS Recommendation	USACE Response
Consider a study to test sediment in the harbor area and determine the level of contaminants that may be released in the water column during harbor expansion activities.	**Adopted.** A comprehensive sediment analysis would be conducted during the PED Phase. This analysis, developed in coordination with the EPA and ADEC using the Draft ADMEF, would test for a broad range of potential chemical constituents to confirm the material is suitable for placement and to satisfy the conditions of the CWA Section 401 WQC.
Consider a study to determine the composition (i.e., diversity and abundance) of the benthic invertebrate community in Kachemak Bay, including in the tidal flats of Mud Bay and in deeper water areas used by sea ducks.	**Adopted.** USACE has already conducted initial benthic community surveys as part of this Feasibility Study (results are detailed in Appendix P). Furthermore, USACE would develop a formal Survey and Monitoring Plan in the PED phase, which includes pre-construction baseline surveys to further document the benthic community and post-construction monitoring to track any changes.
Use model-based predictions to consider how changes to baseline circulation and patterns of sediment transport and deposition could affect: kelp forests and sea otter foraging habitat; the abundance and diversity of benthic food resources for overwintering sea ducks; the abundance and diversity of invertebrate food resources in Mud Bay.	**Adopted.** USACE has developed and utilized hydraulic, sediment transport, and SAV HSI models to inform the project design and impact analysis. These models predict changes to circulation and sedimentation and are used to evaluate potential effects on primary productivity resources like kelp and eelgrass, which form the basis of the food web for sea otters, sea ducks, and invertebrates. These models would be further refined in the PED Phase.

USFWS Recommendation	USACE Response
Develop EDRR plans for marine invasive species and rats.	**Adopted.** The project includes a comprehensive invasive species mitigation strategy. The construction contractor would be required to develop an EPP that includes strict protocols for preventing introductions via biofouling and ballast water. This plan would include EDRR protocol for immediate reporting and action upon any suspected invasive species sighting during construction.

7.10.3 Summary of Proposed Mitigation and Best Management Practices

A core principle of this project is the mitigation of impacts through design. Each alternative uses the minimum footprint necessary to accommodate the number and size of vessels required to achieve its economic benefits. To minimize the footprint, features such as the mooring basin, fairways, and breakwaters are sized and placed with the minimum offsets to enclose the floats. Engineering design specifications, including breakwater stone size, dimensions, and dredging depths, are determined by the criteria for the 2% AEP design event. These specifications would be optimized when practicable throughout the remainder of the Feasibility Study and the PED Phase.

Table 7-8 summarizes the proposed mitigation measures and BMPs that would be implemented to the extent practicable for avoiding and minimizing unavoidable impacts. While these would be commitments integral to the project, safety is the highest priority and would not be compromised for mitigation. Furthermore, many of the measures described offer synergistic benefits, where protecting one resource indirectly protects others.

Table 7-8. Summary of Proposed Mitigation and Best Management Practices

Resource	Mitigation & BMP Category	Proposed Mitigations and BMPs	Primary Compliance Driver
Soil & Sediment	**Regulatory & Material Characterization**	• Complete internal CWA §404(b)(1) analysis. • Conduct comprehensive sediment analysis during the PED Phase to meet CWA §401 WQC conditions, in coordination with EPA and ADEC using the Draft ADMEF. • Analysis includes grain size, total organic carbon, ammonia, sulfides, and other constituents to confirm material is appropriate for placement and inform the final DMMP. • Re-evaluate the need for biological toxicity testing based on chemical analysis results.	CWA §404 / §401; Draft ADMEF

Resource	Mitigation & BMP Category	Proposed Mitigations and BMPs	Primary Compliance Driver
	Construction Controls and Monitoring	• The selected disposal site would be composed of sediment similar to that of the dredged material. • Fine-grained material from new breakwater rock would be screened. • Vessel operations would be restricted in shallow water and grounding prohibited outside the project area. • Silt curtains/fences for new work dredging operations. • Filter material would be placed over barge scuppers to return clear water. • Disposal location would be surveyed and monitored pre- and post-construction to document site recovery and assess cumulative effects.	CWA §404 / §401; Draft ADMEF
Water Quality	**Turbidity & Dredged Material**	• Use BMPs during dredging (e.g., regulating bucket speed) and use silt curtains where effective. • Conduct pre-dredge sediment analysis to ensure disturbed material will not release contaminants.	CWA §404/ §401; Draft ADMEF
	Spill Prevention & Control	• Require contractor to develop and implement a comprehensive SPCC Plan. • Conduct daily equipment inspections for leaks and maintain spill response supplies on-site. • Report all spills in accordance with state law (AS 46.03.755).	CWA; Oil Pollution Act; AS 46.03.755
Floodplain	**Design & Regulatory Compliance**	• Hydraulic Analysis and Design: Use detailed hydraulic modeling to optimize the breakwater's size and alignment to maximize navigational safety while ensuring the final design does not exacerbate flood risk to adjacent shorelines. • Compliance with E.O. 11988: Complete the formal "eight-step process" to document that there is no practicable alternative to construction in the floodplain and that all practicable measures to minimize harm have been taken.	E.O. 11988; Homer City Code 21.41
Air Quality	**Construction Emissions**	• Require contractors to use equipment that is in good repair and meets all applicable emission standards. • Apply BMPs, such as wetting work surfaces, if visible dust is generated.	CAA
Noise	**Worker & Public Safety**	• Require personnel to use appropriate hearing protection. • Restrict public access to high-noise areas using barriers and notices. • Schedule high-noise activities (e.g., pile driving) to avoid periods of high public use, such as the annual Shorebird Festival.	OSHA
Cultural Resources	**Regulatory**	• If a contractor encounters potential Historic Properties or Cultural Resources, they would immediately halt construction activity and contact a USACE Archaeologist for further direction.	NHPA

Resource	Mitigation & BMP Category	Proposed Mitigations and BMPs	Primary Compliance Driver
Terrestrial Habitat	**Construction Site Management**	• Require contractor to develop a site management plan that prioritizes use of existing paved or disturbed areas. • Clearly delineate construction boundaries to prevent encroachment into vegetated parcels. • Regrade and re-seed temporarily disturbed areas with a native mix post-construction.	CWA §404
Marine Habitat	**Policy**	• Utilize an alternatives development process to reduce the dredging and fill footprint to the minimum necessary to meet project purpose and need. • Coordinate with ADF&G for all construction work within the KBCHA.	KBCHA Management Plan; CWA §404
Primary Productivity	**Modeling & Management**	• Use SAV HSI modeling to inform final design and minimize impacts to SAV, especially eelgrass. • Conduct a stakeholder workshop to develop a formal Survey and Monitoring Plan. • Perform pre-construction baseline surveys and post-construction monitoring (Years 0, 1, 3, 5) to assess impacts and track recovery.	CWA §404; MSA; ESA
Marine Fish & Invertebrates	**General & Regulatory**	• Complete EFH consultation with NMFS and ESA Section 7 consultation in during the feasibility study. • Implement seasonal restrictions to avoid impacts to ADF&G salmon smolt stocking. • Require immediate notification of any fish kill events.	MSA; ESA §7, CWA, KBCHA Management Plan
	Activity-Specific Controls	• Dredging/Fill: Use silt curtains for new work dredging, minimize material volumes through design, and use clean fill within the neutral range of 7.5 to 8.4 power of hydrogen. • Pile Driving: Use bubble curtains for noise, prioritize vibratory hammers, and conduct sound source verification. • Design: Incorporate a "fish bench" in the breakwater for organism passage and recommend NFS adopt low-wake zones, runoff treatment, and light-penetrating materials for floats.	
Avian Species	**General & Nest Protection**	• Use downward-shielding lighting and design structures to minimize bird hazards. • Store all trash in wildlife-proof containers. • Conduct pre-construction nest surveys and establish buffer zones; consult with USFWS for BGEPA permit if eagle nests are impacted.	MBTA; BGEPA; ESA §7
	Species-Specific (Steller's Eider)	• Reduce construction vessel speed to 8 knots or less near eiders. • Implement and monitor a 660-foot in-air acoustic shutdown zone and underwater acoustic zone during key winter months (October–May).	

Resource	Mitigation & BMP Category	Proposed Mitigations and BMPs	Primary Compliance Driver
Marine Mammals	**Regulatory & Vessel Rules**	• Complete ESA Section 7 consultation during the feasibility study. • Notify NMFS/USFWS before starting in-water work. • Adhere to strict vessel transit rules for project vessels regarding speed and mandatory separation distances for marine mammals and their critical habitats.	ESA §7; MMPA
	Activity Shutdown Zones	• Implement and monitor mandatory shutdown zones, enforced by PSOs, for all in-water work (dredging, fill, pile driving) if a marine mammal enters a designated area.	
Invasive Species	**Prevention, Planning, & Response**	• Require a contractor EPP detailing biofouling, ballast water, and weed-free material protocols. • Conduct inspections of all vessels and equipment upon arrival. • Implement an EDRR protocol. • Install educational signage and recommend long-term harbor policies post-construction.	CWA; NISA; E.O. 13112

USACE would directly implement the proposed mitigation measures and BMPs described for all activities under its control. For project components managed by other entities, such as the USCG for navigation aids and the NFS for LSF, USACE would formally recommend the adoption of these measures to ensure comprehensive environmental stewardship for the entire action.

7.11 Integration of Environmental Operating Principles

The seven USACE environmental operating principles (EOPs) have been integrated into the planning process:

1. **Foster sustainability as a way of life throughout the organization:** This project would provide benefits from avoided vessel delays and avoided fuel costs associated with rafting. By eliminating these inefficiencies, vessels would use less fuel when transiting through the harbor and mooring thus becoming more efficient and sustainable.
2. **Proactively consider environmental consequences of all USACE activities and act accordingly:** Environmental consequences were considered throughout the planning process, and every effort has been made to avoid, minimize, or mitigate anticipated impacts.
3. **Create mutually supporting economic and environmentally sustainable solutions:** No NED plan was identified for this project, but the Section 2006 authority affords the PDT the flexibility to use CE/ICA in the absence of a NED plan. The TSP, Alternative 2, is the plan that best achieves planning objectives while minimizing project costs. This project was formulated in a way that makes it lasting, requires limited maintenance and avoids long term environmental impacts wherever practicable. The new work sediments removed from the entrance channel, turning basin, and mooring basin would be fine-grained material that has limited beneficial uses, but the dredged material is likely similar

to the existing harbor's dredged material that is dewatered and stockpiled on the Homer Spit and subsequently beneficially used as material to combat shoreline erosion.

4. **Continue to meet our corporate responsibility and accountability under the law for activities undertaken by USACE, which may impact human and natural environments:** A draft EA was conducted as required by the NEPA, and a draft Finding of No Significant Impact (FONSI) was prepared. The principles of avoidance, minimization, and mitigation would be enacted to the extent practicable.
5. **Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs:** For this study, extensive coordination has taken place to determine the impacts and subsequent mitigative actions regarding environmental impacts. This coordination would continue through all phases of the project.
6. **Leverage scientific, economic, and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner:** USACE worked closely with local, State, and Federal environmental stakeholders during the study through the formation of the ESWG and consultation with environmental regulatory agencies. The ESWG enabled environmental stakeholders to provide input to determine the proper scope of environmental analysis for the study. Coordination with the ESWG was completed prior to the release of the Draft EA and prepared draft FONSI. USACE would pursue a Conditional WQC and complete conditions prior to construction. USACE is pursuing a Conditional Section 401 WQC from the ADEC with the intent to complete a complete sediment analysis consistent with the Draft ADMEF in the PED Phase.
7. **Employ an open, transparent process that respects the views of individuals and groups interested in USACE activities:** Public input was solicited and used for both environmental and economic analysis purposes. Section 8.0 details USACE outreach to date.

7.12 View of the Non-Federal Sponsor

The NFS, the City of Homer, has been an active participant in the study and expressed ongoing support for the TSP. The City is aware of the financial obligations of the NFS and has the expected financial capability to satisfy these obligations for the project. The City passed Resolution 26-024 endorsing and concurring with the TSP on April 13, 2026.

8.0 ENVIRONMENTAL COMPLIANCE

8.1 Environmental Compliance Table

Environmental compliance is summarized in Table 8-1.

Table 8-1. Environmental Compliance

Statutory Authority	Compliance Status	Compliance Date/Comment
Bald and Golden Eagle Protection Act	Fully Compliant	This IFR/EA includes an assessment of no significant adverse impact to bald eagles and golden eagles with the implementation of proposed mitigations (Section 5.2.5).
Clean Air Act	Fully Compliant	Project site not within a designated non-attainment or maintenance area; conformity requirements do not pertain. Furthermore, this project is not reasonably expected to cause an exceedance in criteria pollutant.
Clean Water Act	Partially Compliant	A Draft CWA Section 404(b)(1) Evaluation (Appendix G) was completed and will be finalized when USACE pursues a Conditional 401 WQC in the Feasibility Study from ADEC. USACE notified ADEC of its intent to pursue a Section 401 WQC on August 29, 2024, and plans to attain a Conditional 401 WQC from the ADEC in the Feasibility Phase. Additional sediment conventional and chemical analyses would be completed in the PED Phase to meet the ADEC conditions that would be set forth in the Conditional 401 WQC.
Coastal Zone Management Act	Not Applicable	As of July 1, 2011, the CZMA Federal consistency provision no longer applies in Alaska.
Endangered Species Act	Partially Compliant	NMFS and USFWS ESA Section 7 consultations are not complete. A Draft Biological Assessment (Appendix I) has been completed. This Draft Biological Assessment would be finalized and submitted to NMFS and USFWS under informal consultation for their concurrence during the Feasibility Study.
Fish and Wildlife Coordination Act	Fully Compliant	Although USFWS may provide an additional Planning Aid Letter upon completion of their review of the IFR/EA, USACE considers its responsibility under the FWCA complete. USACE requested ADF&G, USFWS, and NMFS collaborate under FWCA for the study on May 12, 2023. NMFS and ADF&G deferred their review and consultation under other environmental laws (e.g., NEPA and ESA). USFWS provided USACE an initial Planning Aid Letter August 16, 2023.
Magnuson-Stevens Fishery Conservation and Management Act	Partially Compliant	USACE consultation with NMFS under MSA is not complete. The EFH Assessment (Appendix H) would be submitted to NMFS and USACE will complete its response to NMFS conservation requirements in the Feasibility Phase.
Marine Mammal Protection Act	Fully Compliant	USACE determined no Incidental Take Authorization from NMFS and/or USFWS is necessary based on its determination that no significant adverse impact would occur to marine mammals with the implementation of proposed mitigations (Section 5.2.4.).

Statutory Authority	Compliance Status	Compliance Date/Comment
Migratory Bird Treaty Act	Fully Compliant	IFR/EA includes an assessment of no significant adverse potential impacts to migratory bird species (Section 5.3.5.).
National Historic Preservation Act	Partially Compliant	A Section 106 Finding of Effect letter was submitted to the Alaska SHPO with a finding of "No Historic Properties Affected." Concurrence from SHPO is anticipated 45 days after submission of the letter.
National Environmental Policy Act	Partially Compliant	NEPA compliance would be complete upon a signing of the appropriate decision document at the end of the Feasibility Study. The anticipated decision document is a FONSI. A Draft FONSI is located in Appendix K.
State Lands Act	Partially Compliant	The tidelands are conveyed to the City of Homer (ADL 28442). For portions of the project outside the tidelands conveyed to the City of Homer, the State of Alaska has been supportive of a future project and is regularly informed of its progress by the City of Homer. The appropriate authorization from ADNR will be required for the portions overlapping submerged lands not conveyed to the City of Homer.
Executive Order 13045: Protection of Children from Environmental Health Risks and Safety Risks	Fully Compliant	This IFR/EA includes an assessment of impacts pertaining to children and no impacts that disproportionately affect the health or well-being of children have been identified.
Executive Order 11988: Floodplain Management	Partially Compliant	This IFR/EA includes an assessment of impacts pertaining to E.O. 11988 (Section 5.1.12), and the public comment period for the IFR/EA acts as the early public review for floodplains required under this E.O.
Executive Order 11990: Wetlands	Not Applicable	This IFR/EA includes an assessment and determination of wetland impacts pertaining to E.O. 11990 (Section 5.2.3.).

Statutory Authority	Compliance Status	Compliance Date/Comment
Executive Order 13112: Invasive Species / National Invasive Species Act	Fully Compliant	This IFR/EA includes an assessment of impacts pertaining to E.O. 13112 (Section 5.1.12).
Alaska Statute § 16.20.590 (2022): Kachemak Bay Critical Habitat Area	Partially Compliant	Portions of Alternative 2 extend into the KBCHA. USACE would coordinate with ADF&G for construction activities and project infrastructure within the boundaries of the KBCHA. ADF&G has advised that the NFS pursue permanently excluding any portions of potential project infrastructure from the KBCHA as it is not consistent with the KBCHA Management Plan.
Homer City Code 21.41: Flood Prone Areas	Partially Compliant	The project as a whole would be designed to comply with Homer City Code 21.41. The harbor features would demonstrate compliance by being engineered to withstand the 2% AEP design event. The NFS would be responsible for ensuring all associated upland facilities meet the specified elevation and flood-proofing requirements of the code. Full documentation for all project components would be finalized during the PED Phase.

8.2 Public Involvement

Public involvement occurred primarily through a series of public meetings coordinated with the NFS. The NFS also regularly disseminated updates to the study with the community through a public website.

8.2.1 Planning Charette – May 17–19, 2023

A Planning Charrette was held in Homer, AK on 17–19 May 2023. This public meeting served as a scoping exercise to assist USACE in defining its overall objectives. The initial array of alternatives was developed during this exercise. Meeting attendees included representatives from the City, State, Federal agencies as well as local stakeholder groups. The meeting was open to the public and had substantial attendance by the local residents. Total participants numbered over 100 for each day.

8.2.2 Environmental Stakeholder Outreach Meeting – May 17, 2023

USACE environmental resources staff conducted an in-person environmental stakeholder engagement meeting on May 17, 2023. The purpose of this meeting was to begin engagement with members of the local community that had environmental expertise and an interest on the environmental impacts of proposed alternatives. Approximately 15 people attended the meeting.

8.2.3 Public Coordination meeting

A public meeting was held in Homer on September 23, 2023. This public meeting served as a way to present the initial array of alternatives after the PDT's Alternatives

Meeting Milestone (AMM) and further solicit community input to refine measures and provide the community access to the PDT for questions.

USACE Alaska District team members presented an update on the study progress to the Homer City Council in a public meeting March 15, 2025. This meeting presented the USACE process of alternative selection and how a TSP would be identified and evaluated.

8.3 Agency Coordination

USACE consulted with Federal and state agencies further to inform the development of this IFR/EA. The correspondence by agency not otherwise listed in Section 8.0 is summarized in Table 8-2. Correspondence records associated with this table can be reviewed in Appendix E. For letter correspondence sent to multiple agencies, a single letter has been included as an example within Appendix E.

Table 8-2. Agency Coordination

Agency	Correspondence	
	Date	Description
ADEC	August 27, 2024	USACE sent formal notification and request for written confirmation acknowledging USACE's intent to coordinate with ADEC to obtain a CWA Section 401 WQC.
	September 4, 2024	ADEC Response to USACE request for written confirmation acknowledging USACE's intent to coordinate with ADEC to obtain a CWA Section 401 WQC.
	July 9, 2024	USACE held a sediment sampling scoping meeting with this agency.
ADF&G	May 12, 2023	USACE sent a formal letter via email requesting collaboration under the FWCA.
	June 9, 2023	USACE held an FWCA Agency Meeting attended by this agency.
	July 10, 2023	ADF&G sent a formal letter deferring to review the Draft IFR/EA for providing comments in response to USACE's invitation to collaborate under FWCA.
	March 6, 2024	USACE extended an invitation to participate in the Ecological Modeling Workshop via email to this agency.
	April 11–12, 2024	Agency participated in the Ecological Modeling Workshop.
AK SHPO	September 21, 2023	Notification Letter
	January 31, 2024	Section 106 Geotechnical Finding of Effect letter; concurrence received.
	May 04, 2026	Section 106 Project Finding of Effect Letter
EPA	June 2, 2023	USACE sent a formal letter inviting the agency to participate as a cooperating agency under the Feasibility Study.
	June 23, 2023	EPA sent a formal letter accepting USACE's request to participate as a cooperating agency under the Feasibility Study.
	August 7, 2023	USACE held a meeting with this agency to preliminarily discuss sampling for dredged material sediment characterization.
	June 30, 2024	USACE held a Cooperating Agency Workshop this agency as a participant.
	April 25, 2025	EPA sent a formal letter reaffirming participation as a cooperating agency.
	May 21, 2025	Conducted a cooperating agency meeting to discuss the study's upcoming TSP milestone with this agency.

Agency	Correspondence	
	Date	Description
	August 10, 2023	USACE notified this agency as a cooperating agency that the study was about to transition into a pause due to lapse in federal funding for the project.
	July 9, 2024	USACE held a sediment sampling scoping meeting with this agency.
NMFS Habitat Division	May 12, 2023	USACE sent a formal letter via email requesting collaboration under the FWCA.
	June 2, 2023	USACE sent a formal letter via email inviting the agency to participate as a cooperating agency under the Feasibility Study.
	June 9, 2023	USACE held an FWCA Agency Meeting attended by this agency.
	June 21, 2023	Cooperating agency request response deferring input through consultation required for other environmental laws (MSA and NEPA).
	March 6, 2024	USACE extended an invitation to participate in the Ecological Modeling Workshop via email to this agency.
NMFS Protected Resources Division	May 12, 2023	USACE sent a formal letter via email requesting collaboration under the FWCA.
	June 2, 2023	USACE sent a formal letter inviting the agency to participate as a cooperating agency under the Feasibility Study.
	June 2, 2023	USACE requested concurrence with its drafted Species List.
	June 9, 2023	USACE held an FWCA Agency Meeting attended by this agency.
	July 19, 2023	NMFS confirmed that the submitted Species List looked complete.
	March 6, 2024	USACE extended an invitation to participate in the Ecological Modeling Workshop via email to this agency.
USCG	June 2, 2023	USACE sent a formal letter inviting the agency to participate as a cooperating agency under the Feasibility Study.
	March 6, 2024	USACE extended an invitation to participate in the Ecological Modeling Workshop via email to this agency.
	April 11 –12, 2024	Agency participated in the Ecological Modeling Workshop.
	June 30, 2024	USACE held a Cooperating Agency Workshop. This agency, as a participant agency, did not formally by letter accept to act as a cooperating agency.
	August 10, 2023	USACE notified this agency as an informal cooperating agency that the study was about to transition into a pause due to lapse in federal funding for the project.
USFWS	May 12, 2023	USACE sent a formal letter via email requesting collaboration under the FWCA.
	May 31, 2023	USACE retrieved a species list from the USFWS IPaC Application.
	June 2, 2023	USACE sent a formal letter via email inviting the agency to participate as a cooperating agency under the Feasibility Study.
	June 9, 2023	USACE held an FWCA Agency Meeting attended by this agency.
	August 16, 2023	USFWS provided an initial Planning Aid Letter August 16, 2023.
	March 6, 2024	USACE extended an invitation to participate in the Ecological Modeling Workshop via email to this agency.
	June 5, 2024	USACE retrieved a new species list from the USFWS IPaC Application.

8.3.1 Miscellaneous Agency Inputs:

The EPA and USCG participated in cooperating agency engagements under the study. The EPA formally accepted a role as a cooperating agency on this study, but the USCG did not formally confirm its participation as a cooperating agency. USCG advised the PDT on requirements for ATONs in alternative formulation. Agency coordination related to environmental compliance is found in Table 8-2.

USACE also held a closed workshop on April 11-12, 2026, at Homer, Alaska, to work with environmental stakeholders to develop an ecological model to inform the study. The results of the workshop are described further in Appendix O.

8.4 Government to Government and ANCSA Corporation Correspondence

Official Government to Government letters were sent to the organizations and Tribes listed in Table 8-3 below. At this time, no formal requests for Government to Government consultations have been received.

Table 8-3. Government Correspondence

Name	Organization
Government to Government	
Kenaitze Indian Tribe IRA	Federally-Recognized Tribe
Native Village of Nanwalek	Federally-Recognized Tribe
Ninilchik Traditional Council	Federally-Recognized Tribe
Port Graham Village Council	Federally-Recognized Tribe
Salamatof Tribe	Federally-Recognized Tribe
Seldovia Village Tribe	Federally-Recognized Tribe
Government to Corporation	
Chugach Alaska Corporation	Regional ANCSA Corporation
Chugachmiut	Regional Non-Profit Corporation
Cook Inlet Region, Inc.	Regional ANCSA Corporation
Cook Inlet Tribal Council	Regional Non-Profit Corporation
Kenai Native Association, Inc.	Village ANCSA Corporation
Ninilchik Native Association	Village ANCSA Corporation
Port Graham Corporation	Village ANCSA Corporation
Salamatof Native Association	Village ANCSA Corporation
Seldovia Native Association, Inc	Village ANCSA Corporation

8.5 NHPA Consultation

Project notification letters were sent on September 21, 2023. Following the notification letters additional stakeholders were added to the Section 106 consultation list. The geotechnical borings and environmental sediment testing Finding of Effect (FOE) letter were sent on January 31, 2024 with a finding of no historic properties affected. SHPO concurrence on the Geotechnical FOE was received February 28, 2024. The TSP FOE was submitted May 4, 2026 with SHPO concurrence anticipated 30 days after receipt. Table 8-4 lists the Section 106 Stakeholders.

Table 8-4. NHPA Consultation

Section 106 Consulting Parties	
Name	Entity Type
Alaska State Historic Preservation Office	State Government

Section 106 Consulting Parties	
Name	Entity Type
Chugachmiut	Non-Profit Regional Corporation
Chugach Alaska Corporation	Regional ANCSA Corporation
City of Homer	Local Government
Cook Inlet Region, Inc,	Regional ANCSA Corporation
Cook Inlet Tribal Council	Non-Profit Regional Corporation
Homer Society of History/Pratt Museum	Museum
Kenai Native Association	Village ANCSA Corporation
Kenai Peninsula Borough	Local Government
Kenaitze Indian Tribe IRA	Federally-Recognized Tribe
Native Village of Nanwalek	Federally-Recognized Tribe
Ninilchik Native Association	Village ANCSA Corporation
Ninilchik Traditional Council	Federally-Recognized Tribe
Port Graham Corporation	Village ANCSA Corporation
Port Graham Village Council	Federally-Recognized Tribe
Salamatof Native Association	Village ANCSA Corporation
Salamatof Tribe	Federally-Recognized Tribe
Seldovia Native Association, Inc	Village ANCSA Corporation
Seldovia Village Tribe	Federally-Recognized Tribe

8.6 Environmental Stakeholder Working Group

The ESWG was established by USACE as a novel approach to environmental stakeholder engagement for this study. Its creation was a direct response to feedback received at the study's Design Charrette, where stakeholders expressed a strong desire for early involvement in the study's environmental analysis. The ESWG was designed to leverage study-area environmental knowledge from local, State, and Federal individuals and agencies to inform the analysis. The purpose of the ESWG was to provide an additional platform to ensure that USACE fully considered the natural resources in and near Kachemak Bay and Homer. These inputs were used to inform and the potential impacts of alternatives , planning, analysis, and decision-making processes through collaboration with the ESWG.

8.6.1 Participants and Outreach

The initial participants consisted of individuals who provided contact information at the Design Charrette's environmental engagement session. Outreach was expanded through member referrals, the NFS project website, and events. Formal letters of invitation sent to Alaska Native Tribes on August 28 or 29, 2023, within the vicinity of the study area. Table 8-5 lists the Tribes formally invited to participate in the ESWG.

Table 8-5. List of Alaska Native Tribes Formally Invited to Participate in the ESWG

Alaska Native Tribes	
Kenaitze Indian Tribe IRA	Native Village of Nanwalek
Ninilchik Traditional Council	Port Graham Village Council
Salamatof Tribe	Seldovia Village Tribe

8.6.2 Governance and Meeting Structure

The ESWG initially operated with an open-forum, unmoderated participation model. To improve focus and ensure the group's objectives were met, USACE, with feedback from the members, implemented a formal *Environmental Stakeholder Working Group Guidance* (herein Guidance Document), dated August 9, 2023. Continued participation was made conditional on members' agreement to the ground rules established through the Guidance Document. This transition to a structured format, with closed meetings for acknowledged members, was to begin on August 16, 2023, but extended to September 21, 2023, to allow interested participants additional time. An exception to this rule was granted for guest participants and regulatory agency staff.

8.6.3 Administration and Assessment

The ESWG was managed by the USACE NEPA Coordinator for this study. While the initial engagement at the Design Charrette occurred in-person, all subsequent ESWG meetings were held virtually to accommodate the geographical separation of participants. Group activities and general correspondence were primarily coordinated via an email distribution list, with communication strategies adapted based on participant feedback.

A total of six virtual meetings were held on the following dates:

- July 10, 2023
- August 23, 2023
- September 28, 2023
- April 24, 2025
- May 30, 2025
- July 11, 2025

The substantial gap between the meetings in September 2023 and April 2025 corresponds to a fiscal pause in the overall study. Meetings were scheduled to ensure they occurred at times when pertinent input from ESWG participants could be gathered or when a major environmental study update could be provided. USACE formally closed out the ESWG on April 2, 2026, through a notification to the group's email distribution list.

The ESWG was only intended to last up to the release of the Draft IFR/EA. Despite these complexities, the overall evaluation concluded that the structured interactions provided benefits to informing the environmental analysis process.

8.6.4 Record of Activities

A complete record of ESWG activities is documented in Appendix L, which includes the:

- Authority Memorandum for Record
- Guidance Document
- List of Participants
- Alaska Native Tribe Invitation Letter Example
- Meeting Agendas and Notes
- Non-Meeting Correspondence Tracker

- ESWG Close-out Notification

9.0 EA NEPA IMPLEMENTING PROCEDURES

In accordance with DoD NEPA Implementing Procedures, the resulting EA represents the following: the USACE's good-faith effort to prioritize documentation of the most important considerations and factors required by NEPA within the congressionally mandated page limits and timeline; that this prioritization reflects the USACE’s expert judgment; the document is substantially complete; that any considerations addressed briefly or left unaddressed were, in the USACE’s judgment, comparatively not of a substantive nature that meaningfully informed the consideration of environmental effects and the resulting decision on how to proceed; and that in the USACE's judgment the analysis contained therein is adequate to inform and reasonably explain the USACE's final decision regarding the proposed federal action.

10.0 DISTRICT ENGINEER RECOMMENDATION

I recommend that the following navigation improvements at Homer, Alaska be authorized with such modifications as in the discretion of the Chief of Engineers: the construction of a harbor at the end of the Homer Spit northeast of the current harbor; dredging of a 215-foot-wide entrance channel to a depth of -26 feet MLLW, and an adjoining 6-acre fairway and 37-acre mooring basin, both to a depth of to -24 feet MLLW; and construction of a breakwater system, with east and west sections breakwater totaling an approximate length of 4,500 feet and crest elevations of +30 feet MLLW, to protect the harbor. Collaboration with stakeholders and regulatory agencies informed a design that minimizes environmental effects to the greatest extent practicable. To ensure long-term environmental stewardship, mitigation measures and BMPs were also established to avoid and minimize impacts over the TSP's entire life. In addition to these general navigation features the non-federal sponsor would construct and operate at no federal expense LSF including gangways, finger floats, electrical utilities and a fuel dock.

Based on the October 2025 price level, a 3.25 % discount rate, and a 50-year period of analysis, the estimated project cost of the TSP is $492,075,800. The estimated Federal and Non-Federal shares of the project are $360,626,000 and $131,450,000 respectively. In addition to the Non-Federal Sponsor’s estimated share of the project cost, the Non-Federal sponsor must pay an additional 10 percent of the cost of the general navigation features of the project in cash over a period not to exceed 30 years with interest. The additional 10 percent payment is estimated to be $38,556,000 before interest is applied.

My recommendation is subject to cost sharing and other applicable requirements of Federal laws, regulations, and policies. Federal implementation of the project for commercial navigation includes, but is not limited to, the following items of local cooperation to be undertaken by the non-Federal sponsor in accordance with applicable Federal laws, regulations, and policies:

a. Provide the non-Federal share of construction costs, as further specified below:

1) Provide, during design, 25 percent of the costs of design for the general navigation features of the project in accordance with the terms of the design agreement for the project;

2) Provide, during construction 10 percent of the costs of the general navigation facilities allocated to that portion of the project with a channel depth not in excess of 20 feet; and 25 percent of the costs of the general navigation facilities allocated to that portion of the project with a channel depth in excess of 20 feet but not in excess of 55 feet;

b. Provide all lands, easements, and rights-of-way, including those required for relocations and dredged material placement facilities, acquire or compel the removal of obstructions, and perform or ensure the performance of all relocations, including utility relocations, as determined by the Federal government to be necessary for the construction, operation, and maintenance of the general navigation features;

c. Pay, with interest over a period not to exceed 30 years following completion of construction of the general navigation features, an additional amount equal to 10 percent of the construction costs of the general navigation features less the amount of credit afforded by the Federal government for the value of the real property interests and relocations, including utility relocations, provided by the non-Federal sponsor for the general navigation features, except for the value of the real property interests and relocations provided for mitigation, which is included in the construction costs of the general navigation features;

d. Ensure that the local service facilities are constructed, operated, and maintained at no cost to the Federal government, and that all applicable licenses and permits necessary for construction, operation, and maintenance of such work are obtained;

e. Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon the real property interests that the non-Federal sponsor owns or controls for the purpose of operating and maintaining the project;

f. Hold and save the Federal government free from all damages arising from design, construction, operation and maintenance of the project, except for damages due to the fault or negligence of the Federal government or its contractors;

g. Perform, or ensure performance of, any investigations for hazardous, toxic, and radioactive wastes (HTRW) that are determined necessary to identify the existence and extent of any HTRW regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, and any other applicable law, that may exist in, on, or under real property interests that the Federal government determines to be necessary for construction, operation and maintenance of the general navigation features;

h. Agree, as between the Federal government and the non-Federal sponsor, to be solely responsible for the performance and costs of cleanup and response of any HTRW regulated under applicable law that are located in, on, or under real property interests required for construction, operation, and maintenance of the project, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination, without reimbursement or credit by the Federal government;

i. Perform the non-Federal sponsor's responsibilities in a manner that will not cause HTRW liability to arise under applicable law to the maximum extent practicable; and

j. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended, (42 U.S.C. 4630 and 4655) and the Uniform Regulations contained in 49 C.F.R Part 24, in acquiring real property interests necessary for construction, operation, and maintenance of the project including those necessary for relocations, and placement area improvements; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

The recommendations contained herein reflect the information available at this time and current departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to higher authority as proposals for authorization and implementation funding. However, prior to transmittal to higher authority, the sponsor, the states, interested federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

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