US Army Corps of Engineers
Alaska District

Draft Interim Integrated Feasibility Report,
Draft Environmental Assessment
and Draft Finding of No Significant Impact

Navigation Improvements
Craig, Alaska

December 2014

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Prepared by
U.S. Army Corps of Engineers
Alaska District

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FINDING OF NO SIGNIFICANT IMPACT

In accordance with the National Environmental Policy Act of 1969, as amended, the U.S. Army Corps of Engineers, Alaska District (Corps), has assessed the environmental effects of the following action:

Navigation Improvements
Craig, Alaska

The recommended plan is a 10.1 acre mooring basin that can accommodate 145 vessels. Features of the harbor include approximately 1,933 feet of breakwaters with fish passage considerations included.

The Corps determined that the navigation improvements project will have no adverse effect on species protected under the Endangered Species Act or the Marine Mammals Protection Act, or on essential fish habitat. The Corps also has concurrence from the State Historic Preservation Officer under the National Historic Preservation Act.

The environmental assessment supports the conclusion that the navigation improvements at Craig, Alaska do not constitute a major Federal action significantly affecting human health and the environment. An environmental impact statement (EIS) is therefore not necessary for this project.

__________________________ _____________
Christopher D. Lestochi Date
Colonel, U.S. Army Corps of Engineers
District Commander

Executive Summary

This report examines the need for navigation improvements at Craig, Alaska and determines the feasibility of Federal participation in potential improvements.

Navigation-related problems at Craig stem from excessive surplus demand for moorage. Craig has multiple existing moorage facilities. However, due to the area's rich marine resources and natural beauty, there is a high level of demand for moorage for both commercial and recreational vessels. Existing facilities attempt to fill as much demand as possible, but overcrowding leads to increased damages to vessels and harbor facilities and vessel delays.

A number of alternatives were evaluated over the course of this study. Alternative 2b maximizes the net National Economic Development (NED) benefits and has been selected as the NED Plan. The local sponsor supports the NED plan which has been carried forward as the Recommended Plan. The Recommended Plan provides dual rubblemound breakwaters totaling approximately 1,933 feet in length. The breakwater will provide protection for a 10-acre mooring basin.

Multiple considerations were made to avoid environmental impacts wherever possible. These considerations include eliminating all dredging, siting the mooring basin to minimize impacts to eelgrass (*Zostera marina*) beds, and including a fish passage opening in the western side of the breakwater.

The features of the Recommended Plan that contribute to the NED plan have a construction cost of approximately $39 million (2014 price levels). The annual investment cost of the project, including the cost of operation and maintenance is $1.52 million with annual NED benefits of $2.56 million. The project's benefit-to-cost ratio is 1.62 with net annual benefits of $981,000.

The local sponsor, City of Craig, would be required to pay the non-Federal share of the costs of construction of general navigation features (GNF) as specified by Section 101 of the Water Resources Development Act of 1986 (Public Law 99-662). The sponsor must also pay the entire cost of the non-GNF, referred to as "local service facilities" (LSF). The estimated total non-Federal share of the project is $13.9 million which includes $6.3 million for GNF and $7.6 million for LSF. The Federal share of the project is $25.1 million, which includes $18,316 for navigation aids to be provided by the U.S. Coast Guard. The fully funded cost, which is the project cost escalated to the mid-point of construction, is $40.9 million.

Pertinent Data

Recommended Plan

Channel and Basin		Main Breakwater	
Entrance Channel	0 acres	Design Wave	
Mooring Basin	10.1 acres	Length, Total	1,933 feet
Maneuvering Basin	0 acres	Crest Elevation	
Mooring Basin		Crest Width	
Total	10.1 acres	Primary Armor	31,100 cy
Dredging Volume	0 cy	Secondary Armor	42,650 cy
		Core Rock	205,300 cy

Project Cost

Item	Federal ($)	Non-Federal ($)	Total ($)
General Navigation Features*	$28,205,000	$ 3,158,900	$31,363,900
Associated costs – local service facilities	$ 0	$ 7,571,000	$ 7,571,000
Lands, Easements, Rights of Way, Relocation, and Disposal (GNF)	$ 0	$ 27,600	$ 27,600
Navigation aids, U.S. Coast Guard	$ 18,316	$ 0	$ 18,316
NED Project Cost	$28,223,316	$10,757,500	$38,980,816
Annual cost, benefit, and benefit cost ratio based on a 2014 price level, 3½ percent, 50-year project life			
NED Investment Cost (Interest During Construction)			$ 1,196,100
Annual Operation, Maintenance, Repair, Rehabilitation, and Replacement			$ 60,309
Total Annual NED Cost			$ 1,519,800
Annual NED Benefits			$ 2,561,000
Net Annual NED Benefits			$ 981,000
Benefit/Cost Ratio			1.62

*Cost sharing reflects provisions of the Water Resources Development Act of 1986, non-Federal initial share 10 percent of GNF minus LERRD credit and 10 percent GNF over time.

Conversion Table for SI (Metric) Units		
Multiply	By	To Obtain
Cubic Yards (cy)	0.7646	Cubic Meters
Acre (ac)	0.4049	Hectare
Feet	0.3048	Meters
Feet Per Second	0.3048	Meters Per Second
Inches	2.5400	Centimeters
Knots (international)	0.5144	Meters Per Second
Miles (U.S. Statute)	1.6093	Kilometers
Miles (Nautical)	1.8520	Kilometers
Miles Per Hour	1.6093	Kilometers Per Hour
Pounds (mass) (lb)	0.4536	Kilograms

*To obtain Celsius (C) temperature readings from Fahrenheit (F) readings, use the following formula: C = (5/9)(F-32)

List of Acronyms and Abbreviations

ADCRA	Alaska Division of Community and Regional Affairs
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ANCSA	Alaska Native Claims Settlement Act
ATS	Alaska Townsite Survey
AWC	Anadromous Waters Catalog
C	Celsius
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFEC	Commercial Fisheries Entry Commission
CFR	Code of Federal Regulations
COL	Colonel
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
CY	Cubic Yards
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ER	Engineer Regulations
ESA	Endangered Species Act
etc.	Et Cetera
FAA	Federal Aviation Administration
F	Fahrenheit
FC	Full Compliance
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
FR/EA	Feasibility Report and Environmental Assessment
FWCA	Fish and Wildlife Coordination Act
ft	feet
GNF	General Navigation Feature
IDC	Interest During Construction
kg	Kilograms
lbs	Pounds
LERR	Lands, Easements, Real Estate, and Rights-Of-Way
LERRD	Lands, Easements, Real Estate, Rights-Of-Way, and Disposals
LPP	Locally Preferred Plan
LSF	Local Service Facilities

mg	Milligrams
MBTA	Migratory Bird Treaty Act
MHHW	Mean Higher High Water
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Water
MMPA	Marine Mammal Protection Act
MSL	Mean Sea Level
MTL	Mean Tide Level
N/A	Not Applicable
NAAQS	National Ambient Air Quality Standards
NED	National Economic Development
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
O&M	Operation and Maintenance
OCT	Opportunity Cost of Time
OMB	Office of Management and Budget
OMRRR	Operation, Maintenance, Repair, Replacement, and Rehabilitation
PC	Partial Compliance
PED	Preconstruction Engineering and Design
R	Republican
S&A	Supervision and Administration
SHPO	State Historic Preservation Officer
TSP	Tentatively Selected Plan
U.S.	United States
UDV	Unit Day Value
USC	United States Code
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USS	United States Survey

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*- Indicates required NEPA sections

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1.0 INTRODUCTION

1.1 Authority

This feasibility study was conducted under authority granted by a resolution adopted on December 2, 1970, by the Committee on Public Works of the U.S. House of Representatives. The resolution states:

> *"Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Rivers and Harbors in Alaska, published as House Document Numbered 414, 83^{rd} Congress, 2^{nd} Session; and other pertinent reports, with a view to determine whether any modifications of the recommendations contained therein are advisable at the present time."*

1.2 Scope of the Study

This study examines the feasibility and environmental effects of potential navigation improvements at Craig, Alaska. The City of Craig is located on the western coast of Prince of Wales Island, approximately 55 air miles west-northwest of Ketchikan. The project area is shown below in Figure 1.

The non-Federal sponsor for the feasibility study is the City of Craig. The study area is in the Alaska Congressional District, which has the following congressional delegation:

Senator Lisa Murkowski (R);
Senator Dan Sullivan (R);
Representative Don Young (R).

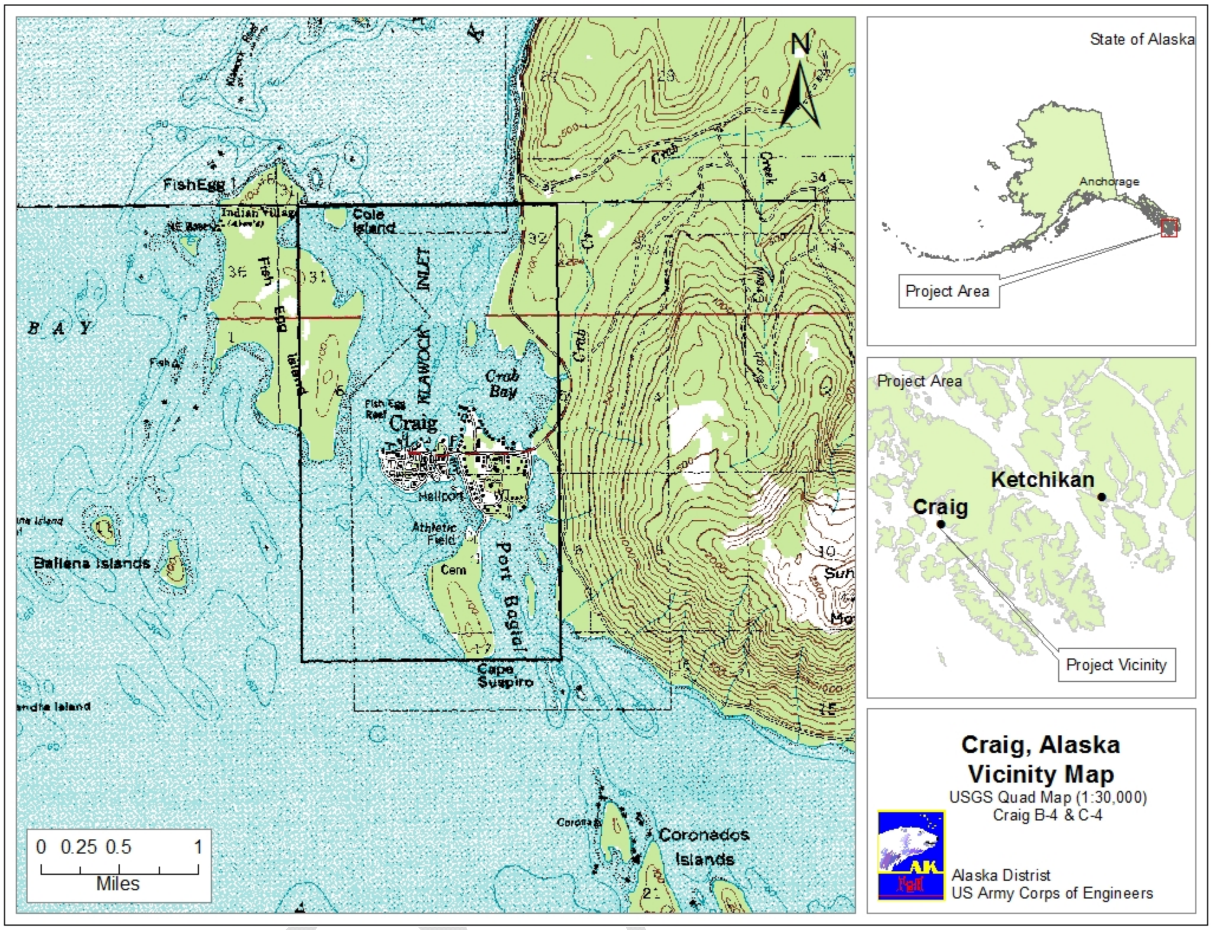

Figure 1: Study Area

Engineer Regulation 1105-2-100, "*Planning Guidance Notebook*" defines the contents of feasibility reports for navigation improvements. Engineer Regulation 200-2-2, "*Procedures for Implementing NEPA*", directs the contents of environmental assessments. This document presents the information required by both regulations as an integrated feasibility report and environmental assessment (FR/EA). It also complies with the requirements of the Council on Environmental Quality regulations for implementing the National Environmental Policy Act of 1969 (42 USC 4341 et seq.).

This draft FR/EA documents the studies and coordination conducted to determine whether the Federal Government should participate in navigation improvements at Craig, Alaska. Studies of potential navigation improvements considered a wide range of alternatives and the environmental consequences of those alternatives, but focused mainly on actions that would provide safe moorage for commercial fishing vessels. Commercial navigation is a high priority mission for the Corps and commercial vessel activity at Craig generates sufficient national economic development (NED) benefits to allow the Corps to recommend a project to Congress. Studies for this action were limited to the Craig area because under existing Federal authorities, the Corps can only recommend to Congress navigation improvements cost-shared by non-

Federal sponsors. The City of Craig has stated its intention to cost-share in a Federally-constructed harbor at Craig. This partnership of Federal and non-Federal interests in navigation improvements helps ensure that those improvements will effectively serve both local and national needs.

1.3 Study Participants and Coordination

The Alaska District, U.S. Army Corps of Engineers was primarily responsible for conducting studies for navigation improvements at Craig. The studies that provide the basis for this report were conducted with the assistance of many individuals and agencies, including the City of Craig, the U.S. Fish and Wildlife Service (USFWS), the U.S. Coast Guard (USCG), the State of Alaska Department of Fish and Game (ADF&G), the State of Alaska Department of Environmental Conservation (ADEC), and many members of the interested public who contributed information and constructive criticism to improve the quality of this report.

1.4 Related Studies and Reports

1993 – U.S. Army Corps of Engineers, "Small Boat Harbor Section 107 Reconnaissance Report, (May 1993). This study evaluated the economic viability of navigation improvements at the North Cove Harbor site. A Federal Interest in providing navigation improvements could not be established at that time.

1992 – BST Associates, "Craig Small Boat Harbor Expansion Study", (April 1992). This study was prepared to evaluate the existing socioeconomic conditions at Craig and provide data to aid in decision making on the requested expansion of North Cove Harbor.

1979 – U.S. Army Corps of Engineers, "Navigation Improvements for Small Boat Harbor, South Cove Harbor, (October 1979). This report recommended construction of navigation improvements at South Cove Harbor.

2.0 PLANNING CRITERIA/PURPOSE AND NEED FOR THE PROPOSED ACTION*

2.1 Problem Statement/Purpose and Need

The primary problem is current moorage demand at Craig, Alaska exceeds supply. The City of Craig and the surrounding area is heavily dependent upon access to protected moorage in order to safely and efficiently engage in commercial, recreational, and subsistence fishing activities. While there are a number of existing facilities in the immediate and surrounding areas, they are inadequate to meet current and future moorage demand. This condition is contributing to inefficiencies and vessel damages. The purpose of this study is to determine the feasibility of constructing navigation improvements at Craig, Alaska to meet surplus demand and to evaluate the environmental impacts of constructing those improvements.

2.1.1 Existing Harbor Conditions

Historically, Craig's harbors have been fully subscribed, or fully utilized. A large waiting list exists for permanent moorage and transient moorage is limited, when available at all. Transient vessels are often forced to moor to unprotected facilities along the northern shore of Craig Island. One of these facilities is the Wards Cove Cannery dock, which is in a state of disrepair and unsuitable for regular use required of marine infrastructure. Vessels often raft to one another at these facilities, causing damage to each other and the infrastructure. Vessels that cannot moor to a dock or raft to another vessel are forced to anchor offshore in Klawock Inlet. Between fishing openers the existing harbors are filled to capacity with vessels mooring to every available dock and rafting to one another, sometimes as many as four deep with over a dozen other vessels anchoring offshore to avoid damage that occurs due to rafting.

In 2010, a processing plant was constructed on False Island, north of downtown Craig. Construction of this facility brought the seine vessel fleet and associated vessels such as tenders to Craig for multiple fishing openings each year. This has exacerbated an already overcrowded situation and increased the need for permanent and transient moorage in the area.

Current conditions at Craig's small boat harbor facilities are marred by inefficiencies and damages due to overcrowding. Overcrowding in harbors often leads to vessel damages due to practices such as rafting (where two or more vessels are moored together), hot-berthing (where a vessel is placed in a dedicated slip when the normal vessel is away), or other operations that take place in a space-constrained harbor. The following sections discuss these damages and inefficiencies.

2.1.2 Vessel Damages

Overcrowding in the harbor often leads to vessel damages. In many cases, these damages occur due to rafting. As discussed above, rafted vessels tie together and can damage railings and fenders and break mooring lines. Other damages can occur when crewmembers from one vessel are forced to exit the raft by transporting gear through multiple other vessels. Survey results revealed an average of 5.6 vessel damages per year with an average repair cost per incident of $1,800 (2013 dollars).

2.1.3 Vessel Delays

Vessels can also be delayed due to rafting as vessel owners must wait for their vessel to be retrieved from a raft before they can depart. In addition, vessels are often delayed entering or exiting Craig's harbor when overcrowding is present. This can be incredibly problematic for commercial fishermen who are seeking to take advantage of a limited fishing opening. Delays in exiting the harbor can lead to a decrease in available fishing time. Delays are also possible when re-entering the harbor if a vessel is hot-berthed in a vessel's dedicated slip. Seventeen percent of survey respondents experienced at least one delay with an average length of delay of 5 hours.

The longest average delay occurred when a vessel had to wait for another vessel to be moved from their dedicated stall (over 10 hours).

2.1.4 Travel Costs

Overcrowded conditions can often lead to increased travel costs for vessels which would prefer to homeport at Craig but who are forced to seek moorage elsewhere due to a lack of space. A number of survey respondents indicated that they would seek permanent moorage at Craig if it were available. Sixteen percent of commercial fishing vessel respondents indicated that they currently homeport elsewhere but would prefer to homeport in Craig if moorage were available. These vessels currently homeport at facilities elsewhere in Alaska or the Pacific Northwest.

2.1.5 Damage to Existing Infrastructure

Harbor facilities can be damaged due to overuse associated with overcrowding. While some degradation in facility condition can be expected over time, overcrowding often leads to an increased rate of degradation, increasing the amount of maintenance needed to maintain a certain level of facility condition. This can occur due to many factors. Rafting can lead to damage of floats by overstressing float fingers, bullrails, cleats, and connections. Placing vessels in slips that are smaller than what is needed can cause damage to cleats and overstress connections.

2.1.6 Recreational Opportunity

Because recreational vessels are subject to the same delays and damages as commercial fishing vessels, their recreational experience is lessened.

2.2 Opportunities and Constraints

2.2.1 Opportunities

No specific planning opportunities exist for this study.

2.2.2 Constraints (Factors to avoid)

2.2.2.1 Eelgrass disturbance

Eelgrass contributes to the ecosystem as a food resource for fish, wildlife and invertebrates. It stabilizes habitat, cycles nutrients, provides spawning medium for fish and invertebrates, and acts as a protective nursery during rearing of fish and invertebrates. Any harbor development at Craig will seek to avoid eelgrass disturbance to the extent possible and to provide mitigation for disturbances that cannot be avoided.

2.2.2.2 Areas without sufficient upland support

Sufficient uplands are vital to the operation of a commercial harbor. Uplands provide parking areas for support vehicles, storage area for gear, and room to develop landside support functions. There shall be sufficient uplands at the chosen site.

2.2.2.3 Areas that are a great distance from existing utility connections

While it is reasonable to expect a certain amount of required infrastructure development around a harbor project, the chosen site shall not be a great distance from existing utility connections due to the high cost of installing new utilities.

2.2.2.4 Disturbing float plane operations

The Craig Seaplane Base is located just north of downtown Craig. It is a vital transportation asset for the community and is regulated by the Federal Aviation Administration (FAA). Sites that adversely impact seaplane operations shall be disqualified.

2.2.2.5 Projects that are not cost effective for the non-Federal sponsor

The City of Craig has limited resources with which to support construction of a harbor project. In the event that the NED plan is of such size that the sponsor cannot financially support its construction, an economically justified locally preferred plan (LPP) will be recommended consistent with policy.

2.2.2.6 Land use conflicts

Given that the City of Craig is fairly well-developed along its existing shoreline, there may be sites at which a harbor would conflict with current or planned uses such as residences, cemeteries, etc. Sites at which obvious land use conflicts will occur will not be selected.

2.2.2.7 User group conflicts (commercial fishing, charter, yachts)

Any harbor will accommodate the identified fleet without adversely burdening one user group.

2.2.2.8 Condemning land

Site selection will minimize condemnations of land due to the cost to the sponsor and the divisions it may cause within this small community. While no site will be eliminated purely based on this constraint, the number of condemnations required will be considered.

2.2.2.9 Crab Bay

Crab Bay is a very important ecological resource for many species and is highly valued as an environmental asset within the community. Impacts to this area will be avoided to the extent practicable and those impacts that cannot be avoided will be mitigated.

2.2.2.10 Shallow areas

As discussed above, the sponsor has limited financial resources to construct a harbor. This consideration extends to the operation and maintenance (O&M) of a project as well. Sites that are excessively shallow and likely to experience a great deal of sedimentation within a harbor basin will be avoided to minimize future dredging costs.

2.2.2.11 Excessively deep water

Similarly, areas with excessively deep water [in excess of -40 feet mean lower low water (MLLW)] will be avoided to minimize rock costs during construction.

2.3 Objectives

2.3.1 National Objectives

The Federal objective of water and land resources planning is to contribute to NED in a manner consistent with protecting the nation's environment. NED features increase the net value of goods and services provided to the economy of the nation as a whole. Only benefits contributing to NED may be claimed for Federal economic justification of a project. For Craig navigation improvements, NED features include breakwaters, channels, basins, float systems, and uplands.

Water resource planning must be consistent with NED objectives and must consider engineering, economic, environmental, and social factors. The following objectives are guidelines for developing alternative plans and are used to evaluate those plans.

2.3.1.1 Federal Engineering Objectives

Plans formulated for navigation improvements at Craig should be adequately sized to accommodate user needs and provide for development of harbor-related facilities. They should protect against wind-generated waves and boat wakes. The U.S. Army Corps of Engineers, Alaska District plans and designs boat harbors to attenuate waves to no more than 1 foot in the moorage area. Information from a number of harbors protecting a range of vessels has shown that reducing waves to this height will allow little potential for wave damage to moored vessels. Adequate depths and entry channels are required for safe navigation. The plans must be feasible from an engineering standpoint and capable of being economically constructed.

2.3.1.2 Federal Economic Objectives

Principles and guidelines of Federal water resources planning require identification of a plan that would produce the greatest contribution to NED. The NED plan is defined as the environmentally acceptable plan providing the greatest net benefits. Net benefits are determined by subtracting annual costs from annual benefits. Corps of Engineers policy requires recommendation of the NED plan unless there is adequate justification to do otherwise.

All alternatives that would meet project needs must be presented and should be described in quantitative terms if possible. Benefits attributed to a plan must be expressed in terms of a time value of money and must exceed equivalent economic costs for the project. To be economically feasible, each separate portion or purpose of the plan must provide benefits at least equal to its cost. The scope of development must be such that benefits exceed project costs to the maximum extent possible. The economic evaluation of alternative plans is on a common basis of November 2014 prices, a period of analysis of 50 years, and the Federal Fiscal Year 2015 interest rate of 3.375 percent.

2.3.2 Study Objectives

2.3.2.1 Reduce damages and delays related to rafting and overcrowding

The majority of damages currently occurring at Craig are caused by overcrowded conditions. When overcrowding occurs in a harbor, vessels are delayed entering and exiting the harbor. Berths normally assigned to permanent moorage may be filled in a practice known as "hot berthing". When the assigned vessel returns, it may find its berth filled and be forced to wait for the space to open. In addition, rafting within a harbor can cause damages to vessels and accelerated wear on harbor facilities. This study seeks to reduce damages and delays caused by these overcrowded conditions.

2.3.2.2 Provide permanent and transient moorage

Currently there is surplus demand for permanent and transient moorage at Craig. This study seeks to accommodate as much demand for permanent and transient moorage as economically feasible over the 50-year study period.

2.3.2.3 Provide for/accommodate the associated features of a harbor

A well-functioning harbor provides space for and/or accommodates features that allow users to be efficient in their vessel-related operations. These features can include parking, storage, logical float configurations, etc. This study seeks to provide for and/or accommodate these features.

2.3.2.4 Avoid and minimize environmental impacts

Prince of Wales Island and the surrounding areas contain an abundance of environmental resources. To the extent practicable, this study will seek to formulate alternatives that avoid environmental impacts wherever possible and to mitigate for those impacts that are unavoidable.

2.4 Criteria

2.4.1 National Evaluation Criteria

Federal Principles and Guidelines establish four criteria for evaluation of water resources projects. Those criteria and their definitions are listed below.

2.4.1.1 Acceptability

Acceptability is defined as "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 particular solutions or political expediency."

2.4.1.2 Completeness

Completeness is defined as "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."

2.4.1.3 Effectiveness

Effectiveness is defined as "the extent to which an alternative alleviates the specified problems and achieves the specified opportunities."

2.4.1.4 Efficiency

Efficiency is defined as "the extent to which an alternative alleviates the specified problems and realizes the specified opportunities at the least cost."

2.4.2 Study Specific Evaluation Criteria

A harbor that effectively serves both Federal and non-Federal interests must be sited, planned, and operated so that it safely and efficiently meets user needs. The following goals and objectives, based on the needs described in Section 2.3, are related to providing a harbor that is safe, usable, and maintainable.

2.4.2.1 Safety

The selected site and alternative should be safe from excessive hazards from avalanche, landslide, icing, severe wind, excessive currents, incompatible industry, unacceptably high waterborne traffic, and onshore traffic that would present undue hazards during operation due to either high volumes or dangerous activities. The site and alternative should allow for harbor activities to remain clear of roadways for safety and to minimize impacts to land-based transportation. The site and alternative should not expose harbor users to undue hazards from slope gradients, overhead operations, or other hazards. The site and alternative should allow for easy monitoring by the Harbormaster for safety and efficiency.

2.4.2.2 Compatibility

The selected site and alternative should be compatible with surrounding land uses including zoning with consideration for residential areas, hospitals, certain types of public use lands, and other public and private uses that could be adversely affected by noise and activities associated with an operating harbor.

2.4.2.3 Accessibility

The site and alternative should be reasonably accessible to all potential users.

2.4.2.4 Supportable

The site and alternative should have access to sufficient uplands to allow for safe and efficient operation of the harbor. Upland areas are required for harbor facilities, access, staging for operations, parking, and other onshore activities normally required for effective operation of a commercial venture or public facility.

3.0 BASELINE CONDITIONS/AFFECTED ENVIRONMENT*

3.1 Community and People

3.1.1 History

Craig and surrounding areas have been used extensively by the Tlingit and Haida people for fish camps and village sites. Fish Egg Island was an important burial site and was also used for seasonal food-gathering activities. Around 1907 Craig Miller and local Haida residents set up a fish saltery on Fish Egg Island, followed by a cannery and cold storage facility in 1911. These facilities became the center of the town of Craig. The City of Craig was incorporated in 1922 (ADCRA 2014, City of Craig 2006a). Excellent pink salmon runs and migration from the Dust Bowl contributed to growth in the late 1930's. Today, Craig's economy is dominated by fishing and fishing support activities.

3.1.2 Government and Tax Structure

The City of Craig is a first class city in the Prince of Wales-Hyder Census Area. The City operates under a mayor/council form of government with a mayor who is elected to a term of 2 years and 6 council members, all of whom are elected to 3-year terms. The City Administrator oversees day-to-day city operations. The City levies a 6.00 mill property tax, 5 percent sales tax, and 6 percent alcohol tax for total 2013 tax revenues of $2.34 million.

3.1.3 Demographics

The 2013 population of Craig was estimated to be 1,195, making it the largest community on Prince of Wales Island (AKDOL). Since 2000, the population has fluctuated between 1,100 and 1,400 people. The population is approximately 65 percent White, 20 percent American Indian and Alaska Native, and 13 percent of the population is two or more races in combination. Other small groups (less than 1 percent) include African Americans, Asians, and Pacific Islanders. The population is 55 percent male and 45 percent female. The median age of the population is 36.4 years.

The principle Alaska Native cultures in the area are Tlingit and Haida. Sealaska is the Alaska Native Claims Settlement Act (ANCSA) regional corporation for the Craig area and the majority of Southeast Alaska. The local tribal entity is Craig Tribal Association and the local ANCSA village corporation is Shaan-Seet, Inc. (ADCRA 2014).

3.1.4 Land Use

The land surrounding the project site is occupied by the now defunct Wards Cove Cannery immediately to the west of downtown Craig. The City owns the Wards Cove property which includes 5 acres of uplands and 5 acres of submerged and intertidal lands. Some of the cannery facilities were constructed in the early 1920s. At one time, the facilities included a fish processing plant, worker housing, bulk fuel storage, vessel storage, and vessel maintenance facilities. Some of the cannery buildings, (such as the web loft and administration building), are still in use today. The City has plans to renovate some of the buildings and redevelop the cannery site for commercial and public use (City of Craig 2006b).

Offshore and intertidal structures within the project area include a 200-foot long by 25-foot wide pier terminating in a 145-foot long dock. Both of these structures are supported by wooden piles. According to the site development plan, the pier was in fair condition, was used to moor vessels, and had the potential to be upgraded for future use (City of Craig 2006b). Several clusters of older wooden piles still exist to the east and west of the remaining pier. These piles were previously used to support docks or piers but those structures no longer remain atop the piles. A wooden beam boatway and haulout structure still exists in the intertidal zone to the east of the existing pier (City of Craig 2006b).

3.1.5 Socio-Economic Conditions

3.1.5.1 Employment and Income

Mean per capita income in Craig is approximately $28,100 with a median household income of $58,000 and a median family income of $73,100. Approximately 17 percent of local residents have incomes lower than the Federal poverty threshold (ADCRA 2014).

According to the AKDOL, 64 percent of resident workers were employed during 2012, (the last year for which statistics are available). The majority of local workers are employed in local government or trade, transportation, and utilities. A great number of workers are employed through commercial fishing and businesses that support that industry as 151 residents hold 121 commercial fishing permits (ADFGb). In 2013, local residents fished 193 permits, landing 11.4 million pounds of fish with estimated gross earnings of $10.4 million. Approximately 72 percent of the harvest was salmon with crab, halibut, herring, groundfish, shellfish, and sablefish making up the remainder of the harvest.

3.1.5.2 Fisheries

Fishing is a vital part of the local economy. Data on fisheries is drawn from many different sources. Some sources report results from only the Craig area whereas some aggregate results to Prince of Wales Island. Where data is available for Craig, it is presented. Where it is only available at the Prince of Wales Island level, it is noted.

3.1.5.2.1 Commercial Fisheries

Craig residents account for approximately 42 percent of the total Prince of Wales Island fishing harvest as well as 52 percent of fishing earnings. Total harvest (lbs) and earning have steadily increased since 2000 with a high of both harvest and earnings occurring in 2013. See Table 1.

Table 1: Historical Fisheries Harvests and Earnings (Craig Residents Only)

Year	Number of Active Fishermen	Total Harvest (lbs)	Est. Gross Earnings	Earnings per Fisherman	Earnings per Fisherman (2013$)
2000	124	3,344,382	$ 3,396,094	$27,388	$38,546
2001	116	4,795,555	$ 3,374,881	$29,094	$39,813
2002	115	3,918,228	$ 2,951,369	$25,664	$34,454
2003	113	4,212,357	$ 3,627,786	$32,104	$41,959
2004	122	6,513,013	$ 5,373,341	$44,044	$56,113
2005	115	4,095,305	$ 4,958,380	$43,116	$53,301
2006	116	3,297,933	$ 5,711,628	$49,238	$58,981
2007	106	4,436,204	$ 6,110,615	$57,647	$67,553
2008	119	4,771,762	$ 7,824,845	$65,755	$73,696
2009	121	5,388,789	$ 5,773,321	$47,713	$52,849
2010	115	5,573,720	$ 7,409,382	$64,429	$70,120
2011	108	7,175,298	$ 8,930,243	$82,687	$87,184
2012	120	6,103,817	$ 8,871,945	$73,933	$76,254
2013	121	11,412,585	$10,443,123	$86,307	$86,307

Note: 2009 and 2010 salmon harvests are understated due to confidentiality of data

There are seven separate fisheries active on Prince of Wales Island. As shown in Table 2, the vast majority of harvest and earnings come from salmon fisheries (all species).

Table 2: Harvest and Earnings by Fishery for Prince of Wales Island

Fishery	Percentage of Harvest (lbs)	Percentage of Earnings
Salmon	90.5	74.6
Herring	6.4	10.2
Other Shellfish	1.4	8.9
Halibut	0.6	3.2
Other Groundfish	0.3	0.6
Crab	0.1	0.5
Sablefish	0.0	0.0

The outlook for commercial fishing in the area is positive. Salmon stocks are generally healthy with some stocks increasing. Herring, sablefish, groundfish, and shellfish fisheries experience low participation with room for growth. The recent establishment of the Silver Bay Seafoods processor is expected to attract more commercial fishers to the region as it provides an efficient and convenient location to offload catch.

3.1.5.2.2 Sport Fisheries

The majority of sport fishing takes place in marine waters from late May through early September but there are significant freshwater fisheries as well. The most targeted species are halibut, Chinook Salmon, and Coho Salmon with a small Steelhead Trout run in the spring.

3.1.5.2.3 Subsistence Fisheries

Various fish species make up the majority of the local subsistence harvest followed by land mammals and marine invertebrates. Species targeted for subsistence consumption are similar to those of commercial, charter, and sport fisheries.

3.1.5.3 Cultural and Subsistence Activities

Hunting, fishing, and gathering of traditional foods are a priority for many Alaska Native residents of the Craig area as a way of maintaining their cultural heritage as well as a matter of economic necessity. A 1982 study found that all households in Craig, regardless of ethnicity, utilize subsistence resources for some portion of their diet. Fishing has traditionally been the most important subsistence activity and includes the harvesting of salmon and salmon eggs. This continues to be an essential activity for Craig residents beginning with the mid-June sockeye (*Oncorhynchus nerka*) run and extending into the early fall with pink (*Oncorhynchus gorbuscha*), chum (*Oncorhynchus keta*), and coho (*Oncorhynchus kisutch*) runs. Salmon and trout are harvested under subsistence permits with the exception of king salmon (*Oncohynchus tshawytscha*), coho salmon, rainbow/steelhead trout (*Oncorhynchus mykiss*). Salmon are often harvested by traditional methods such as spears, gaff hooks, fish traps, beach seines, and gill nets. Herring (*Clupea pallasii*) roe is a highly valued traditional food in Southeast Alaska and is collected from seaweed or hemlock boughs placed in the ocean where herring will spawn on them (City of Craig, 2006a).

The intertidal zone is also an important focus for the subsistence gathering of species such as clams, cockles, rock scallops (*Crassadoma gigantea*), sea urchins, and Dungeness crabs (*Metacarcinus magister*) (City of Craig 2006a).

3.1.5.4 Existing Infrastructure and Facilities

The City of Craig provides water and sewer services while electricity and telephone services are provided by Alaska Power and Telephone Company. The City has a number of businesses in town that provide goods and services. Commercial air services are provided via a seaplane base in Craig and a land-based airport in Klawock (10 road miles to the north).

Existing marine facilities include: South Cove Harbor, North Cove Harbor, the Craig Seaplane Base, and the J.T. Brown Marine Industrial Center which provides a dock, boat launch, and boat haulout services. Ferry service to Ketchikan is available from Hollis (30 road miles to the east). South Cove Harbor is a Corps-constructed harbor that was constructed in 1957 and has undergone multiple changes since then including expansion and addition of a breakwater.

In addition to North Cove and South Cove harbors, there is a small amount of other moorage available in Craig at various docks and a boat launch ramp at North Cove. Table 3 summarizes the amount of existing protected moorage at Craig.

Table 3: Existing Craig moorage capacity

Facility	Number of slips	Feet of transient moorage
North Cove Harbor	102	700
South Cove Harbor	120	125
City Dock		350
False Island Dock		223
Total	**222**	**1,398**

Source: City of Craig, Comprehensive Plan, 2000.

Current facilities are overcrowded and the harbormaster maintains a waitlist. The City of Craig's Comprehensive Plan from 2000 stated that Craig is the busiest port on Prince of Wales Island. This is likely still true as Craig has the largest population of all communities on Prince of Wales Island and has the largest harbor facilities.

Many of the wait-listed vessels are accommodated by rafting at the various docks along the north side of Craig Island with some rafting also occurring at the South Cove Harbor. Rafting increases the vessels' vulnerability to damage during storm events due to the vessels rubbing against one another, damaging fenders and the vessels themselves. Harbor infrastructure is also damaged due to overuse. In addition, rafting leads to overcrowded conditions, causing inefficiencies as vessels are not able to depart during critical fishing openings.

3.1.5.5 Fleet Characteristics

According the CFEC, there were 245 commercial fishing vessels permits for Prince of Wales Island residents in 2013 with 148 permitted to residents of Craig. The vessels averaged 35 years in age and were closely split between aluminum hulls (40 percent) and fiberglass hulls (30 percent). The average vessel length was 33 feet but varied by hull material, as shown in Table 4.

Table 4: Vessel Length by Hull Material

Material	Average Length (feet)	Number of Vessels	Percentage of Total
Aluminum	21.9	44	29.7
Concrete	45.3	3	2.0
Fiberglass/Plastic	34.6	60	40.5
Iron/Steel/Ally	50.3	6	4.1
Rubber	11.0	1	0
Wood	41.1	34	23.0

The majority of the 148 vessels operated as fishing vessels with nine vessels acting as either tenders/packers or freezers/canners. Approximately two-thirds of the vessels have diesel engines with the rest operating on gasoline.

Gear types were varied with vessels often employing multiple gear types in order to participate in multiple seasons. This practice is common throughout Alaska. The gear types are shown in Table 5.

Table 5: Vessel Gear Types

Gear Type	Number of Vessels	Percentage of Total
Diving Gear	34	23
Gill Net - Drift	11	7.4
Gill Net - Herring	4	2.7
Longline	55	37.2
Mechanical Jig	8	5.4
Pot Gear	31	20.9
Ring Net	1	0.7
Seine - Purse Seine	15	10.1
Seine - Beach Seine	1	0.7
Trawl - Beam	2	1.4
Troll - Dinglebar	8	5.4
Troll - Hand	34	23.0
Troll - Power	62	41.9
Other Gear Types	25	16.9

In addition to commercial fishing vessels, other types of vessels are present at Craig. Charter vessels provide sport fishing and sightseeing opportunities. The majority of these vessels are 28 to 45 feet in length. Subsistence vessels assist residents in performance of subsistence hunting, fishing, and gathering activities. The majority of these vessels are less than 27 feet in length. Recreation vessels such as pleasure craft and yachts are also present. These vessels vary greatly in length from less than 20 feet to greater than 60 feet.

3.1.5.6 Moorage Demand

An Office of Management and Budget (OMB)-approved mail-out survey, personal interviews, and other research was conducted in order to ascertain the level of demand for moorage at Craig. The survey was the primary data-gathering tool with other methods supplementing survey results. The resulting information was used to inform the benefits model used to determine whether the project is justified from an economic perspective. The survey was mailed to 1,527 boat owners and permit holders in the region. There were 338 responses and 117 surveys returned as undeliverable for an overall response rate of 24 percent.

There are currently 222 slips available between South Cove Harbor and North Cove Harbor with more than 85 percent of the slips being filled on a permanent basis as of July 2013. Of the vessels with permanent moorage at Craig, 30 percent of them are currently in slips too small for their vessel length with the majority of these vessels currently occupying slips in the 37 to 45 foot and 46 to 60 foot range.

Craig maintains a list of vessels waiting for permanent moorage. Currently, there are 78 vessels on the waitlist. Wait times for moorage range from 1.10 years to 14.21 years, with the longest average wait times occurring for 21 to 27-foot slips (6.20 years). In addition to established demand for permanent moorage, there are many transient vessels utilizing facilities at Craig. In 2012, there were 467 transient vessels at Craig. The majority of these vessels (74 percent) were commercial in nature including fishing, tenders, tugs, and barges. The remaining vessels were either pleasure vessels (yachts) or sport fishing vessels. Survey results show that there currently exists surplus demand for moorage at Craig. This includes up to 94 vessels seeking permanent moorage and up to 385 vessels seeking transient moorage.[1] When added to those vessels currently utilizing Craig harbor facilities, total demand for moorage can be calculated (Table 6).

Table 6: Total Demand for Moorage at Craig

Description	0-20'	21-27'	28-36'	37-45'	46-60'	>60'	Total
Commercial Fishing Vessels							
Permanent	2	14	23	60	45	0	144
Transient	0	0	32	64	152	12	261
Boat Launch	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Total Commercial Fishing	2	14	55	125	197	12	**405**
Charter Vessels							
Permanent	0	3	9	5	0	0	17
Transient	0	0	2	0	6	3	11
Boat Launch	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Total Charter Vessels	0	3	11	5	6	3	**29**
Subsistence Vessels							
Permanent	4	6	2	0	0	0	12
Transient	0	2	0	0	0	0	2
Boat Launch	4	0	0	0	0	0	4
Other	0	0	0	0	0	0	0
Total Subsistence Vessels	8	8	2	0	0	0	**18**
Other Vessels (Recreation & Yachts)							
Permanent	13	38	20	6	4	3	85
Transient	22	16	27	37	49	19	169
Boat Launch	17	6	0	0	0	0	24
Other	0	0	0	0	0	0	0
Total Other Vessels	52	60	47	44	53	22	**278**
Total Vessels	**62**	**86**	**115**	**173**	**256**	**37**	**730**

[1] See economic appendix for detailed discussion of all economic analyses

3.2 Physical Environment

The City of Craig is located on Craig Island, which is connected to Prince of Wales Island via a small isthmus. Craig is 725 miles southeast of Anchorage at approximately 55°28.6' north and 133°8.9' west. Klawock Inlet is located to the north of Craig Island and Bucareli Bay is located to the south. Multiple islands lie between Craig and the Gulf of Alaska, approximately 25 miles to the west. The City of Craig occupies a portion of the western shore of Prince of Wales Island, and the entirety of both Craig and Cemetery Islands.

3.2.1 Climate

Prince of Wales Island generally experiences a marine climate with cool summers, mild winters, and substantial year-round precipitation. Summer temperatures range from +49°F to +63°F. Winter temperatures range from +32°F to +42°F. Average annual precipitation is 120 inches, including 40 inches of snow. Moisture from the Pacific Ocean is released as precipitation as it meets colder continental air and higher terrain. Gale winds are common in fall and winter. Long term climate data is not available for Craig. The nearest long-term climate station is at Ketchikan, 60 miles to the east-southeast. This station shows an historical mean annual temperature of 45.7 °F and a mean annual precipitation of 156.06 inches (City of Craig 2006a, ADCRA 2014).

3.2.2 Geology/Topography

Soil borings drilled on Craig Island reveal native soil profiles of glacial till to depths of 7 feet below the surface, often overlain by beach sand and gravel. A layer of clay was encountered below 7 feet in some borings (City of Craig 2006a). Bedrock is highly metamorphosed volcanic and sedimentary rock with some igneous intrusions. Limestones and calcareous sandstones are found in the area. Quartz veins and pyritization are reportedly common in rocks around the intrusions. The topography of Craig Island is low relief and generally less than 70 feet above sea level. The surrounding area on Prince of Wales Island is mountainous with 2,000-foot Sunnahae Mountain overlooking Craig less than 2 miles to the east (City of Craig 2006a).

3.2.3 Bathymetry

According to navigation charts prepared by the National Oceanic and Atmospheric Administration (NOAA), the seafloor around Craig Island and southern Klawock Inlet is fairly flat and uniform. The southern end of Klawock Inlet forms a broad basin along the northern end of the project area with depths that do not exceed 50 feet below mean lower low water (MLLW). Due to shoaling, depths around Craig Island Reef are approximately 10 to 20 feet below MLLW. A bar extends from the northwest point of Craig Island and limits depths to 7 to 15 feet below MLLW.

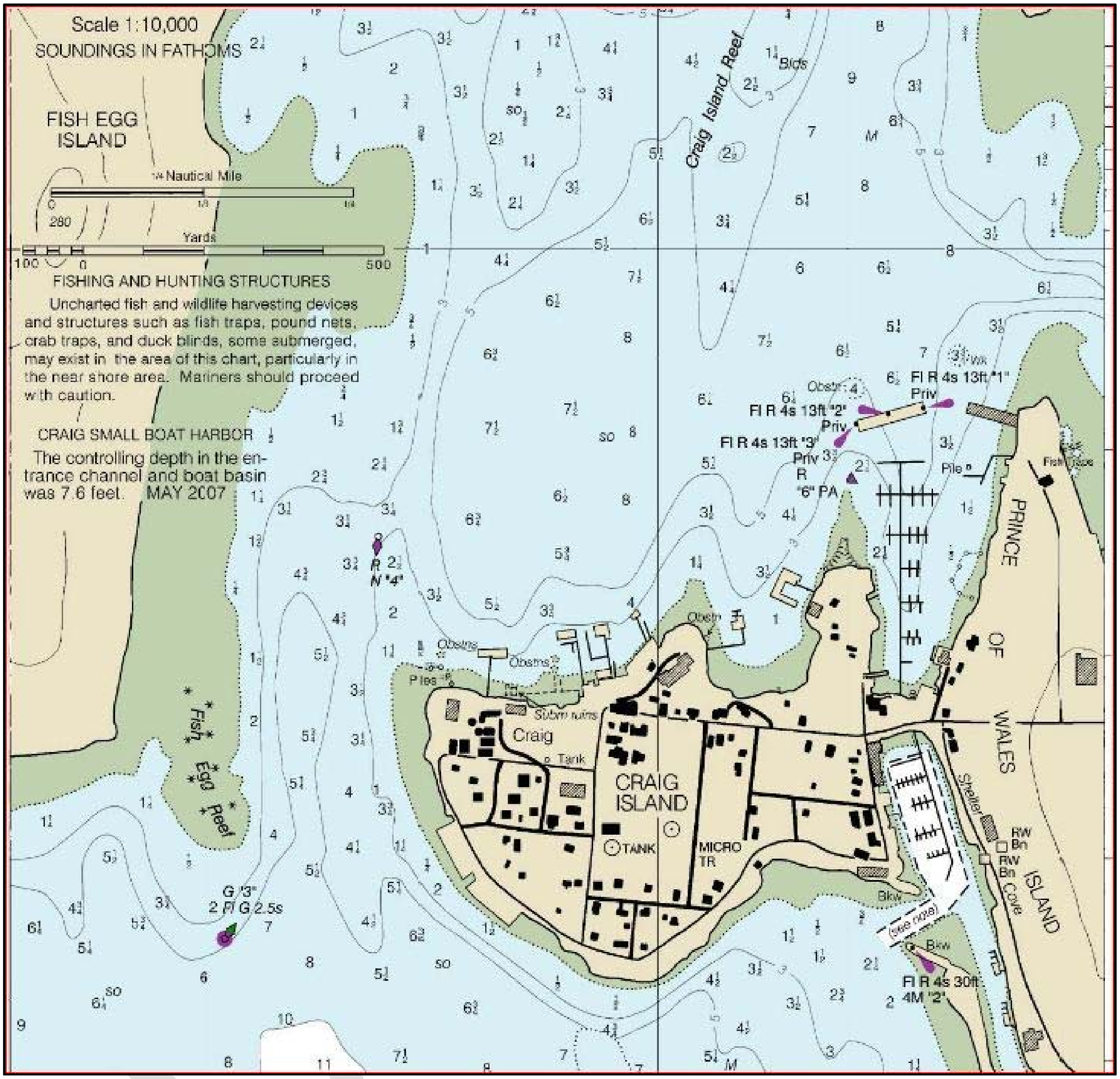

Figure 2: Inset of Craig Island & southern Klawock Inlet (from NOAA Chart 17405)

3.2.4 Ice Conditions

Craig is generally ice-free year round with some minor icing occurring during atypically cold stretches.

3.2.5 Soils/Sediments

Observations during Corps site visits, (including underwater video), indicate bottom material of coarse to fine sand up to several hundred feet from shore. The NOAA chart for the area indicates “soft” or “mud” bottoms in southern Klawock Inlet. Cobbles appear to increase in frequency and size entering the intertidal zone. The beach immediately south of the project site contains very large cobbles and boulders. The intertidal and high subtidal zones north of the former cannery site are littered with debris including machine parts, steel cables, lead net weights, pieces of sheet metal, and firebrick. This debris is presumably from the cannery or from ships that have tied up to the existing dock.

Previous environmental investigations of the cannery site by the Alaska Department of Environmental Conservation (ADEC) included some limited sampling of intertidal sediment. A sample collected near the boatway contained lead at concentrations above the 400 mg/kg State of Alaska cleanup level and a groundwater sample from a probe installed in the intertidal zone showed elevated fuel constituent compounds. A 2002 remediation report claimed that petroleum and lead contamination near the boatway was due to historic boat maintenance operations and not directly connected to the more extensive upland contamination and remedial efforts (City of Craig 2006b).

Based upon available data, known history, and previous uses of the project area, the Corps has proceeded with this project under the assumption that marine sediments in the project area contain chemical contamination. However, the contaminants are likely concentrated in the area immediately surrounding the boatway due to the types of vessel maintenance that were performed on that structure. Petroleum hydrocarbons are likely to have dispersed and biodegraded to some degree but metals associated with vessel paints and fittings such as lead, copper, nickel, tin, etc. are likely to persist.

3.2.6 Water Quality

While there is no specific data on marine water quality at the project site, there are multiple indicators of good water quality including high water clarity (prior to spring phytoplankton blooms) and the presence of eelgrass beds.

Fuel-contaminated groundwater was discovered at the Wards Cove Cannery site in 1987. These are legacy contaminants as a result of previous cannery operations and on-site fuel storage. Wards Cove Packing and Chevron conducted multiple site investigations and cleanup efforts. Subsequent to these efforts, further investigations found that petroleum-impacted soil and groundwater persisted at the site. The contaminants present at the site included benzene, lead, gasoline, and diesel and were found in both soil and groundwater. Due to the fact that the groundwater at or near the cannery is not presently or expected to become a source of drinking water, the Alaska Department of Environmental Conservation (ADEC) approved elevated cleanup levels for groundwater at the site equal to 10 times the default regulatory levels. Site remediation continued until 2005 at which time the ADEC issued a letter stating that no future remedial action would be required (City of Craig 2006b). The Corps believes that it is likely that groundwater contamination persists in the uplands of the harbor project site but primary and secondary sources of contamination have largely been removed under the guidance of ADEC.

The City of Craig draws its drinking water from North Fork Lake, approximately 10.5 miles from town. A primary wastewater treatment plant is located on the north shore of Cemetery Island. Effluent from the treatment plant is discharged into Bucareli Bay via a 12-inch diameter outfall line to a depth of 85 feet below MLLW. The plant treats between 155,000 and 196,000 gallons of wastewater per day. Sludge is dewatered and placed in a landfill at the Klawock Transfer Facility (City of Craig 2006a).

3.2.7 Air Quality

The area has good air quality because of the community's isolation, the small number of pollutant emission sources, and persistent air movement from the nearby ocean. The primary source of air pollutants are the community's electric plant, lumber processing plants, quarries, individual fuel oil or wood stoves, automobiles, and marine vessels. Individual wood burning stoves can create a notable haze over residential areas during cold weather. Under certain weather conditions, wildfires in western Canada can affect air quality and visibility in parts of Southeast Alaska. The State of Alaska issued an air quality advisory in July 2004 due to extensive wildfires in western Canada (USDA 2008). There is no established ambient air quality monitoring program at Craig and there is little existing data to compare with the National Ambient Air Quality Standards (NAAQS) established under the Clean Air Act (CAA). These air quality standards include concentration limits on "criteria pollutants" such as carbon monoxide, ozone, sulfur dioxide, nitrogen oxides, lead, and particulate matter. Craig is not in a CAA "non-attainment area" and the "conformity determination" requirements of the CAA would not apply to the proposed project at this time.

3.2.8 Noise

Specific noise data does not exist for this area but is likely comparable with other small coastal Alaskan communities. The project site is on the waterfront of a town of approximately 1,200 people. Ship and boat traffic, vehicles, construction equipment, and generators are the most likely sources of human-generated noise. Seaplanes land regularly in Klawock Inlet immediately north of the project site, and conventional aircraft often overfly the area on approach to the Klawock airport. Underwater noise comes primarily from the numerous commercial and recreational vessels transiting or mooring within Klawock Inlet.

3.2.9 Currents and Tides

Two-layered estuarine circulation systems are expected to occur seasonally in protected bays and passages along the outer coast. The area experiences increased freshwater discharge beginning with the spring thaw in April and continuing into October due to heavy rainfall. This results in a layer of reduced-salinity water to form at the surface with more saline oceanic waters at lower depths. This two-layer system is disrupted over the winter by storm activity and reduced freshwater runoff, resulting in a more uniform, saline, and colder water column (City of Craig 2006a).

Craig is in an area of semi-diurnal tides with two high waters and two low waters each lunar day. The tidal parameters in Table 7 were determined using data published by the National Oceanic and Atmospheric Administration. The data is based on observations made during May and June 2007. No highest observed water or lowest observed water levels were reported.

Table 7: Tidal Parameters

Parameter	Elevation (ft)
Highest Astronomical Tide	12.59
Mean Higher High Water (MHHW)	10.17
Mean Sea Level (MSL)*	5.34
Mean Tide Level (MTL)**	5.35
Mean Lower Low Water (MLLW)	0.00
Lowest Astronomical Tide	-2.95

**-MSL is the arithmetic mean of hourly heights observed over the National Tidal Datum Epoch. Shorter Series are specified in the name: e.g. monthly mean sea level and yearly mean sea level.*
***-MTL is the arithmetic mean of mean high water and mean low water*

3.3 Biological Resources

3.3.1 Terrestrial Habitat

The project site is adjacent to the developed commercial district of Craig, which is densely occupied by structures and paved or unpaved roadways. Little usable terrestrial habitat exists in the project area or on the rest of Craig Island except for bird and small mammal species that are able to adapt to urban and suburban settings. Adjacent areas of Prince of Wales Island are far less heavily developed, except for several discrete industrial, school, and residential sites along the Craig-Klawock Highway which primarily runs along the coast. Fish Egg Island is currently uninhabited, undeveloped, and used primarily for subsistence activities.

The broader terrestrial landscape of Prince of Wales Island and the surrounding small islands is that of coastal temperate rainforest and Tongass National Forest. Most of the forest is composed of conifers, primarily Western Hemlock (*Tsuga heterophylla*) and Sitka Spruce (*Picea sitchensis*) with smaller populations of Mountain Hemlock (*Tsuga mertensiana*), Western Red Cedar (*Thuja plicata*), and Alaskan Yellow Cedar (*Cupressus nootkatensis*). Red Alder (*Alnus rubra*) and some willow species are common along streams, beach margins, and on land recently disturbed by forestry activities and landslides. Grass sedge meadows are found at low elevations, especially along the coast. Muskeg wetland communities dominated by sedges and mosses occur throughout the forest (USDA 2008).

Freshwater streams and lakes on Prince of Wales Island host sockeye, pink, chum, and coho salmon as well as steelhead and cutthroat trout (*Oncorhynchus clarki*) and Dolly Varden (*Salvelinus malma*). However, there is no freshwater aquatic habitat at the project site or on Craig Island. The nearest substantial freshwater body is Crab Creek, which discharges into Crab Bay 1 mile to the east-northeast of the project site (City of Craig 2006a). Crab Creek is an anadromous stream and is discussed in greater detail in various sections below.

3.3.2 Marine Habitat

Marine substrates and habitats in the waters off Craig Island typically range from coarse gravel and cobbles to sand and mud. The southwest shoreline is exposed to swells sweeping up Bucareli Bay from the open ocean, and consists of gravel and cobbles. More protected waters, such as the project site has finer sand and mud substrates in the nearshore area with more gravelly and cobble substrates further offshore.

3.3.2.1 Intertidal Zone

Corps personnel from the Alaska District Environmental Resources Section conducted a site examination of the intertidal environment on April 17, 2014. The examination consisted of a single transect beginning at the apparent upper limit of the intertidal zone and extending 240 feet to the waterline at the northwestern point of Craig Island.

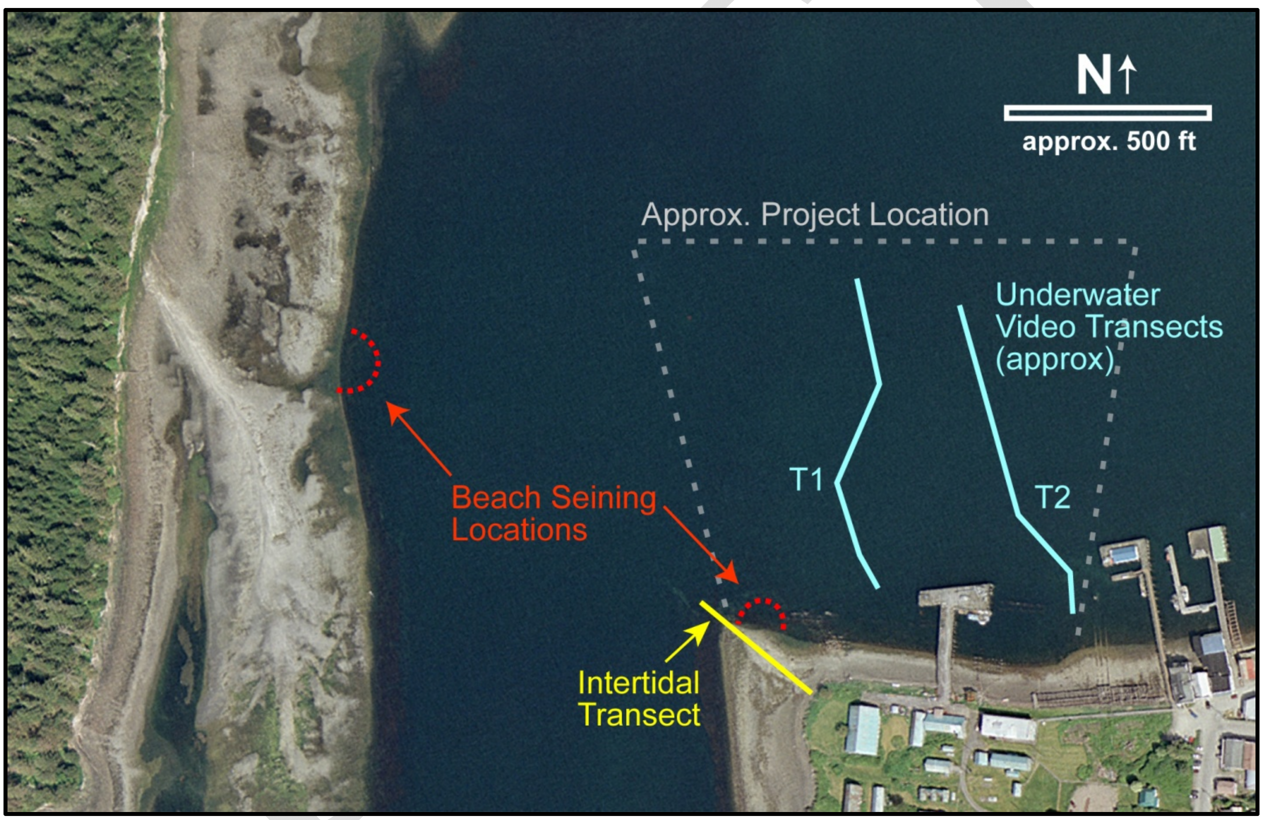

Figure 3. Field Examination Locations (examination occurred 16-17 April 2014)

This point is the site of the project's proposed western breakwater tie-in to shore under all alternatives and is therefore the intertidal area most directly affected under the with-project condition. The examination occurred from 8:30 am to 8:50 am with a -0.91 foot MLLW low tide occurring at 8:50 am. Table 8 shows results of the examination.

Table 8: Results of Intertidal Transect

Interval Distance from Transect Starting Point	Composition of substrate	Coverage of Visible Organisms
0-19 feet	*Start of transect: 55.4772° north, 133.1554° west.* 80% small cobble; 20% gravel.	Jetsam of dried *Fucus*; no live organisms visible
19-43 feet	80% cobble; 5% gravel; 15% coarse sand.	5% small barnacles; 5% *Fucus*
43-65 feet	20% cobble; 60% gravel; 20% coarse sand/shell.	50% *Fucus*; 5% small barnacles
65-110 feet	10% large cobble; 20% small cobble; 60% coarse gravel; 10% sand and shell fragments.	10% *Fucus*,5% mussels; limpets present (*Fucus* and mussel growth much heavier in areas adjacent to transect at same elevation).
110-165 feet	15% large cobble; 40% small cobble; 40% coarse gravel; 5% coarse sand.	80% *Fucus*: 65% small mussels
165-209 feet	30% large cobble; 40% small cobble; 20% coarse gravel; 10% coarse sand.	30% *Fucus*; 15% *Ulva*; < 5% *Acrosiphonia*; <5% *Blidingia*. Green algae start at 175 feet.
209-240 feet	20% large cobbles; 40% small cobbles; 20% coarse sand; 20% sand. *End of transect: 55.4776°N, 133.1564°W.*	25% *Fucus*; 30% *Ulva*; 5% *Acrosiphonia*; <5% *Microcladia*; <5% *Analipus*; <5% *Neorhodomela*

Fucus = *Fucus distichus* subsp. *evanescens*, a.k.a. rockweed (a brown alga)
Ulva = *Ulva intestinalis*, a.k.a sea hair (a tubular green alga)
Acrosiphonia = *Acrosiphnia arcta*, a.k.a. arctic sea moss (a filamentous green alga)
Blidingia = *Blidingia minima*, a.k.a. dwarf sea hair (a tubular green alga)
Microcladia = *Microcladia borealis*, a.k.a. coarse sea lace (a red alga)
Analipus = *Analipus japonicas*, a.k.a bottlebrush seaweed (a brown alga)
Neorhodomela = *Neorhodomela oregana*, a.k.a. Oregon pine (a red alga)
(Lindeberg & Lindstrom 2010).

The dominant marine organisms through much of the intertidal zone were rockweed (*Fucus distichus* susp. *Evanescens*), blue mussels (presumably *Mytilus edulis* or *M. trossulus*), and several species of barnacle. Because of the existence of cobbles and coarse gravel at the site no attempt was made to systematically examine the substrate for interstitial organisms. At lower elevations, there was a marked increase in diversity of marine algae. The exposed area at the northwestern point appeared to be a transition zone between high and low energy vegetation regimes with a small pocket of mixed eelgrass and kelp appearing just to the south of the transect.

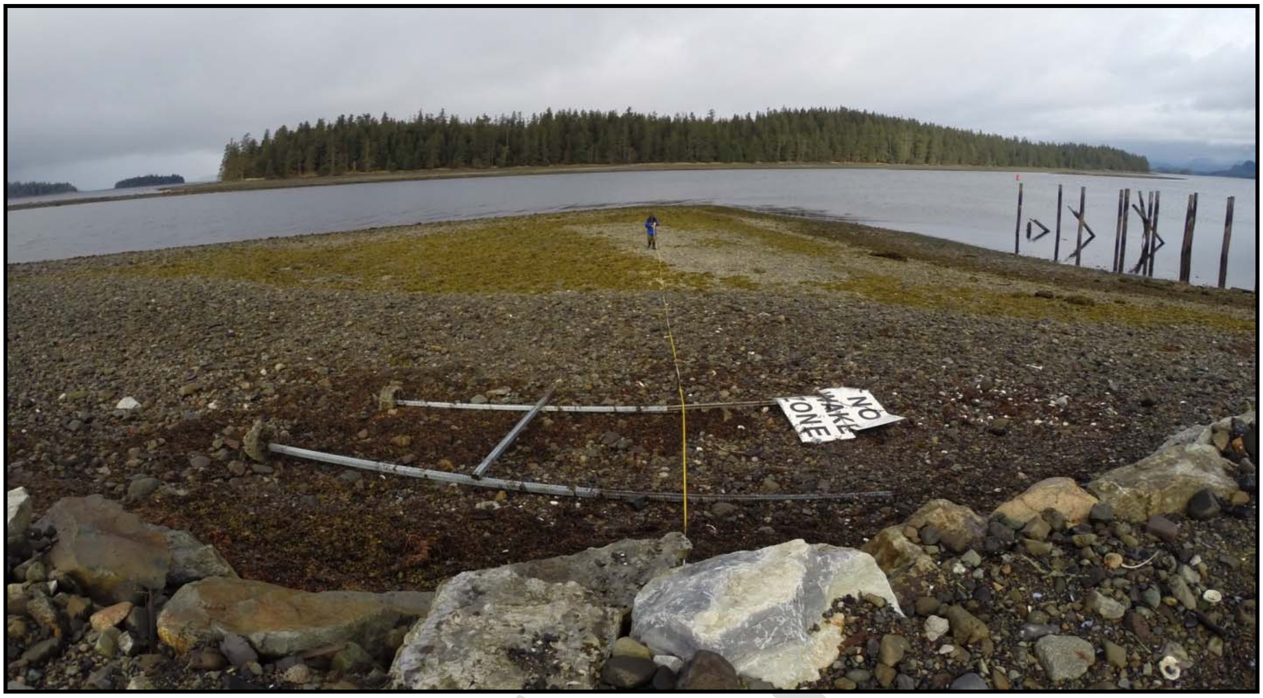

Figure 4: Intertidal transect, 17 April 2014 (looking to the northwest)

Figure 5: Mix of eelgrass, kelp, and other marine algae at the seaward end of the intertidal transect (roughly -0.9 feet MLLW)

The intertidal zone within the project area but east of the point was also examined but no transect was laid out. The upper beach along this stretch is much steeper and narrower, and littered with boulders and debris from the former cannery.

The distribution of *Fucus* and invertebrates was comparable with that seen along the transect but with less diversity of marine algae. The lower intertidal/upper subtidal zone parallel to the shoreline north of the cannery is dominated by a bed of eelgrass, which extends into the intertidal zone with a small portion exposed during some low tides, an occurrence that was observed during the examination. Numerous clam shells are found on the surface in the same sandy area as the eelgrass.

Figure 6: Course Intertidal sediment between the former cannery dock and boatway

3.3.2.2 Subtidal Zone

The marine substrates and habitats in the waters off Craig Island vary from rock to coarse gravel and cobbles, sand, and mud depending on the degree of protection from ocean waves. The southwest shoreline is exposed to swells from open water and consists of gravel and cobbles. The more protected waters of the project site have finer sand and mud substrates.

Corps personnel recorded video of the subtidal sea floor on April 17, 2014 using a towed underwater camera and a skiff borrowed from the City of Craig's Harbormaster's Office. Unfavorable weather conditions resulted in discontinuous video coverage and imprecise positioning of two attempted transects but a general picture of the seafloor in the proposed project area was obtained from near-shore to 750 feet from shore (240 meters as measured with a range-finder to the northern walls of the cannery).

Both transects were started as close to shore as pilings and debris would allow and moved offshore in a direction and speed largely determined by wind gusts. The more continuous of the two transects (T2) started 55 meters (180 feet) from the cannery buildings east of the old cannery dock in waters less than 10 feet (3 meters) deep. This location was within the expected eelgrass bed. However, the eelgrass bed transitioned abruptly to a dense bed of brown algae within 30 feet (10 meters) as the skiff drifted away from shore. The brown algae were broad-bladed kelp (thought to be *Saccharina latissima*, commonly known as sugar kelp). The kelp formed an uninterrupted carpet on the seafloor for a few hundred feet. At 157 meters (500 feet) from shore, the brown algae became discontinuous and bottom sediment of shell-rich sand became visible. As the transect moved further offshore, the algae gradually became more sparse, although algae were still visible when the transect ended 235 meters (750 feet) from shore in waters approximately 45 feet (14 meters) deep.

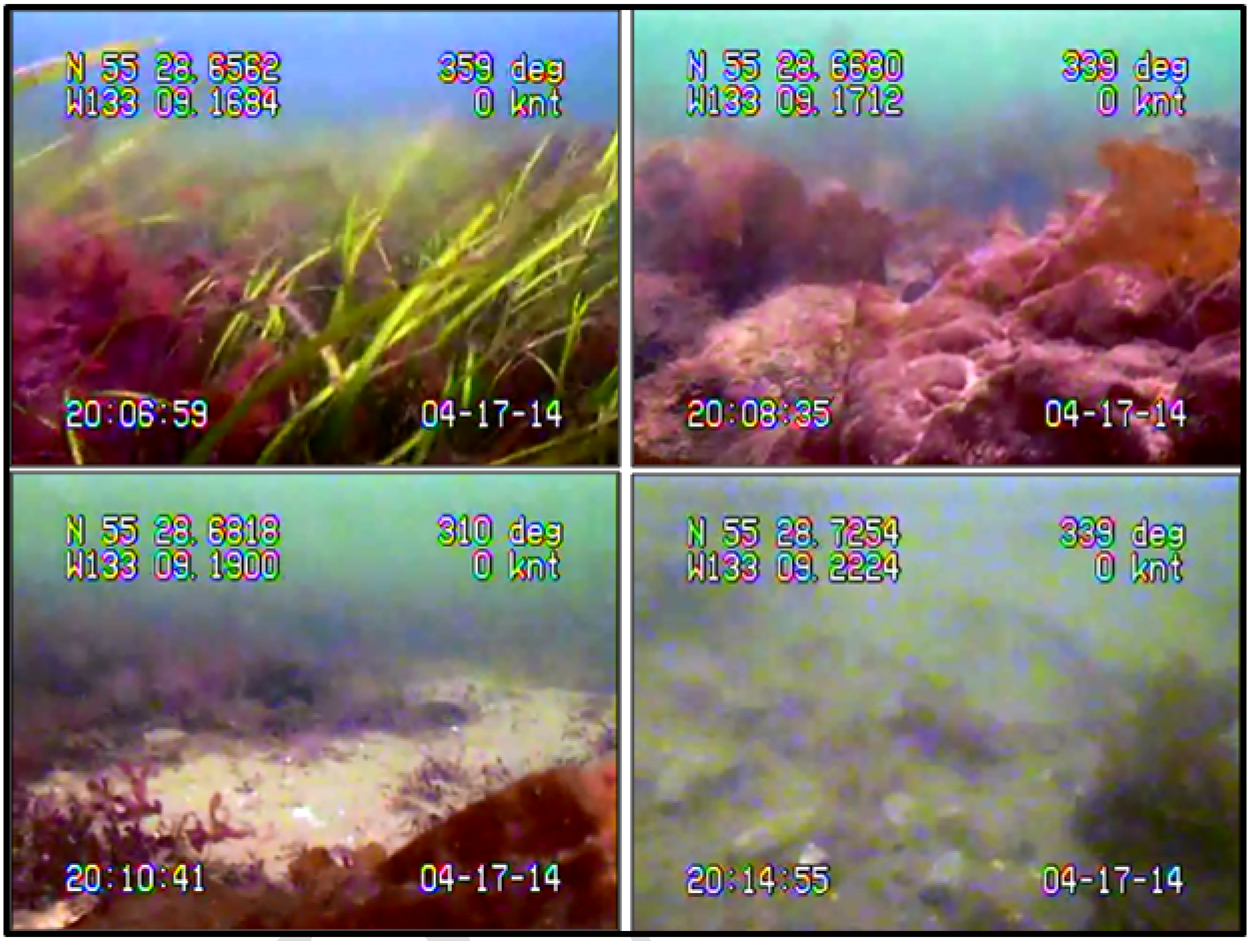

Figure 7: Screenshots from underwater video along transect T2 showing eelgrass (upper left), continuous brown algae (upper right), exposed patches of sediment with discontinuous brown and red algae (lower left), and mostly bare sediment with isolate clumps of algae (lower right).

Eelgrass is found throughout the waters offshore of Craig wherever a suitable substrate (generally fine material such as silt or sand) and adequate sunlight allow it to grow. Eelgrass beds are ecologically significant as they provide valuable rearing habitat for fish, act as a food source for marine invertebrates, fish, and waterfowl, and allow for sediment consolidation.

An estimated 80 to 90 percent of the developable coastline in the Craig area contains eelgrass (City of Craig 2006a). The City of Craig conducted an eelgrass survey in 1998 and mapped 214.8 acres of eelgrass beds within the Craig area. Figure 8 shows eelgrass beds identified by the 1998 survey as well as the approximate project location. The narrow band of eelgrass within the project area was confirmed to still be present during the Corps' site examination on April 17, 2014.

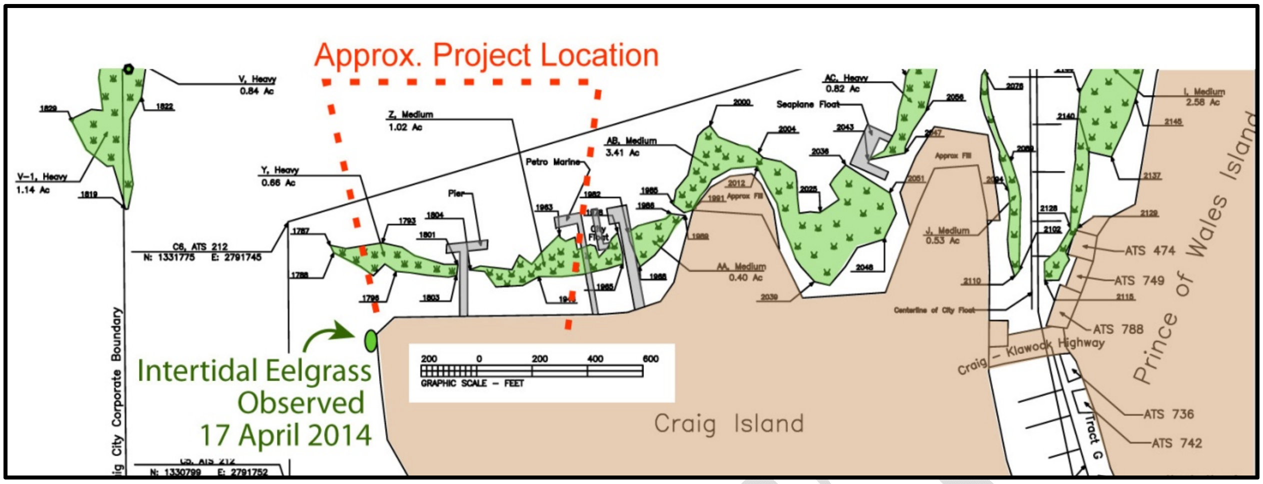

Figure 8: Surveyed Eelgrass beds along the north shore of Craig Island, 1998 (adapted from City of Craig 2006a)

The April 2014 underwater video survey was not able to confirm the western extent of eelgrass present within the project area. However, observations of site conditions suggest that the western extent of the eelgrass bed is similar to what was found by the 1998 survey. A reef extends from the northwestern point toward the channel between Craig and Fish Egg Islands. The reef is vegetated with large kelp, (likely *Macrocystis pyrifera*). The heavy growth of kelp indicates very coarse sediment exists along the reef, which would not be suitable substrate for eelgrass (Figure 9).


Figure 9: Large Kelp on reef northwest of Craig Island

3.3.2.3 Marine Birds

The waters of Klawock Inlet are relatively sheltered and ice-free and provide diverse habitat for resident and migratory birds. The area is part of the Pacific Flyway for waterfowl and shorebirds migrating to and from northerly breeding grounds. Resting and feeding habitat is provided in the Crab Bay estuary and the waters around Cemetery Island. Observations from 2011 through 2014 estimated that 5,000 to 10,000 shorebirds of 19 different species use the area each spring from mid-April to mid-May. Twenty different species of loons, geese, cormorants, dabbling ducks, diving ducks, sea ducks, mergansers, herons, scavenging gulls, crows, and eagles also commonly use the estuarine area. Bald eagles (*Haliaeetus leucocephalus*) are common and nest in large trees in the coastal forest but are not normally seen in the urbanized area near the project area. The eagles feed primarily on herring, waterfowl, seabirds, small mammals, sea urchins, clams, crabs, and carrion. Crows and ravens also feed on dead salmon and scavenge tidal flats and beaches (City of Craig 2006a).

During an April 2014 site visit few seabirds or waterfowl were noted in the project area. The only birds observed intensively using the project site were a flock of several dozen presumably feral domestic pigeons, which were seen roosting within the structure of the old cannery dock. Common goldeneyes (*Bucephala clangula*) and red-breasted mergansers (*Mergus serrator*) were observed working the eelgrass beds along the southern and eastern shore of Fish Egg Island. Loons and red-necked grebes (*Podiceps grisegena*) were observed in offshore areas north of the reef. A large group of gulls, assumed to be black-legged kittiwakes (*Rissa tridactyla*) and glaucous-winged gulls (*Larus glaucescens*), were continuously present at the southern tip of Fish Egg Island. Numerous waterfowl, shorebirds, and terns were seen flying northward over the project site.

3.3.2.4 Marine Fish and Invertebrates

Marine fish in the waters around Craig include a variety of pelagic and demersal (bottom dwelling) species. Although most bottomfish species spawn and feed in deep offshore waters, the nearshore zone is an important nursery region. Juvenile fish dominate the shallow waters seeking protection from predators and finding food in kelp forests, eelgrass, and rocky reefs that fringe most of the shoreline. The use of these areas by juveniles is highly seasonal, extending from summer through early fall. By late fall most of the major species have shifted into slightly deeper waters and usage declines sharply with the onset of winter. Lingcod (*Ophiodon elongatus*) are an exception to this pattern as they spawn and guard their eggs in shallow waters during winter. Catch and permit data from ADFG and NMFS indicate that the most abundant commercially important bottomfish species are: pollock (*Theragra chalcogramma*), Pacific halibut (*Hippoglossus stenolepis*), Pacific Ocean perch (*Sebastes alutus*), sablefish (*Gadus macrocephalus*), arrowtooth flounder (*Atheresthes stomias*), flathead sole (*Hippoglossoides elassodon*), and other rockfish species (City of Craig 2006a).

Pacific Herring are a vital commercial and subsistence resource and are a critical link in many food chains. From egg through adult stages, herring are preyed upon by a variety of waterfowl, seabirds, Bald Eagles, salmon, halibut, and marine mammals. Herring spawning occurs on rockweed, eelgrass and kelp in the intertidal and subtidal zones between +12 feet and -30 feet MLLW. Spawning areas surround Cemetery Island along the west side of Craig Island, in Crab Bay, and on the seaward shore of Fish Egg Island. Adult herring form large winter concentrations in certain bays. Concentrations are known to occur in the entrance to Trocadero Bay but smaller concentrations also occur in the aforementioned spawning areas. Winter bait fish are caught off the shoreline of Fish Egg Island (City of Craig 2006a). Herring seem to avoid the developed northern shore of Craig Island but spawn in the kelp beds on the western shore immediately to the south of the project area (Walker 2014).

Anadromous fish occurring in the Craig area include: Pink Salmon, Chum Salmon, Coho Salmon, Sockeye Salmon, Steelhead Trout, Cutthroat Trout, and Dolly Varden Char. King Salmon migrate through the coastal waters but do not spawn in area streams. Pink Salmon are the most abundant anadromous fish, followed by chum salmon. Pink Salmon begin spawning in August in short coastal streams and intertidal areas at stream mouths. Chum Salmon spawn from late summer through early winter and utilize most of the streams in the region for spawning, preferring gravel riffle areas with upwelling waters. Coho Salmon spawn between September and January but utilize fewer streams and are less abundant than Pink Salmon and Chum Salmon. Sockeye Salmon spawn from late July to early October. Sockeye runs are small in the Craig area because of the limited number and size of lakes necessary for rearing their offspring. Crab Creek has recorded peak escapements of 10,000 Pink Salmon, 2,500 Chum Salmon, and 1,500 Coho Salmon. These fish and others from streams throughout the area rear in intertidal areas of Crab Bay during the first months of their life in saltwater. Seagoing Rainbow Trout, known as Steelhead, rear 2 to 4 years before migrating out to sea from April through June. Steelheads reenter their home stream in the fall and overwinter before spawning between March and May. Outmigration into the marine waters follows spawning. Steelheads occur in approximately three-fourths of Crab Creek's alignment. (City of Craig 2006a).

Mollusks in the area are important for commercial and subsistence harvest. Hard-shell clams and mussels are abundant in the mixed-sediment beaches. Little neck clams (*Leukoma staminea*) can be found a few feet above the zero tide level with butter clams (*Saxidomus gigantea*) somewhat lower and horse clams (*Tresus capax*) burrowing at minus tide levels. These clams primarily feed on drifting plankton and detritus. Dungeness Crabs move about the shores of Crab Bay during high water in order to feed on detritus then burrow into the sediment or hide under boulders at low tide. Dungeness and King Crabs (*Paralithodes camtschaticus*) are present throughout Port St. Nicholas. Other intertidal zone fauna include: octopus, Purple Urchins (*Strongylocentrotus purpuratus*), Sea Cucumbers, Giant Gumboot Chitons (*Cryptochiton* *stelleri*), periwinkles, and abalone. Abalones are commercially harvested offshore of Craig and Cemetery Islands (City of Craig 2006a).

On April 16, 2014 Corps personnel and the City of Craig Harbormaster used a beach seine to capture and examine near-shore fish at two locations in or near the project location. The seine was 37 meters (120 feet) long and composed of tapering panels with mesh sizes ranging from 32mm (1.3 inches) in the outer panels to 3.2mm (0.13 inches) at the center. The net was deployed by holding one end on shore while using a skiff to unfurl the net out away from the beach, then bring the other end back to shore about 60 feet (18 meters) away from the starting point. The two ends of the seine were then carefully hauled in to shore, trapping fish and other organisms within the net. The captured fish and other organisms were quickly transferred to aerated buckets of seawater for examination.

The existing pilings and debris within the project area greatly limited the locations within the project area where the seine could be utilized. Therefore, the two locations utilized were the northwest point of Craig Island and the eastern shore of Fish Egg Island. The habitat at the Craig Island location was a mix of eelgrass and small brown algae. The Fish Egg Island location was predominantly eelgrass. The results of this effort are shown in Table 9.

Table 9: Results of Beach Seining

Northwest Point of Craig Island – Species	**Number and Size Range Caught**
Kelp perch (*Brachyistius fenatus*)	4 (67-116 mm)
Tube-snout (*Aulorhynchus flavidus*)	5 (123-154 mm)
Pipefish	3 (130-289 mm)
Pink salmon, juvenile	6 (28-42 mm)
Chum salmon, juvenile	1 (45 mm)
Penpoint Gunnel (*Apodichthys favidus*)	1 (310 mm)
Sculpin sp.	6 (17-69 mm)
Hair Crab (*Erimacrus isenbeckii*)	3 (17-80 mm)
Unidentified crab	1 (8 mm)
Shrimp (Mysid)	~ 100 (~10-25 mm)
Amphipod	numerous
Fish Egg Island Location – Species	
Pink salmon, juvenile	1 (35 mm)
Chum salmon, juvenile	2 (40-42 mm)
Tube-snout	5 (125-254 mm)
Silverspotted sculpin (*Blepsias cirrhosus*)	4 (22-110 mm)
Shrimp (Mysid)	numerous (~10-25 mm)

The seine snagged on a rock at Fish Egg Island, delaying the collection of the captured fish and may have resulted in a lower catch. The species collected at the Craig Island site reflected its mixed-habitat with kelp-associated species such as Kelp Perch collected in similar numbers as eelgrass-associated species such as tubesnout and pipefish.

Figure 10: Kelp Perch (left) and Pipefish (right) caught at the project site

A larger-scale beach seining study was performed in 2000 by NMFS fishery biologists working from several locations in Klawock Inlet. The seine hauls for that study captured many of the same species seen at the project site in 2014 but yielded greater numbers and diversity of species than those caught at the project site. Species caught during those efforts included juvenile rockfish and flatfish. The NMFS study compared seine catches at sites with eelgrass versus sites with kelp or filamentous algae and concluded that eelgrass and kelp habitats were both important habitat with comparable species richness, but appeared to host fish at different life stages. The youngest salmon and rockfish juveniles appeared to prefer eelgrass but larger juveniles moved into deeper waters and other habitats such as kelp forests. The study concluded it is possible that very young juvenile fish prefer eelgrass because of lower currents and wave action rather than the eelgrass itself.

3.3.2.5 Marine Mammals

Many species of marine mammals can be present in Klawock Inlet including: Humpback Whales (*Megaptera novaeangliae*), Gray whales (*Eschrichtius tobustus*), Killer Whales (*Orcinus orca*), Minke Whales (*Balaenoptera acutorostrata*), Pacific White-Sided Dolphins (*Lagenorhynchus obliquidens*), Dall's Porpoises (*Phocoenoides dalli*), Harbor Porpoises (*Phocoena phocoena*), Harbor Seals (*Phoca vitulina*), Steller Sea Lions (*Eumetopias jubatus*), and Northern Sea Otters (*Enhydra lutris kenyoni*). All of these species may be found in waters near Craig throughout the year. However, seasonal migration patterns bring greater numbers of Humpback and Gray Whales to the area during the summer and fall. Marine mammals will also congregate in certain areas during salmon runs and herring spawns. All of these species are protected under the Marine Mammal Protection Act.

3.3.3 Federal and State Threatened and Endangered Species

The only species currently listed under the Endangered Species Act (ESA) whose range includes the project area is the Humpback Whale (NMFS 2014a). Humpback Whales are listed as “endangered” throughout their range, though the North Pacific population is under consideration for delisting from the ESA (NMFS 2014b). Humpback Whales migrate seasonally, and while individuals may be found in Alaskan waters at any time of year, the great majority of the central North Pacific population uses Alaska as a summer feeding range from May through November, wintering offshore of the Hawaiian Islands through the rest of the year (ADFG 2014a). There is no critical habitat designated for this species (NMFS 2014a).

The Eastern distinct population segment (DPS) of the Steller Sea Lion, formerly listed as “threatened” under the ESA, was delisted in November 2013 (NMFS 2013). This includes the Craig area, which at 133°W longitude is well east of the 144°W longitude that is the demarcation line between eastern and western population segments. Individuals from the endangered Western DPS commonly range east of 144°W. However, NMFS has stated that Steller sea lions are rarely found south of Sumner Strait, 60 miles north of Craig (NMFS 2013b) and that it will not require ESA consultation for Steller sea lions at Craig (NMFS 2014c).

NMFS also noted that the endangered leatherback sea turtle (*Dermochelys coriacea*) is uncommon but recorded in the Gulf of Alaska and that several ESA-listed stocks of Pacific salmon and other fish can be found in Alaskan waters. These fish include Upper Columbia River Spring Chinook Salmon, Snake River Sockeye Salmon, Snake River Fall Chinook Salmon, Snake River Spring Chinook Salmon, Lower Columbia River Chinook Salmon, Upper Willamette River Chinook Salmon, Lower Columbia River Coho Salmon, Lower Columbia River Steelhead, Middle Columbia River Steelhead, Upper Columbia River Steelhead, Puget Sound Chinook Salmon, Snake River Basin Steelhead, Upper Willamette River Steelhead, and Green Sturgeon (*Acipenser medirostris*) (NMFS 2014c).

Northern Sea Otters in the Craig area are not protected under the ESA. Only the Southwest Alaska DPS is listed under the ESA and therefore fall under the jurisdiction of USFWS. (USFWS 2014a). This area is generally defined as Kodiak Island and westward.

The yellow-billed loon (*Gavia adamsii*) may be present in marine waters near Craig. This species is a candidate for protection under the ESA. These birds nest on arctic tundra but winter in ice-free coastal waters, such as those in the Craig area. Non-breeding individuals may remain in coastal waters year-round.

3.3.4 Special Aquatic Sites

The U.S. Environmental Protection Agency (EPA) identifies six categories of special aquatic sites in their Clean Water Act Section 404 (b)(i) guidelines: Sanctuaries and refuges, wetlands, mudflats, vegetated shallows, coral reefs, and riffle and pool complexes. Eelgrass beds in the study area are an example of "vegetated shallows".

Vegetated shallows, in the form of eelgrass beds, exist at the project site. A narrow band of eelgrass extending across the project area was surveyed in 1998 and documented in 2014. Within the general project area, the 1998 survey plotted the eelgrass as two polygons on either side of the old cannery pier: a 0.66-acre bed to the west and a 1.02-acre bed to the east.

The project site has not undergone wetland delineation. The project site is primarily marine in nature. The adjacent onshore areas were developed with roads and buildings as early as the 1920s and are presumed to have been repeatedly filled and modified. The USFWS National Wetlands Inventory classifies the intertidal zone in the project area as E2USN or "Estuarine, Intertidal, Unconsolidated Shore, Regularly Flood" with the offshore areas classified as E1UBL or "Estuarine, Subtidal, Unconsolidated Bottom, Permanently Flooded" (USFWS 2014b).

3.3.5 Essential Fish Habitat

The southern end of Klawock Inlet is designated by NMFS as essential fish habitat (EFH) for all five species of Pacific Salmon (Chinook, Coho, Sockeye, Pink, and Chum) at all life stages (NMFS 2014b).

Several anadromous streams enter Klawock Inlet in the Craig area, all to the east of Crab Bay. No anadromous streams exist on Fish Egg Island. The largest anadromous stream in the area is Crab Creek, stream 103-60-10500 in the State of Alaska Anadromous Waters Catalog (AWC). Crab Creek is noted as having all five species of Pacific Salmon present but not known to spawn or rear there. However, some short tributaries of Crab Creek are designated as providing spawning or rearing habitat for Coho Salmon. In addition to Crab Creek, the AWC lists six small area streams as providing rearing habitat for Coho Salmon including:

- 103-60-10492
- 103-60-10495
- 103-60-10501
- 103-60-10502
- 103-60-10503
- 103-60-10504

Streams 10501 and 10504 also provide spawning habitat for Pink Salmon (ADFG 2014a).

3.4 Historical and Cultural Resources

Historic structures within the proposed Federal project's area of potential effect include the wood pile-supported pier (CRG-722) and the boat haulout (CRG-723). At a minimum, survey of the site is needed prior to construction. Data needed regarding the structures includes dates of construction and historical context. At this time no determination of eligibility has been made due to a lack of evidence that would determine age, construction type, historical significance, or integrity of the structures.

4.0 FUTURE WITHOUT-PROJECT CONDITIONS

This section provides an analysis of conditions that are expected to persist at Craig in the absence of Federal construction of navigation improvements. The purpose of this section is to estimate how existing conditions will change over the course of time and to estimate the economic costs of those conditions. Wherever possible, these costs have been assigned monetary values. In the case that this is not possible, the costs are described qualitatively. This projection provides a benchmark for comparison of future economic costs under each of the analyzed alternatives. For the purposes of this analysis, the Federal Fiscal Year 2015 discount rate of 3.375 percent and a 2014 price level is used. The analysis utilizes a 50-year project period of analysis with a base year of 2017, (the year in which it is expected benefits will begin to accrue).

4.1 Economic Conditions

Several critical assumptions were made when conducting the future without-project economic analysis. Chief among them is that the existing fishery will continue to support the fleet. This is a critical assumption supported by the fact that all fisheries present in the Craig area are highly regulated in order to assure future viability of the resource. That is not to say that factors beyond what is reasonably assured cannot occur.

4.1.1 Fleet Composition

Because of the inherent uncertainty surrounding the forecast of any growth in fisheries and related marine resources, a conservative “no growth” approach was taken in determining the future fleet at Craig. Conversely, there is no evidence that demand for moorage at Craig will decrease over time. Therefore, it is assumed that the fleet identified in Section 3.1.5 remains stable throughout the 50-year period of analysis.

4.1.2 Moorage Facilities

At this time, there is no evidence that the City of Craig or another entity has the financial wherewithal or political will to construct navigation improvements on the scale analyzed in this study. Corps policy states that any infrastructure improvements that are assumed to be constructed over the period of analysis must be supported in writing by the project proponent. No such evidence exists in this case. It is likely that local entities will maintain and rehabilitate existing moorage facilities at Craig and there should not be a decrease in the availability of moorage over the period of analysis.

4.1.3 Damages

Given the stated assumptions, absent Federal investment, it is assumed that damages and inefficiencies will continue to occur at Craig. The sections below discuss the expected future levels of these damages and inefficiencies in detail. See the Economics Appendix to this report for additional details.

4.1.3.1 Vessel Damages

In the future, vessel damages will continue to occur at Craig. Given survey results detailing the rate at which vessel damages occur and the average costs per incident, it is expected that there will be approximately 14 damaging incidents per year at a repair cost of approximately $1,800 per incident. At this rate, the present value of vessel damages caused by congestion and overcrowding are $4.61 million over the 50-year period of analysis with an average annual value of $192,000.

4.1.3.2 Vessel Delays

In addition, vessels will continue to be delayed entering/exiting Craig's existing harbors. These delays are due to multiple reasons listed in survey responses including: waiting for tide change, waiting for a boat to be moved from their stall, harbor staff being unavailable, waiting for a rafted boat owner to return, launching delays are the boat ramp, overcrowding/congestions, and ice in the harbor.

Table 10: Total Annual Future Without-Project Vessel Delay Times (Hours)

Vessel Type	0-20'	21-27'	28-36'	37-45'	46-60'	>60'	Total
Commercial Fishing Vessel Delays	34.04	241.12	519.46	1,299.21	1,423.28	54.13	**3,571.23**
Charter Vessel Delays	0.00	12.96	41.93	21.36	11.59	5.80	**93.63**
Subsistence Vessel Delays	8.07	0.00	0.00	0.00	0.00	0.00	**8.07**

The costs of delays are multi-faceted and include both increased vessel operating expenses and opportunity costs of time to the captain and crew. Total operating hours and number of crew per vessel vary with vessel size, vessel type, and fishing seasons in which the vessel participates. Through consideration of increased vessel operating costs and lost opportunity cost of time, total vessel delay costs were calculated and are shown below in Table 11.

Table 11: Average Annual Vessel Delay Costs

Delay Category	0-20'	21-27'	28-36'	37-45'	46-60'	>60'	Total
Vessel Operating Costs	$2,300	$14,600	$ 36,500	$151,500	$187,000	$11,000	$ 403,000
Opportunity Cost of Time	$6,300	$36,300	$117,700	$388,500	$425,300	$16,400	$ 990,000
Total Delay Costs	$8,600	$50,900	$154,200	$540,000	$612,300	$27,400	$1,393,000

The present value of total vessel delays costs over the 50-year period of analysis is $33.5 million with an average annual value of $1.4 million.

4.1.3.3 Foregone Subsistence Harvests

Congestion and overcrowding at Craig also contributes to a decrease in subsistence harvests due to reduced access to fishing, hunting, and gathering grounds. This reduced harvest level is expected to persist in the future. The residents of Craig harvest approximately 275,600 pounds of subsistence resources on an annual basis, or about 231 pounds per person per year. This is approximately 8 percent lower than the surrounding communities of Klawock and Thorne Bay which harvest an average of 250 pounds per person per year. Klawock and Thorne Bay have similar access to fishing, hunting, and gathering grounds and a similar number of opportunities. Therefore, it is assumed that absent delays caused by suboptimal conditions at Craig's harbors, the community would harvest approximately the same number of pounds per person as the surrounding communities, or approximately 295,000 pounds per year. Through studies by ADFG and the Corps of Engineers, it was found that the value per pound of subsistence resources range from $3.81 per pound to $24.12 per pound. Given this, the total present value of forgone subsistence harvests due to congestion is $83.6 million over the 50-year period of analysis with an average annual value of $3.5 million (ADFGc, Tetra Tech).

4.1.3.4 Increased Travel Costs

Survey results show that 36 vessels would prefer to permanently moor at Craig but cannot due to a lack of available moorage. Because of this, these vessels find moorage elsewhere on Prince of Wales Island, elsewhere in Southeast Alaska, or in the Lower 48 in the Pacific Northwest. These vessels make at least one annual roundtrip between their current homeport and Craig. This roundtrip ranges from 160 miles to 1,432 miles, taking between 8 and 183 hours per roundtrip. Taking into account increased vessel operating costs and opportunity cost of time, increased costs due to a lack of permanent moorage at Craig have a present value of $14.1 million over the 50-year period of analysis with an average annual value of $589,000.

4.1.3.5 Increased Infrastructure Damages

As described in Section 2.1.5, existing facilities are subject to accelerated wear and tear due to overuse. Specifically, this includes a decreased useful life of floats, leading to an accelerated replacement schedule in which the floats at Craig's harbors must be replaced every 20 years, giving a present value of infrastructure replacement of $19 million over the 50-year period of analysis with an average annual value of $792,000.

4.1.3.6 Recreational Opportunities

Under future without-project conditions, the recreational experience of harbor users is decreased due to congestion and overcrowding, leading to a decrease in the Unit Day Value (UDV) of each visit. The recreational experience at Craig is valued at $50.1 million over the 50-year period of analysis with average annual value of $2.09 million. The present value of recreational opportunity cost of time in Craig over the 50-year period of analysis is $32,000 with an average annual value of $1,000.

4.1.3.7 Existing Threat to Other Facilities

Under future without-project conditions, the City Dock, the adjacent private dock, and the seaplane dock will be subject to wave action from the west and northwest.

4.1.4 Summary of Without-Project Conditions

Absent Federal action to provide navigation improvements at Craig, the above-detailed damages will continue to accrue. A summary of these damages is provided in Table 12.

Table 12: Summary of Future Without-Project Condition Damages

Category:	Net Present Value	Average Annual
Vessel damages	$4,613,000	$192,000
Vessel delays	$33,482,000	$1,395,000
Subsistence	$83,590,000	$3,484,000
Travel Cost	$14,129,000	$589,000
Infrastructure Damage	$19,009,000	$792,000
Recreation UDV	$50,076,000	$2,087,000
Recreation OCT	$32,000	$1,000
Total	**$204,931,000**	**$8,540,000**

5.0 FORMULATION AND EVALUATION OF ALTERNATIVE PLANS*

5.1 Plan Formulation Rationale

Plan formulation 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 one or more planning objectives. A management measure is a feature or activity that can be implemented at a specific geographic location to address one or more planning objectives. A feature is a "structural" element that requires construction or assembly on-site whereas an activity is defined as a "nonstructural" action. Each alternative plan shall be formulated in consideration of criteria stated in Section 2.4.

5.2 Management Measures

A list of management measures is listed below. After going through a screening process based on listed criteria, all of the listed measures were carried forward for consideration.

5.2.1 Protection

This measure would be a rubblemound or floating breakwater that would be constructed in order to provide permanent and transient moorage over the 50-year study period.

5.2.2 Dredging
This measure would include removal of bottom material in order to provide adequate depths for navigation and/or moorage. Under this measure, a disposal area would be identified.

5.2.3 Upland Improvements
Upland improvements include such items as docks, haulouts, grids, fish cleaning stations, parking, restrooms, storage, and cranes. The improvements provide access to moorage and associated harbor features and reduce damages related to overcrowding.

5.2.4 Mitigation Features
Mitigation features may include benches along breakwaters, fish passage openings, and other measures that would offset the environmental impacts of a project.

5.3 Preliminary Alternative Plans

5.3.1 No Action Plan
The No Action Plan would not construct any navigation improvements at Craig, Alaska. Public concerns, issues, and environmental welfare would remain unchanged unless a non-Federal entity elected to construct improvements. The identified purpose and need would not be met. Moorage facilities at Craig, Alaska would continue to experience shortened usable life due to overuse. Damages to vessels and docking facilities due to overcrowded conditions would continue. Economic benefits to the fleet from improved access to harbor facilities would not be achieved. Vessels unable to secure moorage at Craig would seek refuge at other ports, often traveling long distances to homeports.

5.3.2 Sites Considered
The initial consideration in alternative formulation was project siting. Multiple sites in the Craig area could have been utilized to increase the amount of moorage available to the fleet. The ten sites that were considered are shown in Figure 11 and discussed below.

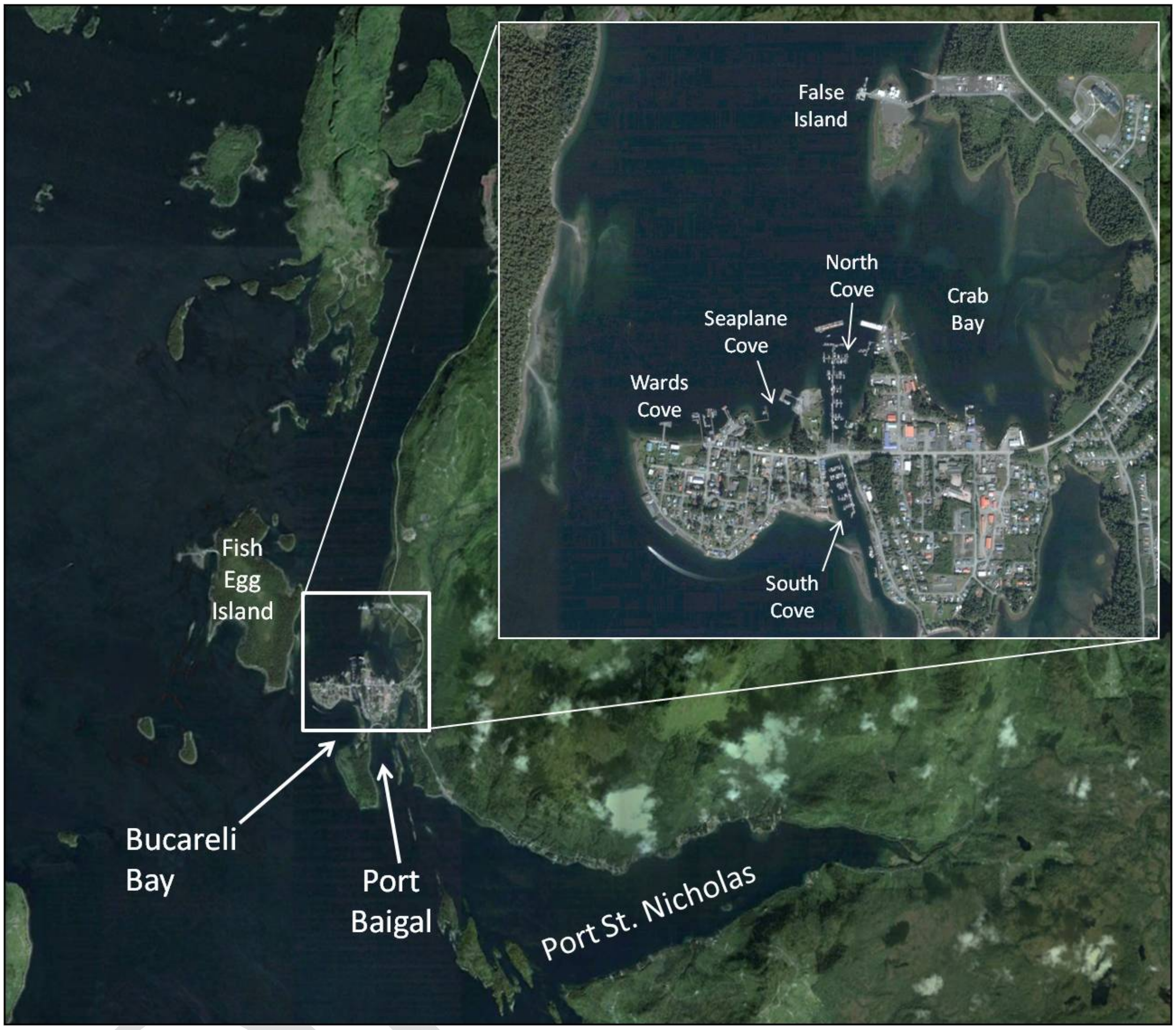

Figure 11: Overview of Potential Harbor Sites
Source: Google Earth with Corps Amendments

5.3.2.1 Fish Egg Island

Fish Egg Island is a large island on the western side of Klawock Inlet approximately 1,500 feet from downtown Craig. Several natural features could be utilized to house a harbor. The main channel allowing access into the southern portion of Klawock Inlet passes by the eastern shore of Fish Egg Island, potentially making the island a desirable place to develop a harbor. In addition, since it is separated from downtown, it could be a desirable place for transient boats that generally use the area for the sole purpose of delivering fish. While this site meets all of the study objectives, it also violates a number of the study constraints. The island supports eelgrass beds, there are no utility connections available, development of this site would require condemnation of land, there are no intermodal connections, and shallow waters surround the island. Because of these factors, this site was not carried forward for further consideration.

5.3.2.2 Seaplane Cove

This site is located in downtown Craig to the east of the Wards Cove Cannery site. It currently houses the Craig Seaplane Base and a dock. This site does not possess the needed lands for upland development and would displace the Craig Seaplane Base, a vital transportation asset. Because this site did not meet study objectives and violated study constraints, it was not carried forward for further consideration.

5.3.2.3 Crab Bay

Crab Bay is located to the north of Craig on the eastern shore of Klawock Inlet. It is a relatively well-protected area. However, large beds of eelgrass are present, the area is used by multiple species of fish for spawning and rearing, and its shores support a large crab population. Because of this, environmental mitigation would be a large part of any project at this site. While this site meets all of the study objectives, it is located in a very environmentally sensitive area with shallow water, making dredging and costly mitigation likely. In addition, the community does not support development in this area. Because of these factors, this site was not carried forward for further consideration.

5.3.2.4 Port Baigal

Port Baigal is a bay to the south of Craig that lies between Cemetery Island and Port St. Nicholas Road. However, development of uplands on Cemetery Island is not desirable given its current use as a cemetery and park area. Development of uplands along Port St. Nicholas Road would be difficult due to the area's residential zoning. While this site meets all of the study objectives, the water is shallow and supports eelgrass beds. Because of these factors, this site was not carried forward for further consideration.

5.3.2.5 Port St. Nicholas

Port St. Nicholas is a bay to the southeast of Craig. The area is largely residential with development on many of the shorefront lots. While this site meets all of the study objectives, it is residential in nature and heavily developed. It also has shallow water depths that support eelgrass beds. There is also a lack of utility connections in the area, making the site costly to develop. Because of these factors, this site was not carried forward for further consideration.

5.3.2.6 False Island

False Island is the site of the J.T. Brown Marine Industrial Center that houses an existing boat launch and dock. Much of the island has been developed for use by the marine industrial center. There is approximately 3 acres of undeveloped land on the southern portion of the island. While this site meets all the study objectives, it is in an environmentally sensitive area adjacent to Crab Bay, has shallow water depths, and would likely require condemnation of land. Because of these factors, this site was not carried forward for further consideration.

5.3.2.7 Bucareli Bay

Bucareli Bay is a body of water fronting the southern coast of Craig Island along Beach Road. The area is residential in nature and mostly developed. While this site meets all of the study objectives, it is in an area that supports eelgrass beds and due to heavy residential development any harbor would require the condemnation of a large amount of land and demolition of associated structures. Because of these factors, this site was not carried forward for further consideration.

5.3.2.8 South Cove

South Cove is the site of an existing harbor. There is very little room for expansion due to existing development on the west, the highway to the north, Hamilton Road to the east, and a private harbor development to the south. While this site meets study objectives, it is considered to be a fully developed site with no room for expansion. Because of these factors, this site was not carried forward for further consideration.

5.3.2.9 North Cove

North Cove is the site of an existing harbor. It is protected by a floating breakwater to the north but is susceptible to wave action from the west. There is very little room for expansion due to existing development to the west and east and the highway to the south. Expanding the harbor to the north would be problematic due to required float configuration and the breakwater configuration that would be required to mitigate exposure to wave action from the north and west. While this site meets study objectives, it is considered to be a fully developed site with no room for expansion. Because of these factors, this site was not carried forward for further consideration.

5.3.2.10 Wards Cove Cannery

This property is the site of the now defunct Wards Cove Cannery. The site is owned by the City of Craig. An existing dock and multiple pilings are in a state of disrepair and would require removal should this site be chosen. This site meets all study objectives. However, it supports small eelgrass beds and lies just to the south of the FAA-designated seaplane landing zone. Therefore, any harbor configuration at this site would need to take into account seaplane operations landing and taking off to the north. A number of factors combined to make Wards Cove the most desirable site for harbor development. While eelgrass beds are present, they are relatively small compared to the other sites. This met the study's objective to avoid and minimize environmental impacts that would occur in the with-project condition. In addition, it is possible to configure a harbor at this site that would not interfere with seaplane operations. The City of Craig already owns the Wards Cove site, greatly simplifying the real estate process and avoiding the need to condemn land as part of a harbor development project. The site is already zoned for marine uses and has supported the fleet in the past. Redevelopment of a previously-used area can be advantageous from an environmental standpoint. Because of previous cannery and vessel maintenance operations at this site, it is likely that there are legacy contaminants in the sediments. Redeveloping this area for industrial use would therefore be preferable to developing an environmentally pristine site. Because of these factors, this site was carried forward for further consideration.

5.3.3 Alternatives Considered

Once the Wards Cove Cannery site was chosen, multiple alternatives were formulated that would provide protection for vessels.

5.3.3.1 Initial Designs Considered

In addition to the No Action Plan, four alternatives were initially designed, each of which would have different capacities but similar breakwater layouts with protection on the western and northern boundaries of the mooring basins. After further information was gathered, additional layouts were formulated.

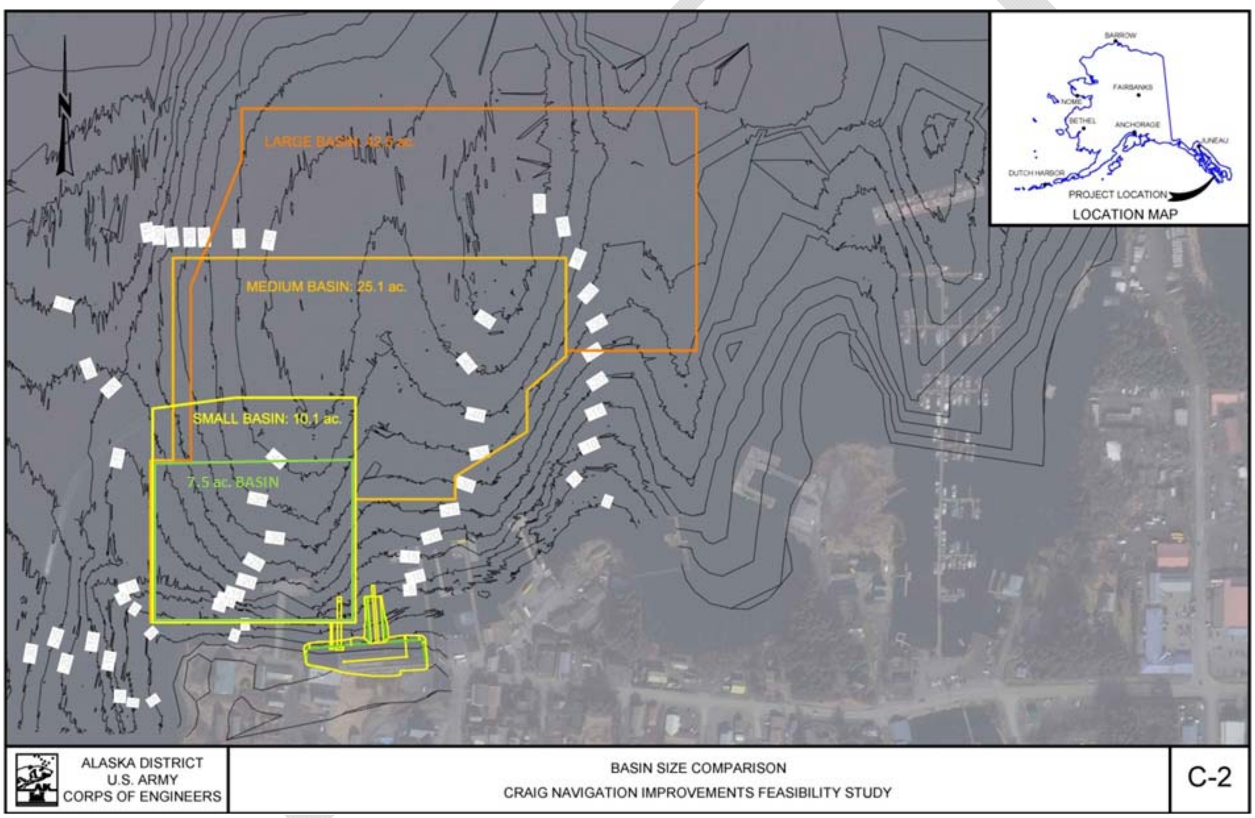

Figure 12: Basin Sizes Considered

The four basin sizes were formulated in order to provide moorage at different levels of demand. The smallest basin size, shown in green in Figure 12, is 7.5 acres in size and would be approximately the size of each of the two existing harbors, providing moorage for approximately 105 vessels. The next basin size, shown in yellow in Figure 12, is 10.1 acres in size and would provide moorage for 145 vessels. The third basin size, shown in orange in Figure 12, is 25.1 acres in size and would provide moorage for approximately 303 vessels. The final and largest of the basins is shown in red in Figure 12. This basin is 42.5 acres in size and would provide moorage for approximately 530 vessels. The alternatives developed from an investigation of these different basin sizes follows.

5.3.3.1.1 Alternative 1

This alternative would consist of a mooring basin approximately 7.5 acres in size and would be able to accommodate 105 vessels if configured as shown in Table 13 . Fish passage was incorporated into the design. This alternative is estimated to have a total project cost of $35.4 million. The proposed layout of Alternative 1 is shown in Figure 13.

Table 13: Alternative 1 Configuration

Berth Length	Number of Berths
20	12
28	20
36	30
46	18
60	24
75	0
120	1

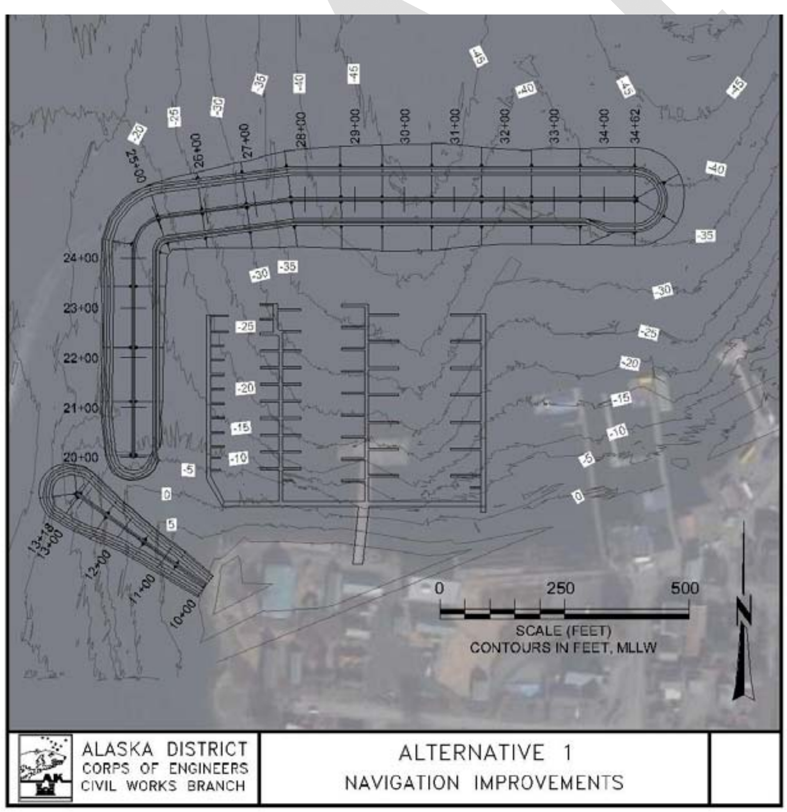

Figure 13: Alternative 1 Layout

Note: Float design depicted here is for planning purposes only. Final float design is the responsibility of the non-Federal sponsor.

5.3.3.1.2 Alternative 2

Alternative 2 would consist of a 10.1-acre basin protected by a 650-foot long western breakwater in a north-south alignment and an 850-foot long northern breakwater in an east-west alignment. There would be an opening to the west allowing for vessel ingress and egress to both the east and west. This alternative would be able to accommodate 145 vessels if configured as shown in Table 14 and has an initial project cost of $33.6 million. The proposed layout of Alternative 2 is shown in Figure 14.

Table 14: Alternative 2 Configuration

Berth Length	Number of Berths
20	12
28	28
36	38
46	30
60	36
75	0
120	1

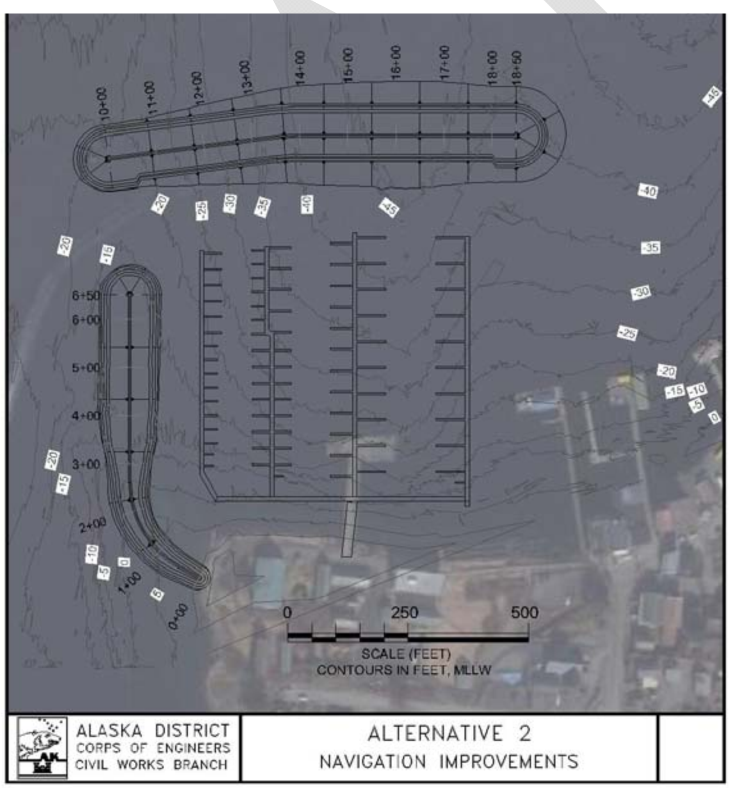

Figure 14: Alternative 2 Layout

Note: Float design depicted here is for planning purposes only. Final float design is the responsibility of the non-Federal sponsor.

At a February 2014 meeting with the community, concerns were raised about a 2-foot swell that enters Klawock Inlet from the southwest. The community was concerned about the swell entering the harbor's western opening and reflecting into the moorage basin, causing damage to vessels. Due to this new information, any design with an opening to the west such as that shown in Figure 14 would be considered an incomplete design.

5.3.3.1.2.1 Alternative 2a

This alternative would consist of a 10.1-acre basin protected by a 960-foot long western breakwater in a general north-south alignment and a 960-foot long northern breakwater in a general east-west alignment. The western breakwater was modified to allow for vessel ingress and egress from the northwest while simultaneously addressing concerns about a southwesterly swell entering the harbor. This alternative could accommodate 145 vessels if configured as shown in Table 15 and would have an estimated total project cost of $44.8 million. The proposed layout of the harbor is shown in Figure 15.

Table 15: Alternative 2a Configuration

Berth Length	Number of Berths
20	12
28	28
36	38
46	30
60	36
75	0
120	1

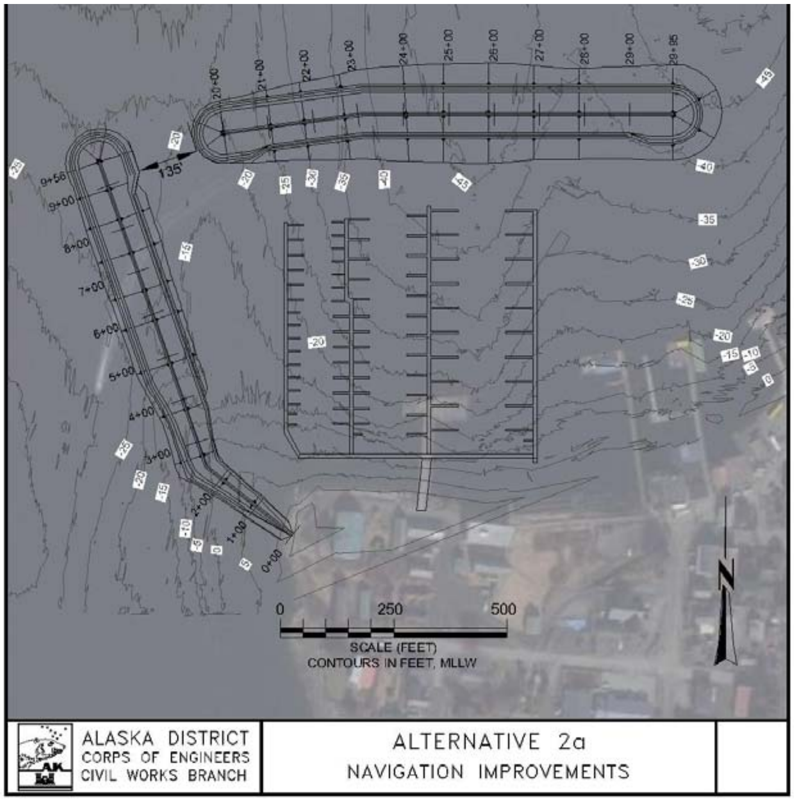

Figure 15: Alternative 2a Layout

Note: Float design depicted here is for planning purposes only. Final float design is the responsibility of the non-Federal sponsor.

5.3.3.1.2.2 Alternative 2b

This alternative would consist of a 10.1-acre basin protected by an "L-shape" breakwater that is approximately 1,933 feet in length. This design mostly eliminates the western opening completely except for an overlapping gap in the western alignment to provide for fish passage. This design provides protection against waves from all westerly and northerly directions. This basin would be able to accommodate 145 vessels if configured as shown in Table 16 and has an estimated total project cost of $37.9 million. Alternative 2b layout is shown in Figure 16.

Table 16: Alternative 2b Configuration

Berth Length	Number of Berths
20	12
28	28
36	38
46	30
60	36
75	0
120	1

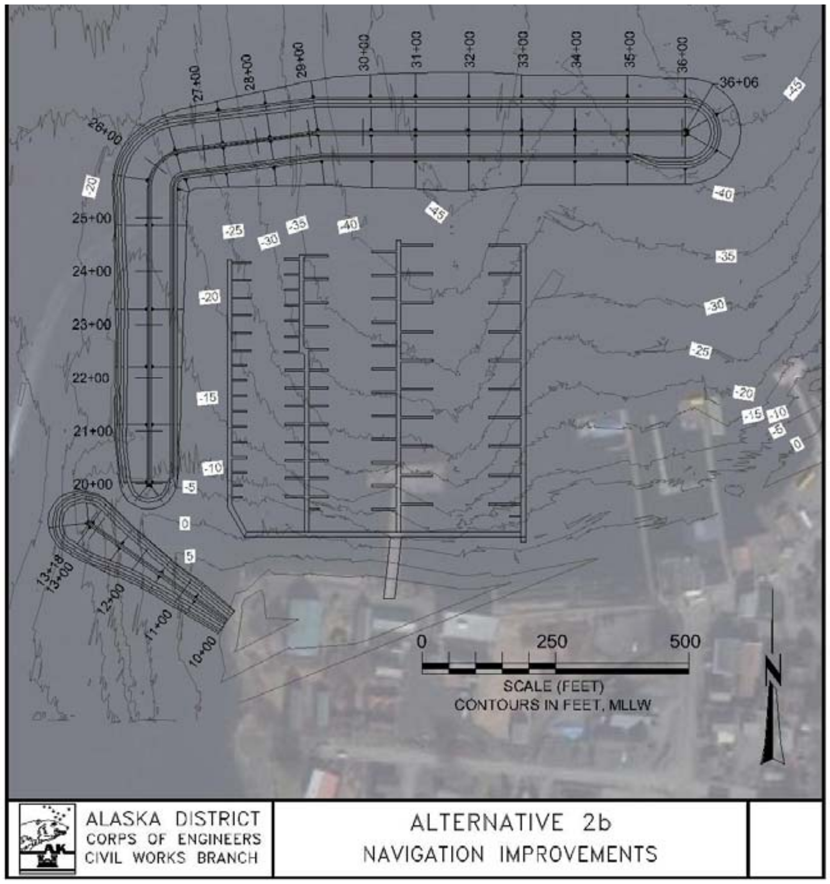

Figure 16: Alternative 2b Layout

Note: Float design depicted here is for planning purposes only. Final float design is the responsibility of the non-Federal sponsor.

5.3.3.1.3 Alternative 3

This alternative would consist of a 25.1-acre basin protected by a 650-foot long western breakwater in a north-south alignment and a 1,450-foot long northern breakwater in an east-west alignment. This basin would be able to accommodate 303 vessels if configured as shown in Table 17. This alternative is estimated to have a total project cost of $54.3 million. The proposed layout of Alternative 3 is shown in Figure 17.

Table 17: Alternative 3 Configuration

Berth Length	Number of Berths
20	8
28	0
36	72
46	73
60	142
75	7
120	1

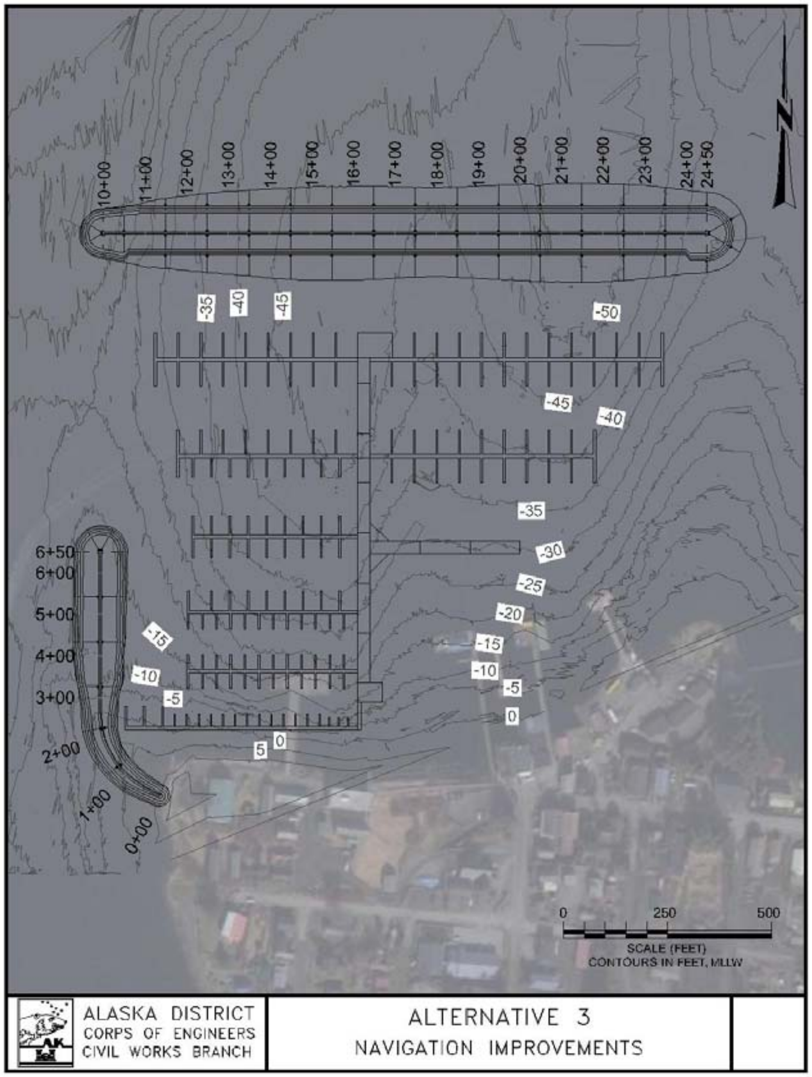

Figure 17: Alternative 3 Layout

Note: Float design depicted here is for planning purposes only. Final float design is the responsibility of the non-Federal sponsor.

5.3.3.1.4 Alternative 4

This alternative would consist of a 42.5-acre basin protected by a 650-foot long western breakwater in a north-south alignment and a 1,600-foot long northern breakwater in an east-west alignment. This basin would be able to accommodate 530 vessels if configured as shown in Table 18 and has an estimated total project cost of $61.7 million. The proposed layout of Alternative 4 is shown in Figure 18.

Table 18: Alternative 4 Configuration

Berth Length	Number of Berths
20	10
28	29
36	101
46	132
60	245
75	12
120	1

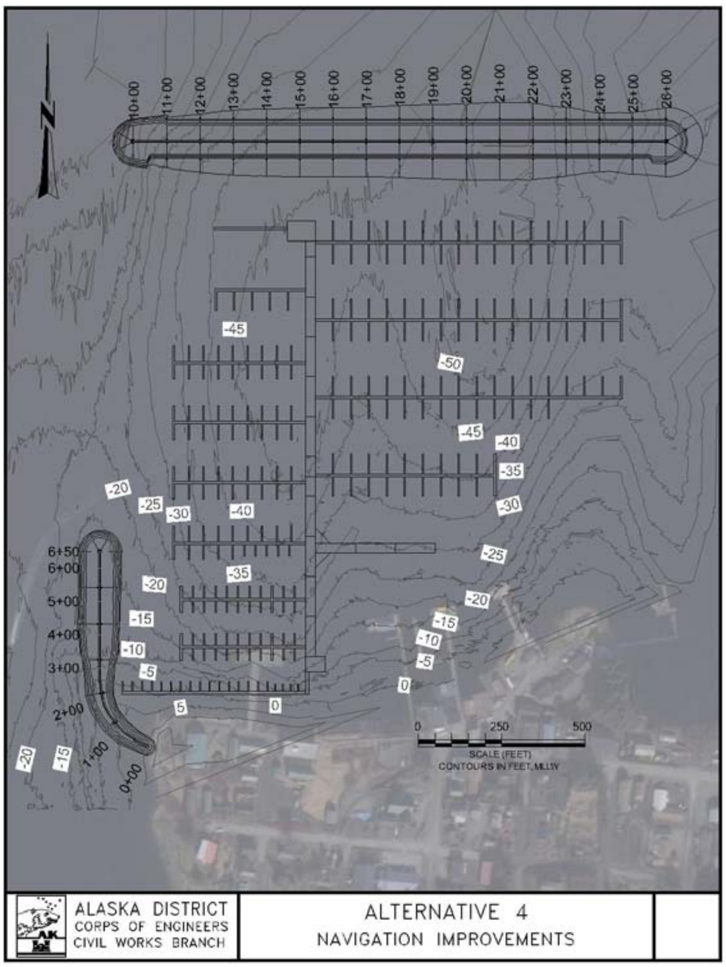

Figure 18: Alternative 4 Layout

Note: Float design depicted here is for planning purposes only. Final float design is the responsibility of the non-Federal sponsor.

6.0 COMPARISON AND SELECTION OF PLANS*

6.1 With-Project Condition

The alternatives were designed to meet the planning objectives and criteria and were evaluated based on environmental, economic, and engineering considerations. Regardless of the selected alternative, under the with-project condition, there would be a marked decline in damages and inefficiencies.

6.2 Alternative Plan Costs

Costs of the alternatives including those to construct and maintain the facilities are shown in Table 19. Costs are current as of April 2014. Interest during construction (IDC) assumes a 2-year construction window. Operations, Maintenance, Repair, Rehabilitation, and Replacement (OMRRR) assumes that 5 percent of armor rock is replaced every 25 years and anodes are replaced every 15 years.

Table 19: Summary of Costs by Alternative

Alternative	Construction Costs	IDC	OMRR&R	Present Value	Avg. Annual Value
1	$32,639,000	$1,107,000	$1,444,000	$35,190,000	$1,467,000
2a	$40,935,000	$1,388,000	$2,280,000	$44,603,000	$1,859,000
2b	$35,087,000	$1,190,000	$1,447,000	$37,724,000	$1,572,000
3	$50,121,000	$1,701,000	$2,441,000	$54,263,000	$2,262,000
4	$56,141,000	$1,905,000	$3,625,000	$61,672,000	$2,570,000

Note: Alternatives 2a and 2b are modifications of the original Alternative 2 which was dropped from consideration.

6.3 With-Project Benefits

Each alternative provides a certain amount of relief from existing and expected future damages and inefficiencies. The differences between the expected level of damages and inefficiencies absent Federal action (without-project condition) and those that will occur under the various with-project conditions are benefits that accrue to the project and form the basis for selecting a recommended plan.

6.3.1 Moorage Demand Met

The alternatives have been formulated to meet a certain amount of surplus demand for moorage at Craig. Benefits accrue to small boat harbors in a logical manner that depends on the percentage of demand met and the amount of overcrowding alleviated. Once overcrowding is addressed, external demand for moorage, (that portion of demand from vessels that either haul out or moor elsewhere), can be met.

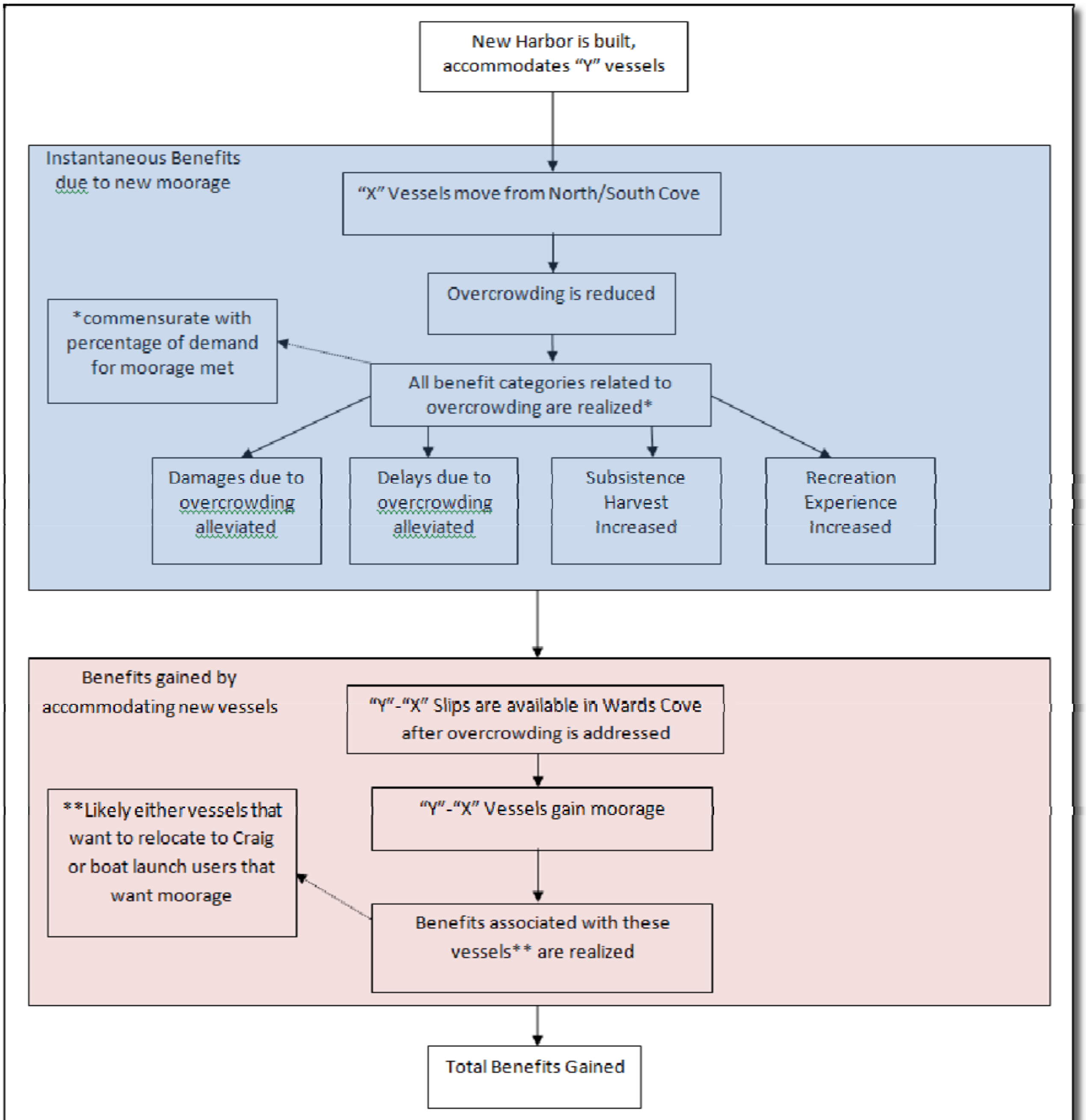

Figure 19: Chronological Realization of Benefits Due to New Harbor Construction

6.3.2 Avoided Vessel Damages

In the with-project condition, a portion of existing and expected future damages will be alleviated. These avoided damages are those that occur due to overcrowding and include damaged fenders and vessels, broken mooring lines, etc. Damages due to things such as theft, electrolysis, vandalism, and freeze damage will still occur. Table 20 shows the total vessel damages decreased by each alternative.

Table 20: Avoided Vessel Damages, by Alternative

Alternative	Average Annual Benefits
Alternative 1	$105,000
Alternative 2a	$126,000
Alternative 2b	$126,000
Alternative 3	$188,000
Alternative 4	$188,000

6.3.3 Avoided Vessel Delays

Similarly, there are a number of vessel delays that would not occur under the with-project condition. As discussed in Section 4.1.3.2, there were seven delay categories listed by vessel owners in the surveys. Under the with-project condition, delays due to several categories will be completely eliminated including: wait times while another boat is moved from a vessel's dedicated stall, delays due to waiting for another vessel's owner to return, and delays due to congestion and overcrowding. In addition, delays due to waiting for the tide to change would be reduced by 50 percent. These delays are not completely eliminated because while the recommended site would not be tide-limited, it is reasonable to assume that a portion of vessel owners currently experiencing tide delays would either choose to stay in their current harbor or would not be able to procure a slip in the new harbor.

Some delays would continue to occur at Craig. These include situations where harbor staff are not available, delays at the launch ramp, and delays due to ice in the harbor. Total delays reduced by the various alternatives are shown in Table 21.

Table 21: Avoided Vessel Delays, by Alternative

Alternative:	Average Annual Value
Alternative 1	$711,000
Alternative 2a	$795,000
Alternative 2b	$795,000
Alternative 3	$1,044,000
Alternative 4	$1,044,000

6.3.4 Increased Subsistence Harvests

Given the 8 percent disparity between the amount of subsistence harvest per person at Craig and those at nearby villages, it is reasonable to assume that a portion of this disparity occurs due to delays associated with vessel use. Subsistence activities are largely an investment of time. Therefore, any delay that occurs due to existing harbor conditions increases the amount of effort (economic cost) required to harvest subsistence resources. A decrease in those delays makes subsistence activities less expensive in the non-monetary sense and would likely lead to an increase in subsistence harvests at Craig closer to what is experienced by surrounding villages. The values of increased subsistence harvests for each alternative are shown in Table 22.

Table 22: Increase Subsistence Harvests, by Alternative

Alternative:	Average Annual Value
Alternative 1	$456,000
Alternative 2a	$544,000
Alternative 2b	$544,000
Alternative 3	$544,000
Alternative 4	$544,000

6.3.5 Decreased Travel Costs

With an increase in available moorage, vessel owners that currently moor elsewhere and travel to Craig for fishing openings would save on the cost of roundtrip travel between their current homeport and Craig. The expected decreases in travel costs by alternative are shown in Table 23.

Table 23: Decreased Travel Costs, by Alternative

Alternative:	Average Annual Value
Alternative 1	$589,000
Alternative 2a	$589,000
Alternative 2b	$589,000
Alternative 3	$589,000
Alternative 4	$589,000

6.3.6 Decreased Infrastructure Damage

With a reduction in congestion and overcrowding, (which leads to overuse), there is a corresponding decrease in infrastructure damage. Instead of degrading at an accelerated rate, floats and related structures degrade at a slower rate, increasing useful life. The current useful life of floats at Craig's harbors is 20 years. Under the with-project condition, it is expected to increase to 30 years. The benefit of this extension of useful life is shown in Table 24.

Table 24: Decreased Infrastructure Damage, by Alternative

Alternative:	Average Annual Value
Alternative 1	$229,000
Alternative 2a	$229,000
Alternative 2b	$229,000
Alternative 3	$229,000
Alternative 4	$229,000

6.3.7 Recreational Opportunity – Unit Day Values

With a reduction in congestion and overcrowding, there is a corresponding increase in the recreational experience of harbor users. The value of recreational experience is expressed in Unit Day Values. Unit Day Value is made up of five criteria:

- Recreation Experience (overall experience)
- Availability of Opportunity (proximity of project to similar recreation facilities)
- Carrying Capacity (congestion)
- Accessibility (land-side access)
- Environmental (aesthetic quality)

The benefit of the increase in Unit Day Value is shown in Table 25.

Table 25: Increased Unit Day Values, by Alternative

Alternative:	Average Annual Value
Alternative 1	$277,000
Alternative 2a	$277,000
Alternative 2b	$277,000
Alternative 3	$277,000
Alternative 4	$277,000

6.3.8 Recreational Opportunity – Opportunity Cost of Time

With a reduction in congestion in overcrowding, there are decreases in the amount of time recreational boaters spend in transit between the harbor and their recreational destinations. That time savings has a direct benefit expressed in the opportunity cost of time. The benefit of the saved opportunity cost of time is shown in Table 26.

Table 26: Saved Opportunity Cost of Time for Recreational Boaters, by Alternative

Alternative:	Average Annual Value
Alternative 1	$1,000
Alternative 2a	$1,000
Alternative 2b	$1,000
Alternative 3	$1,000
Alternative 4	$1,000

6.4 Net Benefits of Alternative Plans

Given the quantified benefits discussed above, the net annual benefits of each alternative are shown in Table 27.

Table 27: Summary of With-Project Benefits

Criteria	Alt. 1	Alt. 2a	Alt. 2b	Alt. 3	Alt. 4
Vessel Damages	$105,000	$126,000	$126,000	$188,000	$188,000
Vessel Delays	$711,000	$795,000	$795,000	$1,044,000	$1,044,000
Subsistence	$456,000	$544,000	$544,000	$544,000	$544,000
Travel Cost	$589,000	$589,000	$589,000	$589,000	$589,000
Infrastructure Damage	$229,000	$229,000	$229,000	$229,000	$229,000
Recreation UDV	$277,000	$277,000	$277,000	$277,000	$277,000
Recreation OCT	$1,000	$1,000	$1,000	$1,000	$1,000
Total Net Annual Benefits	**$2,368,000**	**$2,561,000**	**$2,561,000**	**$2,872,000**	**$2,872,000**

6.5 Summary of Accounts and Plan Comparison

The physical characteristics of the alternatives are shown in Table 28. A comparison of the NED costs and benefits associated with the various alternatives is shown in Table 29. Interest during construction (IDC) was added to the initial cost to account for the opportunity cost incurred during the time after the funds have been spent, but before the benefits begin to accrue. Preconstruction, engineering, and design (PED) was assumed to take nine months and construction assumed to take 24 months.

Table 28: Comparison of Alternatives: Physical Characteristics

Feature/Alternative	Alt. 1		Alt. 2a	Alt. 2b	Alt. 3	Alt. 4
Western Breakwater						
Length (ft)	-		960	-	650	650
Armor Rock (cy)	-		14,303	-	9,682	9,682
B Rock (cy)	-		11,740	-	5,823	5,823
Core Rock (cy)	-		43,670	-	14,588	14,588
Northern Breakwater						
Length (ft)	-		960	-	1,450	1,600
Armor Rock (cy)	-		21,000	-	26,685	28,984
B Rock (cy)	-		35,300	-	48,957	48,962
Core Rock (cy)	-		176,000	-	295,510	298,689
Combined Breakwater						
Length (ft)	1,780		-	1,933	-	-
Armor Rock (cy)	31,400		-	31,100	-	-
B Rock (cy)	37,600		-	42,650	-	-
Core Rock (cy)	181,000		-	205,300	-	-

Note: "(cy)" equals "cubic yards" and "ft" equals "linear feet".

Table 29: Comparison of Alternatives: Costs and Benefits

Item	Alt. 1	Alt. 2a	Alt. 2b	Alt. 3	Alt. 4
Mobilization & Demobilization	$901,400	$901,400	$901,400	$870,000	$870,000
Surveys	$162,175	$195,973	$195,973	$143,000	$143,000
Demolition	$302,180	$302,180	$302,180	$210,000	$210,000
Breakwaters	$16,965,580	$20,240,989	$18,566,352	$28,557,000	$29,025,000
Inner Harbor Development	$6,764,295	$9,854,055	$6,767,505	$9,025,000	$13,225,000
Navigation Aids	18,315	18,315	18,315	48,000	48,000
Construction Contract Cost	$25,969,000	$31,512,911	$26,736,773	$38,854,000	$43,520,000
Contingency	$5,344,672	$6,696,648	$6,047,100	$7,771,000	$8,704,000
Construction Management	$2,153,211	$2,697,882	$2,275,797	$3,497,000	$3,917,000
Subtotal	$7,497,883	$9,394,530	$8,322,897	$11,267,000	$12,621,000
Project Cost	$33,466,883	$40,907,441	$35,059,670	$50,121,000	$56,141,000
Interest During Construction	$1,107,000	$1,388,000	$1,190,000	$1,701,000	$1,905,000
NED Investment Cost	$34,573,883	$42,295,441	$36,249,670	$51,822,000	$58,047,000
Annual OMRRR	$60,173	$95,013	$60,309	$102,000	$151,000
Total Annual NED Cost (50 years at 3.375%)	$1,467,000	$1,859,000	$1,572,000	$2,262,000	$2,570,000
Annual Benefits	$2,368,000	$2,561,000	$2,561,000	$2,872,000	$2,872,000
Average Annual Net Benefits	$901,000	$702,000	**$989,000**	$610,000	$302,000
Benefits to Cost Ratio	1.61	1.38	**1.63**	1.27	1.12
Rank by NED Benefits	2	3	**1**	4	5

Environmental impacts were also considered. As discussed in Section 5.3, the siting of the harbor explicitly considered possible environmental impacts which led to the selection of the Wards Cove Cannery site. The environmental impacts and benefits associated with each of these alternatives are fairly similar with breakwater footprints covering existing bottom habitat but providing additional habitat in the process.

7.0 TENTATIVELY SELECTED PLAN*

7.1 Description of Tentatively Selected Plan

The tentatively selected plan (TSP) is Alternative 2b, shown in Figure 16. This plan maximized net NED benefits and was selected as the NED Plan. The plan is acceptable to the local sponsor and became the Recommended Plan. Major construction items include: removal of the existing pilings and dock, construction of a rubblemound breakwater, and construction of a moorage float system. No dredging would be required to construct the project.

7.1.1 Plan Components

7.1.1.1 Rubblemound Breakwater

This feature consists of dual rubblemound breakwaters approximately 1,933 feet in length that combine to extend northward from the northwest point of Craig Island for approximately 700 feet, then extends to the east for approximately 1,200 feet. A stub breakwater extends northwest from the northwest tip of Craig Island along the north-south alignment to allow for fish passage.

7.1.1.2 Entrance Channel and Moorage Basin

The 10-acre moorage basin would be accessed from the east. While depths within the basin extend to -45 feet MLLW, all maneuvering areas will have an authorized controlling depth of -20 feet MLLW. Minimal sedimentation within the basin would depend on storm conditions but dredging is expected to be infrequent if necessary at all.

7.1.1.3 Inner Harbor Facilities

A float system will be constructed by the non-Federal partner to accommodate the 145 vessels of various sizes as shown in Table 16.

7.1.2 Plan Costs and Benefits

As shown in Table 29, the Recommended Plan provides annual navigation benefits of $2,561,000. The annual cost is $1,572,000 with net annual benefits of $989,000 and a benefit to cost ratio of 1.63. Economic analyses are based on 2014 price levels, a 50-year period of analysis, and the fiscal year 2015 Federal discount rate of 3.375 percent.

7.1.3 Construction

7.1.3.1 Federal

The U.S. Army Corps of Engineers will be responsible for construction of the breakwaters. The U.S. Coast Guard will be responsible for installing aids to navigation.

7.1.3.2 Non-Federal

The City of Craig will be responsible for construction of the float system and providing all lands easements, rights-of-way, and relocations necessary for the project. The City will also be responsible for providing utility service to the harbor and for funding its share of the general navigation features.

7.1.4 Financial Analysis

The non-federal partner's capability to provide funding is largely dependent on legislative appropriations from the State of Alaska. However, the sponsor has shown the ability to secure the necessary appropriations to move this project forward and has submitted a request for design and construction funding for the next State of Alaska legislative session.

7.1.5 Dredging and Disposal

The recommended plan has been formulated to avoid dredging in order to minimize environmental impacts. The existing piling and dock structures will be removed and disposed of in the city landfill. The pilings will be cut at grade instead of extracted in order to avoid disturbing sediments.

7.1.6 Operations, Maintenance, Repair, Replacement, and Rehabilitation (OMRRR)

Total present value OMRRR costs for the recommended plan over the 50-year period of analysis are $1.78 million. A brief discussion of Federal and non-Federal responsibilities is included below.

7.1.6.1 Federal

The Corps of Engineers will be responsible for maintenance of the breakwaters. Although extremely unlikely, occasional dredging may be required to maintain authorized entrance depths. Should dredging become necessary, a disposal site would need to be identified and measures taken to ensure that contaminated soils are handled in a proper manner. The City of Craig has identified its landfill as a possible upland disposal site in the event that maintenance dredging is required.

The U.S. Coast Guard will maintain navigational aids.

7.1.6.2 Non-Federal

Although unlikely, the City of Craig will perform maintenance dredging of the mooring basin, if necessary. The City of Craig will also maintain the float, utilities, etc. and operate the completed project.

7.1.7 Mitigation

Environmental impacts have been avoided to the extent possible through avoidance of dredging, choosing a site with the least environmental impacts, and providing for fish passage. A United States Forest Service archaeologist will monitor the removal of the existing piling and dock structures in order to provide mitigation under Section 106 of the NHPA.

7.2 Integration of Environmental Operating Principles

Environmental operating principles have been integrated into the planning process wherever possible. Specific considerations are included below.

Foster sustainability as a way of life throughout the organization: This project seeks to protect the subsistence lifestyle of the citizens of rural Alaska. This lifestyle relies on striking a balance between humans and their surrounding environment, taking only what is needed. In addition, this project will support the Alaskan fishing fleet. Alaska's fisheries are carefully managed to provide sustainable yields.

Proactively consider environmental consequences of all Corps activities and act accordingly: Environmental consequences were considered throughout the planning process and every effort has been made to avoid, minimize, or mitigate all anticipated impacts. These actions included eliminating dredging from consideration early on to avoid disturbing contaminated sediments, siting the harbor in an area that would minimize impacts to eelgrass and other resources, and providing for fish passage through a gap in the recommended plan's breakwater.

Create mutually supporting economic and environmentally sustainable solutions: The recommended plan is the NED plan and therefore provides the maximum amount of benefits to the nation. The project was formulated in a way that makes it lasting, requiring very little in maintenance, and avoids long term environmental impacts wherever possible.

Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps which may impact human and natural environments: A full environmental assessment was conducted as required by the National Environmental Policy Act. In addition, the principles of avoidance, minimization, and mitigation were enacted to the extent possible.

Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs: For this study, a systems approach was utilized to examine the interaction between marine, estuarine, and freshwater habitat units and to formulate the recommended project in a way that avoided impacts that would sever or otherwise disrupt those relationships. The project eliminated dredging in order to minimize the risk of disturbing contaminated sediments, both during construction and during subsequent operation and maintenance activities.

Leverage scientific, economic and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner: The Corps attended several meetings with the community and actively sought out local and institutional knowledge about the human and natural environments that would be affected, both positively and negatively, by action and inaction. Community feedback has been integral to proper formulation of alternatives.

Employ an open, transparent process that respects the views of individuals and groups interested in Corps activities: The Corps has followed all guidelines for public involvement and made every effort to be responsive to stakeholder concerns. Public input has been solicited throughout the study and used for both environmental and economic analysis purposes.

7.3 Real Estate Considerations

The project lies within Section 6, Township 74 South, Range 81 East, USS 1429A and ATS 212, Copper River Meridian. All submerged lands necessary for construction, operation, and maintenance of the proposed project are subject to navigational servitude. Lands, easements, relocations, and rights-of-way (LERRs) required for construction include those listed below in Table 30.

Table 30: LERRs Requirements

Features	Owner(s)	Acres	Interest	GNF/LSF
Entrance Channel, Breakwater (Portions Below MHW)	City of Craig and State of Alaska	8.4	Navigational Servitude	GNF
Breakwater (Portions Above MHW)	City of Craig	0.05	Fee Simple	GNF
Mooring Basin (Below MHW)	City of Craig and State of Alaska	10.1	Navigational Servitude	GNF
Temporary Staging	City of Craig	0.75	Temporary Work Area Easement	LSF

As shown above, all uplands necessary for construction, operation, and maintenance of the proposed project are currently owned by the City of Craig.

7.4 Summary of Accounts

7.4.1 National Economic Development

The recommended plan is the NED plan and provides the greatest amount of net annual benefits to the nation. It is the most effective plan at reducing damages and inefficiencies due to overcrowding and congestion at Craig's harbors.

7.4.2 Regional Economic Development

Economic benefits that accrue to the region but not necessarily the nation include the shifting of vessels from outside of the region to Craig. These vessels currently moor as far away as the Pacific Northwest. Their permanent relocation to Craig would provide a number of benefits to the region. These vessels would bring revenue to the region in the form of moorage fees, additional sales tax revenues on purchases of fuel and groceries for the vessel, additional corporate income taxes to the State of Alaska, crew patronage of local businesses, and fares on local air carriers between Prince of Wales Island and the crews' homes.

7.4.3 Environmental Quality

Qualitative enhancements to the environment include a reduction in fossil fuel usage and emissions due to decreased travel for vessels permanently relocating to Craig from other homeports.

7.4.4 Other Social Effects

Construction of this project supports the local economy and provides income to a small community. This injection of income to the City of Craig allows the provision of social services to the community, increasing community viability and quality of life. Enhanced revenue to local businesses provides incentive to hire additional personnel, providing income stability to more of the local citizenry.

7.5 Risk and Uncertainty

As in any planning process, some of the estimates made in this report are uncertain. Elements of risk and uncertainty could affect the design and performance of the project, cost, and benefits. An ongoing effort to address risk has been made throughout the study process. Possible effects are detailed below.

7.5.1 Fleet Characteristics

The fleet associated with any one community is fluid in nature and subject to change. Surplus demand for moorage can often be determined by examination of a port's waitlist. However, there are no funds required to remain on Craig's waitlist and therefore vessels on the waitlist may not currently require moorage. This may be due to a cease in operations, change in geographic location, or acquisition of moorage in another location. Consequences to the study could include overestimation of surplus demand for moorage, and therefore construction of a project larger than what is needed. To mitigate this risk, a survey of vessel owners was completed. It is believed that this risk has been mitigated to the extent possible.

7.5.2 Wind and Wave Data

For this study, wind and wave data from NOAA was utilized in place of a detailed wind and wave analysis, which would have been cost and time-prohibitive. If the existing wave climate is greater than 4 feet, 4 seconds, a floating breakwater would not be possible. However, without evidence of a wave climate to this extent, cheaper floating breakwaters may be eliminated in favor of more expensive rubblemound breakwaters. The City of Craig was able to produce video of waves that appeared to be in excess of 4-feet, 4-seconds and there is local knowledge of a 2 foot southwesterly swell. Because of this, floating breakwaters were eliminated in favor of rubblemound breakwaters. It is believed that this risk has been mitigated to the extent possible.

7.5.3 Contaminated Soils

Because of the project area's historical uses and the former presence of contaminated soils in the uplands, it is assumed that there is contamination in the in-water sediments as well. Failure to fully account for contaminated soils could result in escalation of costs related to disposal of dredged materials, a longer construction process, and additional real estate requirements. To mitigate this risk, contamination of in-water sediments was assumed to be present and dredging was completely avoided. Dredging and disposal of dredged material would have proven to be costly, timely, and unnecessary. Eliminating dredging did not significantly affect the ability of the harbor to meet local moorage demand. In addition, it is believed that the majority of the contaminated sediments are located in the area immediately surrounding the existing boatway. This area does not lie within the footprint of the proposed breakwater alignment. Therefore, placing rock would not suspend contaminated soils in the water column. To any degree that sediments are suspended in the water column, it would likely be for a very short time as the substrates offshore are larger gravels and cobbles and expected to resettle very quickly. It is believed that this risk has been mitigated to the extent possible.

7.5.4 Sediment Properties

For the feasibility phase of this study, geotechnical borings were not conducted. Instead, it was assumed that the sediments within the breakwater footprint are diamicton soils. Diamicton soils are a very hard soil that is resistant to settling and are commonly found throughout Southeast Alaska. If softer soils were discovered during design, more material would be needed in the breakwater to account for settling, leading to higher project costs. However, the only sediment sources in the area are the creeks that flow into Crab Bay, nearly 1 mile to the east, and topographical alignments make it unlikely that these creeks contribute sediment directly to the project site. In addition, an underwater camera was used to examine the bottom materials at the project site. Evidence from this investigation suggests that soft soils are not present. Because of these factors, this risk was tolerated.

7.5.5 Fish Passage

Fish passage was incorporated into the final design of the recommended plan in concert with the study's goal of avoiding or minimizing environmental impacts to the extent possible. The passage opening was configured with input from USFWS. Given a known southwesterly swell that occurs during some storm events, it is possible that swell and waves could enter the protected area through this opening. This uncertainty has been mitigated to the extent possible through wave modeling. The Alaska District has an abundance of experience in including fish passage into breakwater designs. Because of these factors, this risk was tolerated.

7.5.6 Implementation of Recommended Plan

The Recommended Plan would meet the planning objectives in a number of ways. The construction of the breakwater would reduce damages to commercial fishing vessels, recreational vessels, subsistence vessels, and harbor infrastructure that result from overcrowding. It would reduce delays to vessels as a result of overcrowding at existing facilities. It would contribute to efficiencies by reducing travel times to the area by vessels currently homeported elsewhere. It would maintain nearshore fish passage and it would avoid disturbing contaminated soils.

7.6 Cost Sharing

7.6.1 Cost Apportionment

Construction of the project will be apportioned in accordance with the Water Resources Development Act of 1986, as amended. The fully funded cost apportionment for the project features is summarized in Table 31.

Table 31: Construction Cost Apportionment

	Cost Contribution (%)	
Portion of Project	**Federal**	**Non-Federal**
General Navigation Features (breakwater)	80	20
Local Service Facilities (floats)	0	100
Aids to Navigation (provided by USCG)	100	0

7.6.2 Cost Allocation

Table 32: Federal/Non-Federal Initial Cost Apportionment for Recommended Plan

Items	**Total Project Costs**	**Implementation Costs**			
		Federal	%	Non-Federal	%
General Navigation Features (GNF):					
Mobilization/Demobilization	$1,057,368	$951,631	90	$105,737	10
Breakwaters	$23,741,402	$21,367,262	90	$2,374,140	10
Preconstruction, Engineering, & Design	$4,264,327	$3,837,894	90	$426,433	10
Construction Management (S&A)	$2,275,797	$2,048,217	90	$227,580	10
LERRD (GNF) Administration Costs	$25,000	$0	0	$25,000	100
Subtotal GNF	$31,363,894	$28,205,005	90	$3,158,889	10
Additional Funding Requirement					
10% of GNF		($3,136,389)		$3,136,389	
GNF LERRD Credit		$0		$0	
Adjustment for GNF LERRD credit		($3,136,389)		$3,136,389	
Relocations (GNF not creditable)					
Subtotal of GNF Related Items	$31,363,894	$25,068,615		$6,295,279	
LERRD (GNF) Acquisition Credit	$0	$0	0	$0	100
Aids to Navigation	$18,316	$18,316	100	$0	0
Local Service Facilities (LSF):	$7,570,992	$0	0	$7,570,992	100
Final Initial Cost Requirements	$38,953,202	$25,086,931	64%	$13,866,271	36%

Note: May not equal previous tables due to differing calculations in PED, OMRR&R, and land acquisition costs.

The initial construction cost of the general navigation features is 90 percent for the initial Federal investment and 10 percent for the initial local share because there is no dredging greater than 20 feet. The non-Federal sponsor must also contribute an additional 10 percent, plus interest, during a period not to exceed 30 years after completion of the general navigation features. The sponsor will be credited toward this 10-percent cost with the value of LERRD necessary for construction, operation, and maintenance of the general navigation features. This post construction contribution is current estimated at $3,136,389 as shown below.

Table 33: Non-Federal Post Construction Contribution

Total GNF	**10% of GNF**	**LERRD Credit**	**Non-Federal post-construction contribution**
$31,363,894	$3,136,389	$0	$3,136,389

8.0 ENVIRONMENTAL CONSEQUENCES*

8.1 Physical Environment

8.1.1 Bathymetry, Currents, and Tides

Alternatives were specifically formulated to avoid dredging. Therefore there are no changes in sea floor profile outside of the footprint of the breakwater. The purpose of a breakwater is to alter currents and wave patterns in order to create a sheltered area for vessel moorage. Therefore, there is expected to be some localized changes to nearshore currents along the northwest shore of Craig Island. The area protected by the breakwater would experience reduced current velocities, potentially leading to an increased rate of sedimentation. However, construction and operation of the harbor would not impact existing area-wide currents and circulation patterns.

8.1.2 Water Quality

Impacts to the waters of the United States are expected to be less than significant. During the removal of the existing piles and construction of the new breakwater, there is likely to be a temporary increased concentration of suspended sediment within the water column in nearshore areas with finer substrates. Placement of the breakwater's base rock will loft finer sediments into the water column and residual fines on the surface of core and armor rock will also contribute to temporary localized increases in turbidity. However, given the poor condition of the existing piles, it is possible that they could simply be cut or broken at the seabed rather than being extracted. This could reduce the amount of sediment disturbed during removal. Since the existing pilings nearest to the shore are located in an area conservatively assumed to contain contaminated sediments, minimization of sediment disturbance during demolition of these particular piles is a significant consideration.

8.1.3 Air Quality

Air quality in the immediate project area would be affected by emissions from the harbor. Equipment used during the construction process will likely be diesel-powered. This will include both equipment used to haul rock to the project site and equipment used to place the rock once it is at the project site. Dust emissions will likely be minimized through the wet working conditions associated with harbor construction and prevailing weather patterns in the area. Construction-related emissions would be intermittent, occurring only during work hours. They would also be temporary in nature as they would end at the completion of construction. Vessels transiting to and from the newly-constructed mooring basin would be the primary source of air pollutants once construction ended. Pollutants generally found at harbors are nitrogen oxides, carbon monoxide, sulfur dioxide, and particulate matter less than 10 microns in diameter related to fuel combustion.

Air quality in the Craig area is not expected to be significantly impacted by construction or operation of a new harbor. New permanent emission sources will be limited to vessels relocating from other communities seeking permanent moorage at a newly constructed harbor. There is also likely to be a number of transient vessels seeking temporary moorage during various fishing seasons. Because of the limited number of new emission sources and strong meteorological influences in the area, National Ambient Air Quality Standards are not likely to be exceeded.

8.1.4 Noise

Construction of the new harbor will generate noise both above and below the water surface. Water-propagated noise and its effects on marine life are discussed in subsequent section. Air-propagated noise above typical levels will be present during the operation of construction machinery and vessels during transportation and placement of rock and fill material. The nearest residential buildings to the project site are located several hundred feet from the closest on-shore construction activities, (staging of vehicles and stockpiling of materials). This should help minimize disturbances to the community during construction. The Corps will work with the community to devise work schedules and heavy equipment traffic patterns that minimize noise and disruption within the community.

8.2 Biological Resources

8.2.1 Terrestrial Habitat

Adverse impacts to terrestrial habitat will be negligible as most construction activity will be offshore and the adjacent uplands have been commercially developed for a number of years. Onshore activity will mostly consist of staging and lay-down of construction equipment and material within open areas. Any urban-acclimated wildlife living within the existing cannery property may be displaced by increased noise and activity and move into similar habitat in adjacent areas.

8.2.2 Marine Habitat

8.2.2.1 Intertidal Zone

A portion of the west breakwater will be placed between MHW and MLW. This portion of the breakwater will cover less than 1 acre of intertidal zone, replacing the existing flat gravel and cobble habitat in that area will large rock surfaces. The new large rock surfaces are expected to be colonized by the same marine algae and invertebrate species observed growing on existing cobbles.

8.2.2.2 Subtidal Zone

The placement of rock for the breakwaters would significantly alter the subtidal habitat in the project area, replacing the existing flat sand and gravel substrate with large vertical and horizontal rock surfaces and introducing vertical structure were very little currently exists. The breakwaters would eliminate less than one-half acre of eelgrass beds, a portion of the dense

Saccharina community along the north shore of Craig Island, and an unknown but small extent of *Macrocystis* perennial kelp off the west shore.

The rock surfaces of the breakwater will likely rapidly recruit new growths of marine algae. A study of new rubblemound breakwaters at Sitka, Alaska, (130 miles north of Craig), evaluated the development of herring spawning habitat, (specifically the growth of suitable marine algae), over the 10 years following completion of the breakwaters in 1995 (Brockman and Grossman 2005). The study found that the breakwaters recruited algae and other marine organisms rapidly over the first several years, steadily increasing in density and diversity of species. After 5 years, algae had become well established on the seaward side of the breakwaters and were continuing to colonize the harbor side of the breakwaters at a slower rate. Heavy and extensive herring spawn was noted on the seaward side of the breakwaters. The report found that for the 5-year study period, overall herring spawn had decreased within the harbor basin when compared to areas outside the harbor basin with decreased water circulation and related sedimentation identified as likely causes. However, 10 years after construction, both the seaward and harbor sides showed robust stands of macro-algae including species of kelp that provide good substrate for herring spawn (*Saccharina latissima* and *Agarum fimbriatum*). The primary difference between the inside and outside of the Sitka breakwaters after 10 years was the presence of perennial kelp (*Macrocystis pyrifera*) outside the breakwaters but absent inside. Perennial kelp provides highly productive herring spawn substrate due to its large leaf area. It was unclear why perennial kelp was largely absent on the harbor side of the Sitka breakwaters.

The subtidal environment along the north shore of Craig Island is known to be an area of relatively low herring spawn activity compared with nearby areas along the west shore of Craig Island and Fish Egg Island. The beds of sugar kelp growing on the bottom of much of the project area are suitable for herring, but the density of sugar kelp beds throughout the greater area, a lack of perennial kelp along the north shore of Craig Island, and a lack of protection near the project site may reduce its attractiveness to spawning herring.

Based on the existing subtidal environment at Craig and the observations of algae recruitment at Sitka, it is reasonable to expect that the breakwater constructed at Craig would result in a net increase in quality herring spawning habitat and general marine organism diversity in the project area. A small area of perennial kelp would be buried under the western arm of the breakwater but this effect would be mitigated to a great degree by the creation of substrate for a diverse community of kelp and other marine algae. The north arm of the breakwater would create an entirely new platform for algae growth in deep waters that currently offer very little in the way of algae habitat.

Most of the eelgrass bed extending across the project site would not be directly affected. The western arm of the breakwater is likely to bury a small area at the extreme west end of the eelgrass bed. However, the reduced current velocities within the new harbor basin may encourage a slight expansion of the eelgrass bed. Extensive bands of eelgrass are present all along the waterfront and within North Cove harbor. The development of a new harbor is unlikely to have an obvious adverse effect on the existing beds of eelgrass outside of the breakwater's footprint.

Several construction projects on Prince of Wales Island have reportedly led to environmental problems due to the use of gravel made from acid-generating, high-sulfide rock. The Corps will bear this in mind in the selection of rock sources for constructing the breakwaters or placing fill in the marine environment. Sources of rock that are currently under consideration include limestone from a quarry on Wadleigh Island at the north end of Klawock Inlet and greywacke from a quarry on San Jan Bautiste Island to the southwest. Both types of rock have a minimal risk of generating acid leachate when exposed to air and water. Standard tests such as the Net Neutralizing Potential test can determine the acid-generating potential of mine tailings and waste rock but it is not clear how appropriate these tests would be for large rock placed in the marine environment.

8.2.2.3 Marine Birds

During construction activities the few marine birds using the project area would quickly move to similar or superior habit available elsewhere in Klawock Inlet. The removal of the existing piles and dock would result in the loss of roosting habitat for gulls and shorebirds. However, those species are likely to rapidly make use of the new breakwaters as roosting and foraging habitat. Therefore no net loss of marine bird habitat will result from construction of the harbor. The only bird species that may experience a permanent loss of habitat is a flock of feral pigeons roosting and possibly nesting in the existing dock. The pigeons would likely move to other structures or buildings in the nearby waterfront area. No mitigation is proposed for the loss of pigeon habitat.

8.2.2.4 Marine Fish and Invertebrates

Breakwater construction would eliminate approximately 7 acres of existing submerged habitat consisting of a combination of deep-water benthic communities and shallower kelp beds. The breakwater would permanently replace existing habitat with rocky substrate extending from the seabed to the surface, introducing structure and vertical relief where none currently exists.

As discussed previously, marine algae and invertebrates that are characteristic of rocky intertidal and subtidal habitats can be expected to rapidly colonize the breakwaters, adding diversity of species to the area. The new species can be expected to include stalked marine algae such as *Fucus* as well as kelps, barnacles, mussels, anemones, and sea stars. The growth of sessile organisms on the breakwater surface would provide food and cover for shrimp and fish. Based on studies of rubblemound breakwaters installed in a similar setting in Sitka, Alaska, once the breakwater at Craig is vegetated, there will be spawning and rearing habitat for Pacific Herring that is superior to what currently exists at the project site.

8.2.2.5 Marine Mammals

Marine mammals may avoid the area or be temporarily displaced as a result of in-water construction and project vessel movements. No blasting or pile-driving is anticipated as part of the Federal project so injurious high-amplitude underwater noise should not result from construction. The placement of rock in the water for the creation of the breakwaters would generate relatively low-amplitude underwater noise likely to cause marine mammals to temporarily move away from the construction site. The noise generated by barges and tugs in transit to and from the work area would be similar to that generated by routine small vessel traffic in the shipping lanes. Low levels of turbidity generated by fill and rock placement may cause marine mammals to avoid the area until turbidity levels returned to background levels. The completed project would not result in the loss of habitat valuable to marine mammals. Conversely, rubblemound breakwaters can be expected to provide additional spawning and rearing habitat for Pacific herring and other forage species.

Marine mammals present in the project area that are not protected under the ESA are protected under the MMPA. The mitigatory steps to be implemented for ESA species will also be applied to species protected under the MMPA.

8.2.3 Federal and State Threatened and Endangered Species

8.2.3.1 Present Species

The ESA-listed species under consideration is the humpback whale. The expected project effects on humpback whales are the same as those described for marine mammals in the preceding section. The Corps made a determination that the project “may affect, but not adversely affect” humpback whales in a letter to NMFS on June 13, 2014. NMFS concurred with this determination in a letter dated July 9, 2014, which stated that humpback whales were not likely to be adversely affected by the project (NMFS 2014d). This letter reiterated that ESA-listed Western DPS Steller sea lions are unlikely to be found in the Craig area and that consultation for that species is not required for this project.

8.2.3.2 Proposed Mitigation

To minimize the risk of harm to listed and protected marine species including: ESA-listed Humpback Whales, species protected by the MMPA, Yellow-Billed Loons, and marine turtles, the Corps proposes the following mitigation measures:

- Project vessels will be limited to a speed of 8 knots to reduce the risk of collisions with protected species.
- Workers conducting in-water construction will be instructed to watch for marine animals and cease work if a marine mammal approaches within 50 meters of their activity.
- In-water work will be avoided between 15 March and 15 June in order to avoid the peak herring spawn and juvenile salmon out-migration periods as well as the period when

humpback whales and other marine mammals are most likely to be present in the project area.
- The selected contractor will include an Oil Spill Prevention and Control Plan in its Environmental Protection Plan, which will be submitted to the Corps for review and approval.

The Corps does not know of a specific means of detecting or protecting ESA-listed fish that may incidentally enter the project area. Sound environmental practices intended to protect fish in general, such as implementation of an Oil Spill Prevention and Control Plan, restrictions on grounding project vessels, etc., will serve to limit risk to individual adults from ESA-listed fish stocks that may enter the project area.

8.2.3.3 Determination

With the provision of the mitigation steps outlined above, the Corps determines that the project activities are "not likely to adversely affect" humpback whales and seeks concurrence with this determination from NMFS. In accordance with the Endangered Species Act, the proposed project will have no effect upon the continued existence of any Federally-listed threatened or endangered species or designated critical habitat, and therefore does not require formal Section 7 consultation.

8.2.4 Special Aquatic Sites

The band of eelgrass extending through the project area constitutes a special aquatic site under the Clean Water Act Section 404(b)(1) guidelines. Within the general project area, the 1998 survey plotted the eelgrass as two polygons on either side of the old cannery pier including a 0.66-acre bed to the west and a 1.02-acre bed to the east (as shown in Figure 8).

The westernmost extent of this eelgrass bed is not precisely known, but it most likely ends at the reef upon which the western alignment of the breakwater will be built. The western alignment of the breakwater may encroach upon a very small portion of the area thought to contain eelgrass with total eelgrass affected expected to be approximately 0.3 acres.

No mitigation is proposed for the potential loss of this small area of eelgrass. The surrounding areas contain widespread and abundant beds of eelgrass. Transplantation of the eelgrass to another nearby location would have little value since all habitat that is suitable for eelgrass growth already contains eelgrass. North Cove Harbor and other high-use areas along the Craig waterfront host eelgrass beds, so construction of the recommended plan would not in and of itself necessarily affect existing eelgrass. The float system to be constructed by the non-Federal sponsor outside of the Federal action may affect existing eelgrass to some degree through shading. However, these effects can be minimized through utilizing light-permeable materials in float construction.

8.2.5 Essential Fish Habitat

NMFS has designated the southern end of Klawock Inlet as essential fish habitat for all five species of Pacific salmon, at all life stages (NMFS 2014b). The project area does not contain spawning habitat and has limited value as juvenile rearing habitat. It is most likely to be used as a migration corridor to and from Crab Creek and other anadromous streams in the region as the shallow nearshore waters may serve as protection from predators. The proposed breakwater has the potential to negatively affect salmon movement through the nearshore environment by diverting salmon into deeper waters, which increases predation, and lengthening the distance traveled through the area. The recommended plan includes a fish passage gap in the breakwater to minimize impacts on fish movements. The Corps has collaborated with USFWS, ADFG, and NMFS regarding fish passage design requirements that allow proper passage while simultaneously preserving breakwater functionality.

8.3 Cultural and Subsistence Activities

The project site has not served as an important area for subsistence activities in recent history due to its proximity to the cannery site. The existing pilings and debris in the water make the site difficult to approach via water, and contamination at the cannery has no doubt discouraged subsistence gathering along the shore. The relatively small size and low productivity of the project site, especially when juxtaposed with an abundance of highly productive surrounding areas, also reduces the value of the project site for subsistence purposes.

The completed project would improve access to subsistence resources in the region by creating additional boat moorage space for the community.

8.4 Coastal Zone Resource Management

Alaska's Coastal Zone Management Program expired on June 30, 2011. Project proponents are no longer required to evaluate projects for consistency with enforceable standards of coastal management plans. Those plans do, however, offer useful criteria for evaluating projects in the coastal zone.

The project is consistent with the coastal management plan's general goals of protecting and prioritizing subsistence and recreation uses, and limiting impacts on coastal resources and processes. If the former Alaska Coastal Zone Management Program is reinstituted prior to construction of this project, the project would be submitted to the State of Alaska for coastal consistency review.

8.5 Historical and Cultural Resources

Coordination with the State of Alaska State Historical Preservation Officer under Section 106 of the National Historic Preservation Act (NHPA) has commenced regarding removal of the piles and dock that are slated for removal as part of the tentatively selected plan. A U.S. Forest

Service archaeologist will be present to monitor the removal and disposal of the piles and dock in accordance with Section 106 of NHPA.

8.6 Environmental Justice and Protection of Children

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations", requires Federal agencies to identify and address any disproportionately high and adverse human health effects of its programs and activities on minority and low-income populations. The proposed project is not expected to adversely impact these populations.

8.7 Unavoidable Adverse Impacts

Any impacts as a result of construction of this project are expected to be less than significant and temporary in nature. The principle unavoidable impact of breakwater construction will likely be the permanent alteration of subtidal habitat within the breakwater footprint. However, the habitat created by breakwater construction is likely to be at least as productive as the existing habitat and the adverse impacts would be localized to the immediate habitat and organisms eliminated by placement of stone during breakwater construction.

8.8 Cumulative and Long-term Impacts

Federal law (33 CFR 230 et seq.) requires that NEPA documents assess cumulative effects, which are the impact on the environment resulting from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions.

Construction of the recommended plan will substantially increase available vessel moorage capacity along the Craig waterfront, which increases the risk of fuel spills and long term environmental degradation that can occur with development. However, the fact that the project area has already been affected by long term commercial use limits the environmental impacts that the project will cause within the immediate area. Marginal impacts to this already impacted site are less than would occur if a more pristine, undeveloped site were chosen for construction of a harbor.

Most of the northern shore of Craig Island has already been developed to some extent for marine transportation and other commercial uses. Future development beyond the scope of the recommended plan would likely consist of replacement or repurposing of existing facilities. Rehabilitation of the Ward Cove Cannery property has been proposed by the City of Craig. This action in concert with construction of the recommended plan would greatly increase the level of human activity at the northwest corner of Craig Island. The level of vessel traffic may increase but to a certain degree, the vessels that would moor inside a new harbor already visit the area. Some vessels are assumed to relocate to Craig from other areas but their level of activity (fishing) is not expected to increase. Any increase in vessel traffic is not expected to adversely impact marine life.

8.9 Summary of Mitigation Measures

The following measures are being included in the recommended plan in order to avoid or reduce environmental impacts.

The project will not include dredging of the harbor basin in order to preserve the eelgrass beds present within the project area and to avoid disturbing contaminated sediments present from previous commercial activity within the project site. During pile removal, the piles will be cut at grade instead of extracted in order to minimize sediment mobilization.

The breakwater design will incorporate fish passage in order to limit the effects of the breakwater on nearshore fish movements.

To the extent practicable, work below the high tide line will be limited to low tidal stages to reduce turbidity.

Project vessels will be limited to a speed of 8 knots in order to reduce the risk of collisions with protected species.

Workers conducting in-water construction will be instructed to watch for marine mammals and to cease work if an animal approaches within 50 meters.

In-water work will be avoided between March 15th and June 15th. This period coincides with the peak herring spawning season, juvenile salmon out-migration, and the time in which humpback whales and other marine mammals are most likely to be present in the project area.

The selected contractor will include an Oil Spill Prevention and Control Plan in its Environmental Protection Plan. This plan will be submitted to the Corps for review and approval.

9.0 PUBLIC AND AGENCY INVOLVEMENT*

9.1 Public/Scoping Meetings

A charette was held in November 2012. Officials from the City of Craig, a number of local fishermen, other stakeholders, and representatives from the U.S. Army Corps of Engineers, Alaska District, Pacific Ocean Division, and Headquarters were present. During this meeting, various sites and alternatives were discussed including the positive and negative potential effects of each.

A public presentation was made at the February 2014 City Council meeting. During this presentation, the Corps presented an update on study progress and enumerated remaining tasks and risks. An additional presentation was made at the November 2014 annual Craig Tribal

Council meeting which provided more information on the study progress and expected release of the draft report.

9.2 Federal and State Agency Coordination

9.2.1 Relationship to Environmental Laws and Compliance

9.2.1.1 National Environmental Policy Act (NEPA) of 1969 (42 USC 4321 et seq.)

This Act requires that environmental consequences and project alternatives be considered before a decision is made to implement a Federal project. NEPA established the requirements for preparation of an Environmental Impact Statement (EIS) for projects potentially having significant environmental impacts and an Environmental Assessment (EA) for projects with no significant environmental impacts. This EA has been prepared to address impacts and propose avoidance and minimization steps for the proposed project, as discussed in the CEQ regulations on implementing NEPA (40 CFR 1500 et seq.). This document presents sufficient information regarding the generic impacts of the proposed construction activities at the proposed Little Diomede project to guide future studies and is intended to satisfy all NEPA requirements.

In accordance with NEPA and Corps regulations and policies, the EA and Finding of No Significant Impact (FONSI) will be circulated for public and agency review, and the EA will be made available on the Alaska District website to the interested public prior to the implementation of this proposed action.

9.2.1.2 Clean Water Act Of 1972 (33 USC 1251 et seq.)

The objective of the Federal Water Pollution Control Act of 1972, as amended by the Clean Water Act (CWA) of 1977 (Public Law 92-500), is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Specific sections of the CWA control the discharge of pollutants and wastes into aquatic and marine environments.

The specific sections of the CWA that apply to the proposed project are Section 404, addressing the discharge of fill material to waters of the United States, and Section 401, which requires certification that the permitted project complies with the State Water Quality Standards for actions within State waters. The enforcement agency for Section 404 is the U.S. Army Corps of Engineers; the Corps does not issue permits to itself, but will prepare an evaluation of the effects of its proposed discharge under Section 404(b)(1), available in Appendix 1.

The Corps will comply with Section 401 by applying for water quality certification from the State of Alaska Department of Environmental Conservation. The major action of the project invoking this regulation is the placement of rock into nearshore waters to create the breakwaters although other actions with the potential to affect water quality (e.g. disturbance of sediment during removal of the existing offshore structures) are also considered in the 404(b)(1) evaluation.

9.2.1.3 Rivers and Harbors Act of 1899 (33 USC 403 et seq.)

Section 10 of this Act prohibits the obstruction or alteration of navigable waters of the U.S. without a permit from the U.S. Army Corps of Engineers. The Corps does not issue permits to itself, so no specific permit is required under this act.

9.2.1.4 Endangered Species Act of 1973 (16 USC 1531 et seq.)

The Endangered Species Act (ESA) protects threatened and endangered species by prohibiting Federal actions that would jeopardize continued existence of such species or result in destruction or adverse modification of any critical habitat of such species. The Corps is required to coordinate with both the USFWS and NMFS to identify what ESA-listed species under those agencies respective jurisdictions may be present in the project area. The Corps then assesses how the proposed Federal action may impact listed species and makes one of several determinations including: “No Effect”, “May Affect but Not Adversely Affect”, and “May Affect and Likely to Adversely Affect”. If the determination is “No Effect” then the action may proceed without consultation with NMFS. However, ESA Section 9 prohibitions will apply if unanticipated take to a listed species occurs.

If the determination is “May Affect but Not Likely to Adversely Affect”, NMFS must be consulted. During consultation NMFS will review the Biological Assessment (if prepared by the Corps) and either concur with the determination, end the consultation process and allowing the project to proceed, or not concurring and recommending changes or mitigation measures to remove any adverse effects and ending formal consultation.

If the determination is “May Affect and Likely to Adversely Affect”, the Corps would need to enter into formal consultation with NMFS. The action may not proceed as designed until formal consultation is complete. During formal consultation NMFS will review the Biological Assessment and prepare a Biological Opinion.

The Corps has determined in this document that the recommended project will have “No Affect” on ESA-listed species under USFWS jurisdiction as no such species are present in the project area. The Corps made a determination to NMFS that the recommended project “May Affect but Not Likely to Adversely Affect” humpback whales. NMFS concurred in a letter dated 9 July 2014.

9.2.1.5 Fish and Wildlife Coordination Act (16 USC 661 et seq.)

The Fish and Wildlife Coordination Act (FWCA) requires the Corps to consult with the USFWS whenever the waters of any stream or other body of water are proposed to be impounded, diverted, or otherwise modified. The act authorizes USFWS to take the lead in consultation, to conduct surveys and investigations to determine the possible damages of proposed actions on wildlife resources, and to make recommendations to the Corps regarding measures to prevent the loss or damage to wildlife resources, as well as the development and improvement of such resources. The Corps is authorized to transfer fund to USFWS to carry out these investigations. The Corps shall give full consideration to the reports and recommendations of the wildlife agencies and include such justifiable means and measures for wildlife mitigation or enhancement as the Corps finds should be adopted to obtain maximum overall project benefits.

The Corps invited USFWS, NMFS, and ADFG to engage in FWCA coordination in its initial round of correspondence and received a Planning Aid Letter from USFWS. Findings and recommendations included in the Planning Aid Letter were taken into consideration and included in project design where appropriate.

9.2.1.6 Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006, as amended (16 USC 1801 et seq.)

The Magnuson-Stevens Fishery Conservation and Management Act provides for the conservation and management of all fishery resources between 3 and 200 nautical miles offshore. The 1996 amendments to this act require regional fisheries management councils, with assistance from the NMFS, to delineate Essential Fish Habitat (EFH) in Fishery Management Plans (FMPs) for all managed species. EFH is defined as an area that consists of “waters and substrate necessary for spawning, breeding, feeding or growth to maturity” for certain fish species. Federal action agencies that carry out activities that may adversely impact EFH are required to consult with the NMFS regarding potential adverse effects of their actions on EFH. An EFH assessment is provided as an appendix to this report.

The Corps has coordinated with NMFS and received general recommendations to avoid and minimize impacts to EFH. The Corps has adopted many of these recommendations and is continuing to develop practicable fish passage options for the project in order to minimize impacts to juvenile salmon and herring.

9.2.1.7 Marine Mammal Protection Act of 1972, as amended (16 USC 1361 et seq.)

The Marine Mammal Protection Act (MMPA) provides protection to marine mammals in both State waters (within 3 nautical miles from the coastline) and the ocean waters beyond. As specified in the MMPA, USFWS is responsible for the management of polar bears, walrus, and sea otters; NMFS is responsible for all other marine mammals such as whales, porpoises, and seals. The Corps is required to coordinate with these agencies on potential impacts to species covered by this act and must address these agencies’ concerns and recommendations.

Corps coordination with NMFS included discussions of MMPA species. The measures adopted to avoid and minimize potential harm to the ESA-listed humpback whale will also be applied to any marine mammals encountered at the project site during construction.

9.2.1.8 Migratory Bird Treaty Act of 1918, as amended (16 USC 703 et seq.)

The essential provision of the Migratory Bird Treaty Act makes it unlawful, except as permitted by regulations, "to pursue, hunt, take, capture, kill…any migratory bird, any part, nest or egg," or any product of any bird species protected by the convention. The Corps is required to avoid a taking under this act during construction of a project. Avoidance often takes the form of construction during windows that limit brush clearing or ground preparation to periods outside of typical nesting periods for protected birds or discouraging birds from nesting within the construction area using exclusion or scare devices.

No birds protected under the MBTA are known to nest on the limited upland area that will be affected by the project, (Feral Pigeons roosting in the old cannery pier are not protected under the MBTA). The Corps will assess construction access and laydown areas once those are identified by the contractor for their potential as bird nesting habitat and apply timing windows or exclusion methods where applicable.

9.2.1.9 National Historic Preservation Act of 1966, as amended (16 USC 470 et seq)

The purpose of the NHPA is to preserve and protect historic and prehistoric resources that may be damaged, destroyed, or made less available by a project. Under this Act, Federal agencies are required to identify cultural or historic resources that may be affected by a project and to consult with the State Historic Preservation Officer (SHPO) when a Federal action may affect cultural resources.

The Alaska District archaeologist has identified the old cannery pier and boat haulout as historic structures within the area of potential effect but noted that a future survey was needed to determine the age, construction type, historical significance, and integrity of the pier and haulout before a determination of eligibility could be made. These determinations have been made in a letter to the SHPO on July 16, 2014.

9.2.1.10 EO 12898 – Environmental Justice and Protection of Children

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires the Corps to identify and address any disproportionately high and adverse human health effects of its programs and activities on minority and low-income populations.

The recommended project is not immediately adjacent to any low-income or minority residential areas. The harbor should be an asset to the community that improves subsistence and coastal resources access for all of the area's residents. The Corps does not foresee that construction of the recommended plan would create disproportionate adverse effects on the more vulnerable elements of the community.

9.2.1.11 EO 13112 – Invasive Species

Executive Order 13112, “Invasive Species” requires the Corps to prevent the introduction of invasive species to project construction sites.

The project is expected to involve locally quarried rock and locally contracted heavy machinery and barge. Therefore, the risk of introducing invasive species to the site is minimal.

9.2.2 Status of Project Coordination

As of December 2014, coordination activities with major resource agencies were ongoing and described in the sections below.

9.2.2.1 Alaska Department of Fish and Game

The Corps notified ADFG of the proposed project in a letter dated 7 March 2014, addressed to Mark Minnillo at the ADFG office in Craig. The Corps followed up with emails and an attempted personal visit to the Craig office in April 2014. The Corps received an email response from ADFG biologist Scott Walker on 30 May 2014 in which he described his field experience in the project area. Mr. Walker stated that the project area is used by out-migrating pink salmon but avoided by spawning herring which prefer the large kelp beds immediately south of the project area. He recommended a gap in the breakwater for juvenile salmon and herring passage but thought that the breakwater would eventually provide new spawning habitat for herring.

Mark Minnillo provided recommendations in an email dated 22 July 2014 responding to an email discussion on fish passage between the Corps, USFWS, and ADFG. Mr. Minnillo’s recommendations are:

“The opening in the breakwater does not appear to be substantial enough to actually provide any benefit to rearing salmonids moving through the area. The opening in the breakwater should be deeper to allow flow for more than 1 foot for 1 hour per day. Perhaps the opening could be such that, referring to the map, the end of the shorter part of the breakwater could extend beyond and to the outside of the larger part of the breakwater.”

“As it is drawn, the proposed dock would be located over the eelgrass bed. The entire dock facility should be moved seaward toward deeper water to avoid the eelgrass bed.”

“All rock used for the breakwater should be tested to determine that it is not toxic or acid-generating in order to avoid impacts to marine life.”

In response to Mr. Minnillo’s recommendations, the Corps has revisited the design of the breakwater gap using criteria obtained from USFWS (email dated 24 July 2014) and has investigated the best methods of avoiding the use of acid-generating rock. The float design to which Mr. Minnillo referred was conceptual. The actual layout is the responsibility of the City of Craig. All ADFG recommendations have been implemented to the extent practicable.

9.2.2.2 Alaska Department of Natural Resources, Office of History and Archaeology

The Alaska District archaeologist Erin Laughlin prepared a letter to SHPO dated 16 July 2014 in which she outlined the known history of the site and existence of documented historic properties. The archaeologist identified the old cannery pier and boat haulout as historic structures within the area of potential effect but noted that further survey was needed to determine the age, construction type, historical significance, and integrity of the structures before a determination of eligibility could be made.

9.3 Status of Environmental Compliance (Compliance Table)

Table 34: Summary of Relevant Federal Statutory Authorities

Federal Statutory Authority	Compliance Status
Clean Air Act, as amended	FC
Clean Water Act of 1977, as amended	PC
Coastal Zone Management Act of 1982	N/A
Endangered Species Act of 1973, as amended*	FC
Fish and Wildlife Coordination Act, as amended	FC
Marine Mammal Protection Act	FC
Marine Protection, Research, and Sanctuaries Act of 1972	FC
Migratory Bird Treaty Act of 1918*	FC
Magnuson-Stevens Fishery Conservation and Management Act*	FC
National Environmental Policy Act of 1969, as amended*	PC
National Historic Preservation Act of 1966, as amended*	PC
Protection of Wetlands (Executive Order 11990)	FC
Rivers and Harbors Act of 1899	FC

PC = Partial Compliance, FC = Full Compliance
**- Full compliance will be attained upon completion of the public review process and/or further coordination with responsible agencies*
Note: This list is not exhaustive.

9.4 Views of the Sponsor

The City of Craig has expressed ongoing, enthusiastic support for the recommended plan and is seeking funding opportunities that would allow for a smooth transition into both the design and construction phases of the project.

10.0 CONCLUSIONS AND RECOMMENDATIONS*

10.1 Conclusions

The proposed construction of a new harbor as discussed in this document would have minor but largely controllable short term environmental impacts. However, in the long term it would help improve the overall quality of the human environment. This assessment supports the conclusion that the proposed project does not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, a finding of no significant impact will be prepared.

10.2 Recommendations

I recommend that the navigational improvements at Craig, Alaska be constructed generally in accordance with the plan herein, and with such modifications thereof as in the discretion of the Chief of Engineers may be advisable at an estimated total Federal cost of $25.1 million and $60,300 annually for Federal maintenance provided that prior to construction the local sponsor agrees to the following:

a. Provide, during the period of design, 10 percent of design costs allocated by the Government to commercial navigation in accordance with the terms of a design agreement entered into prior to commencement of design work for the project; and provide, during the first year of construction, any additional funds necessary to pay the full non-Federal share of design costs allocated to the Government to commercial navigation in accordance with the cost sharing as set out in paragraph b., below;

b. Provide, during construction, 10 percent of the total cost of construction of the general navigation features attributable to dredging to a depth not in excess of 20 feet; plus 25 percent of the total cost of construction of the general navigation features attributable to dredging to a depth in excess of 20 feet but not in excess of 45 feet; plus 50 percent of the total cost of construction of the general navigation features attributable to dredging to a depth in excess of 45 feet;

c. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the project, up to an additional 10 percent of the total cost of construction of the general navigation features. The value of lands, easements, rights-of-way, and relocations provided by the non-Federal sponsor for the general navigation features, described below, may be credited toward this required payment. If the amount of credit exceeds 10 percent of the total cost of construction of the general navigation features, the non-Federal sponsor 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 in excess of 10 percent of the total cost of construction of the general navigation features;

d. Provide all lands, easements, and rights-of-way, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the construction or operation and maintenance of the general navigation features (including all lands, easements, and right-of-way, and relocations necessary for dredged material disposal facilities);

e. Accomplish all removals determined necessary by the Federal Government other than those removals specifically assigned to the Federal Government;

f. Provide, operate, maintain, repair, replace, and rehabilitate, at its own expense, the local service facilities consisting of the existing float system and additional floats added to accommodate the fleet designed for the recommended project in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government.

g. Shall not use funds from other Federal programs, including any non-Federal contribution required as a matching share thereof, to meet any of the non-Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that expenditure of such funds for such purpose is authorized;

h. Shall prepare and implement a harbor management plan that incorporates best management practices to control water pollution at the project site and to coordinate such plan with local interests;

i. Comply with all 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. 4601-4655), and the Uniform Regulations contained in 49 CFR Par 24, in acquiring lands, easements, and rights-of-way required for construction or operation and maintenance of the general navigation features and the local service facilities, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

j. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of operating and maintaining the general navigation features;

k. Hold and save the United States free from all damages arising from the construction or operation and maintenance of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the United States or its contractors;

l. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total costs of construction of the general navigation features, and in accordance with the standards for financial management systems et forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 CFR Section 33.20;

m. Comply with all applicable Federal and State laws and regulations, including, but not limit to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7 entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a *et seq.*) the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 *et seq.*) and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c *et seq.*);

n. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-520, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction or operation and maintenance of the general navigation features. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

o. Assume, as between the Federal Government and the non-Federal sponsor, complete financial responsibility for necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction or operation and maintenance of the general navigation features;

p. To the maximum extent practicable, perform its obligations in a manner that will not cause liability to arise under CERCLA; and

q. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b), and Section 101(e) of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2211), which provides that the Secretary of the Army shall not commence the construction of any water resources project, or separable element thereof, until each non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element.

The recommendations for implementation of navigation improvements at Craig, Alaska reflect the policies governing formulation of individual projects and the information available at this time. They do not necessarily reflect the program and budgeting priorities inherent in the local and State programs or the formulation of a national civil works water resources program.

Consequently, the recommendations may be changed at higher review levels of the executive branch outside Alaska before they are used to support funding.

Date: __________________________

____

COL Christopher D. Lestochi
Commander
Corps of Engineers, Alaska District

11.0 REFERENCES*

Alaska Division of Community and Regional Affairs (ADCRA). 2014. Community Database Online, http://commerce.alaska.gov/cra/DCRAExternal/community

Alaska Department of Fish and Game (ADFG). 2014a. Humpback Whale (*Megaptera novaeangliae*) Species Profile: http://www.adfg.alaska.gov/index.cfm?adfg=humpbackwhale.main.

ADFGa. 2014. Anadromous Waters Catalog, Interactive Mapping website, http://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?adfg=maps.interactive.

ADFGb. 2010. Commercial Fisheries Entry Commission, Permit Holder & Crew Member Counts by City of Residence.

ADFGc. 2010. Subsistence in Alaska, A Year 2010 Update.

AKDOLa. 2014. Research and Analysis Section: http://laborstats.alaska.gov/pop/popest.htm

Brockman, Steve, and Grossman, Ed. 2005. A Survey of Herring Spawning Habitat on the New Thompson Harbor Breakwaters, Sitka, Alaska, prepared by U.S. Fish and Wildlife Service, Juneau Office, Southeast Alaska, for U.S. Army Corps of Engineers Alaska District. June 9-12 2005.

City of Craig. 2006a. Craig Coastal Management Program. April 2006.

City of Craig. 2006b. Ward Cove Cannery Site Development Plan, Public Review Draft. 18 July 2006.

Lindeberg, Mandy, and Linstrom, Sandra. 2010. Field Guide to Seaweeds of Alaska.

Lindeberg, Mandy (NMFS). 2014. Personal correspondence dated 27 June 2014.

Murphy, Michael, *et al.* 2000. A Comparison of Fish Assemblages in Eelgrass and Adjacent Subtidal Habitats Near Craig, Alaska. Alaska Fishery Research Bulletin, Vol. 7, Summer 2000.

National Marine Fisheries Service (NMFS). 2014a. Marine Mammal Species Range and Critical Habitat Interactive Map, website: http://alaskafisheries.noaa.gov/mapping/esa/.

NMFS. 2014a. Protected Resources Species Profile, Humpback Whale *(Megaptera novaeangliae) website:* http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/humpbackwhale.htm

NMFS. 2014b. Alaska Region Essential Fish Habitat (EFH) website, http://www.fakr.noaa.gov/habitat/efh.htm

NMFS. 2014c. Letter dated 5 May 2014, subject: Proposed Navigation Improvement Project at Craig, Alaska.

NMFS. 2014d. Letter of Concurrence, Craig Navigational Improvements Project, NMFS #AKR-2014-9384, dated 9 July 2014.

NMFS. 2013a. Protected Resources Species Profile, Steller Sea Lion *(Eumetopias jubatus), website:* http://www.nmfs.noaa.gov/pr/species/mammals/pinnipeds/stellersealion.htm

NMFS. 2013b. Occurrence of Western Distinct Population Segment Steller Sea Lions

East of 144° W. Longitude. 18 December 2013.

Tetra Tech, Inc. 2011. Economic Value of Subsistence Activity, Little Diomede, Alaska.

U. S. Department of Agriculture (USDA). 2008. Final Environmental Impact Statement, Tongass Land Management Plan Amendment. January 2008.

U.S. Fish & Wildlife Service (USFWS). 2014a. Species Profile, Northern Sea Otter (*Enhydra lutris kenyoni*) website:

http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0HK

USFWS. 2014b. National Wetlands Inventory Mapper website: http://www.fws.gov/wetlands/Data/Mapper.html

Walker, Scott (ADFG). Alaska Department of Fish and Game, Juneau, Alaska. Email dated 30 May 2014, subject: Craig navigation improvements and essential fish habitat.

Appendix A

Section 404(b)(1) Evaluation

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

Navigation Improvements
Craig, Alaska

I. Project Description and Background

A. Location: The project area is in the near-shore environment at the northwest corner of Craig Island (roughly, 55.48°N, 133.16°W), adjacent to the community of Craig, Alaska, and the disused Wards Cover cannery site (figures 1 and 2).

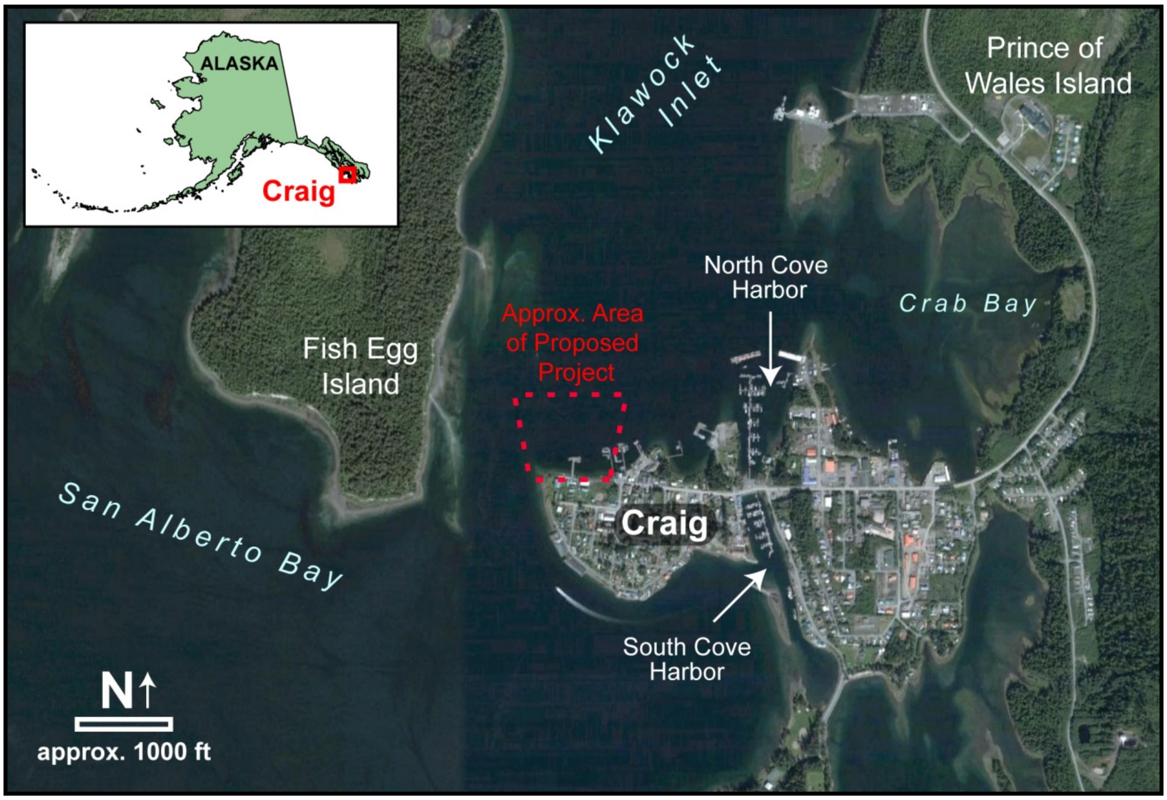

Figure 1. Location and vicinity of the proposed harbor site at Craig, Alaska.

B. General Description: The integrated feasibility report and environmental assessment (FR/EA) to which this evaluation is appended contains a full discussion of the project problems and alternatives. The intent of this project is to provide additional protected moorage space for vessels at Craig, where demand for moorage for commercial, subsistence, and recreational vessels exceeds the current supply. The six construction alternatives discussed in the FR/EA are all placed at the same location, and use rubblemound breakwaters of differing configurations to define harbor basins of 7.5, 10.1,

Figure 2. 2012 aerial view of the proposed project site (view is from the north).

25.1, or 42.5 acres to accommodate different fleet sizes. All of the alternatives avoid the need for dredging, by positioning the mooring basin in sufficiently deep water.

Alternative 2b (figure 3) is the Tentatively Selected Plan. This alternative would require placement of 279,050 cubic yards of rock into the marine environment to create 1,933 combined linear feet of rubblemound breakwater with a footprint of 8.1 acres.

C. Authority: The feasibility study for this project was conducted under authority granted by a resolution adopted on December 2, 1970, by the Committee on Public Works of the U.S. House of Representatives, under House Document No. 414, 83rd Congress, 2nd Session.

D. General Description of Dredged or Fill Material: Construction of the breakwaters under the preferred alternative would require the placement of approximately 31,100 cubic yards of armor rock, 42,650 cubic yards of B rock, and 205,300 cubic yards of core rock. The breakwater would occupy 8.1 acres of submerged land. The rock would be obtained from a local approved source. No dredging would be performed.

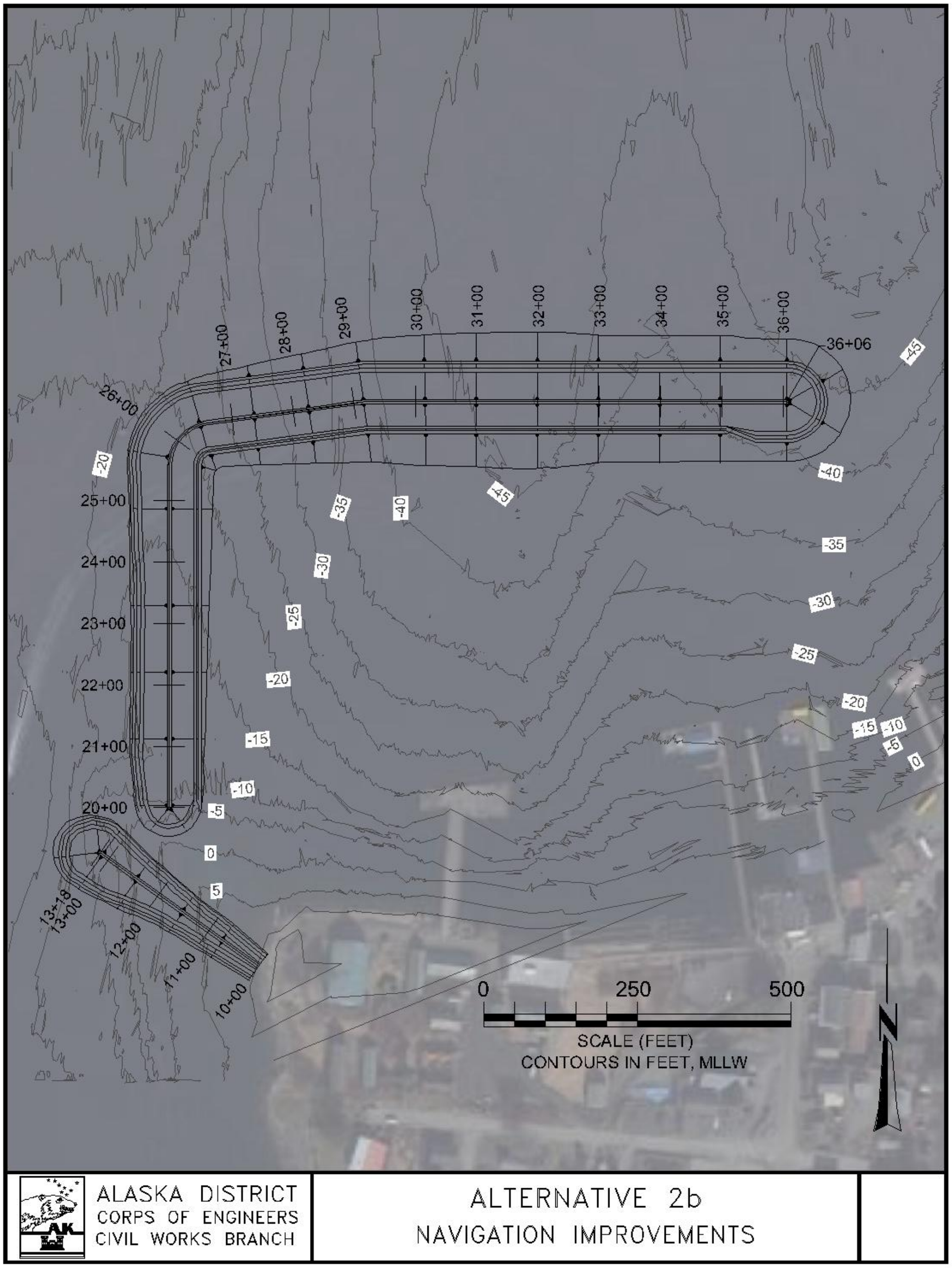

Figure 1. Layout of Alternative 2b, the Tentatively Selected Plan.

E. Description of the Proposed Discharge Site: The west side of the breakwater would take advantage of a submerged rocky or cobble spur extending north from the northwest corner of Craig Island; the exact composition of the substrate in this area is unknown, but is assumed to be coarse or rocky based on the heavy growth of large kelp in the area. The north arm of the breakwater would extend into waters of about 45 feet below mean lower low water (MLLW). The substrate in this area is known from an underwater video survey to consist of shelly, gravelly sand with sparse vegetation.

F. Description of Disposal Method: The rock pieces would be transported to the construction site by barge, and placed into position using an excavator or similar equipment.

II. Factual Determinations

A. Physical Substrate Determinations: The west side of the breakwater would extend along a submerged rocky or cobbly spur extending north from the northwest corner of Craig Island; the exact composition of the substrate in this area is unknown, but is assumed to be coarse based on the heavy growth of large kelp in the area. The north arm of the breakwater would be placed in waters of about 45 feet below MLLW. The substrate in this area is known to consist of shelly, gravelly sand with sparse vegetation.

B. Water Circulation, Fluctuations, and Salinity Determinations: The project alternatives were designed using circulation criteria to minimize environmental degradation associated with harbor improvements. Nece, et al. 1979 “Effects of Planform Geometry on Tidal Flushing and Mixing in Marinas” was adopted as standard practice for estimating harbor basin flushing by use of an average exchange coefficient for one tidal cycle. This work is based on physical model studies of harbor basins of varying geometry and tidal range typical of Puget Sound in the State of Washington; the mean tidal range for the project site at Craig (10 feet) is greater than that for the Puget Sound area (6 feet).

The project alternatives would not affect tidal fluctuation. The hydraulic design examined the potential for storm surge. Storm induced surge can produce short term increases in water level, which can rise to an elevation considerably above tidal levels. Craig experiences low pressure events that could contribute to storm surge, but the water is too deep to stack up and cause a significant surge. A rise in the water elevation due to surge has not been a problem reported at Craig.

The proposed harbor would not enclose the discharge of any freshwater stream, and would not cause changes in salinity versus current ambient levels.

C. Suspended Particulate/Turbidity Determinations: Placement of the bottom course of rock for the breakwaters would loft some bottom sediment into the water column. This increase in turbidity would be short-term and highly localized. The rock itself would have a minimal layer of surficial dust and fines on its surface that would also contribute in a minor way to the short-term, localized increases in turbidity.

D. Contaminant Determinations: The rock placed for the breakwaters would be clean material free of contaminants. Marine sediment nearest the former cannery facilities and the old cannery dock is presumed to contain chemical contamination; no dredging is planned as part of the proposed project. The breakwaters are located well away from the cannery, and sediment lofted by the placement of rock for the breakwater would not be expected to contain contaminants. However, removal of debris, existing pilings from the old cannery pier, and other offshore structures near the cannery may loft contaminated sediment into the water column if not done with care. Cutting or shearing the old pilings instead of pulling them may minimize disturbance of contaminated sediment.

Certain types of high-sulfide rock found on Prince of Wales Island have been found to leach potentially damaging concentrations of acid when crushed and incorporated into structures such as road beds. The exact source of rock to be used for the Craig harbor breakwaters has not yet been selected, but the most likely sources are quarries producing limestone or greywacke, materials which would not be expected to generate acid. The final selection of the rock source will take into account the type of rock and its potential to generate acid leachate, and mineral types with a potential to generate acid will be avoided.

E. Aquatic Ecosystems and Organism Determinations: Marine substrates and habitats in the waters off Craig Island range from rock, to coarse gravel and cobbles, to sand and mud, reflecting the degree of protection from ocean waves afforded a particular location. The southwest and west shoreline is more exposed to swells sweeping up Bucareli Bay from the open ocean, and is more likely to consist of gravel and cobbles. More protected waters, such as the project site in partially enclosed Klawock Inlet, have finer sand and mud substrates. An underwater video survey performed by the Corps in April 2014 found flat shelly sand with sparse clumps of marine algae on the seafloor in the area where the northern arm of the breakwater would be installed. The west arm of the breakwater would lie along a reef extending from the northwest corner of Craig Island. The environment along the reef is not well characterized, but appears to be colonized by large kelp, indicating a rocky or cobble substrate. The marine waters around Craig host extensive beds of eelgrass. A narrow band of eelgrass runs through the project area parallel to the north shore of Craig Island. The western extremity of this eelgrass bed ends at the reef; the west arm of the breakwater has the potential to intrude upon a very small portion of the eelgrass bed, but otherwise the project has been designed to avoid and minimize impacts to the eelgrass.

The underwater survey did not reveal notable numbers of fish or other marine organisms using the general project area, in comparison to highly productive herring spawning habitat along the west shores of Craig Island and Fish Egg Island. A beach seining study at the project site in April 2014 captured a low number of fish, which appeared to be a mix of kelp- and eelgrass-associated species.

The installation of the breakwaters would bury approximately 8 acres of existing submerged habitat consisting of deep-water benthic communities and shallower kelp beds. The breakwaters would permanently replace existing habitat with rocky substrate extending from the seabed to the surface, introducing structure and vertical relief that does not currently exist in the project area.

The breakwaters can be expected to rapidly colonize with marine algae and invertebrate organisms characteristic of rocky intertidal and subtidal habitats, and with different communities than currently exist at the site. Based on studies of rubblemound breakwaters installed in a similar setting near Sitka, Alaska, the revegetated breakwaters at Craig can be expected to offer spawning and rearing opportunities for fish such as Pacific herring superior to what currently exists at the project site.

The preferred alternative includes a fish passage breach that will reduce the breakwater impact on juvenile fish migrating through the near-shore environment. This fish passage feature was designed with input from the U.S. Fish and Wildlife Service, the Alaska Department of Fish and Game, and the National Marine Fisheries Service.

<u>F. Proposed Disposal Site Determinations:</u> No dredging is associated with the proposed project. Construction operations associated with installing the breakwaters would have only a temporary effect on the water column. The proposed action would comply with applicable water quality standards and would have no appreciable detrimental effects on municipal and private water supplies, recreational and commercial fisheries, water-related recreation, or aesthetics.

<u>G. Determination of Cumulative and Secondary Effects on the Aquatic Ecosystem:</u> The new small boat harbor will substantially increase the vessel moorage capacity along the Craig waterfront, with the increased risk of fuel spills and long-term environmental degradation that goes with such development. The fact that the project area has already been affected by a century of commercial use limits the environmental impacts that the project will cause to the immediate area. Most of the north Craig Island waterfront is

already developed for marine transportation and commercial uses; future waterfront development beyond the proposed project would most likely consist of replacement or repurposing of existing facilities. The rehabilitation of the Ward Cove cannery property proposed by the City of Craig, along with the development of a new small boat harbor immediately offshore, would greatly increase the level of human activity at the northwest corner of Craig Island.

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

A. Adaptation of the Section 404 (b)(1) Guidelines to this Evaluation: The proposed project complies with the requirements set forth in the Environmental Protection Agency's Guidelines for Specification of Disposal Sites for Dredged or Fill Material.

B. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem: The principle discharge to waters of the U.S. proposed in this project would be the placement of rock for rubblemound breakwaters. The project requires breakwaters of some type to create a protected harbor basin for boat moorage. The Corps studied the possibility of floating breakwaters, but quickly determined that floating breakwaters would not be effective in the wave environment at Craig.

The Corps studied ten potential harbor sites in the Craig area. Several of the viable sites, including Fish Egg Island, False Island, and Crab Bay, appeared to have greater ecological value than the proposed Wards Cove location, would probably require dredging, and were thus not carried forward for consideration. The Corps determined that dredging of marine sediment was not necessary to construct a harbor at the Wards Cove location, thus avoiding issues with the disturbance and discharge of potentially contaminated sediment, and the destruction of eelgrass beds.

C. Compliance with Applicable State Water Quality Standards: The proposed construction project would not be expected to have an appreciable adverse effect on water supplies, recreation, growth and propagation of fish, shellfish and other aquatic life, or wildlife. It would not be expected to introduce petroleum hydrocarbons, radioactive materials, residues, or other pollutants into the waters near Craig. A temporary increase in turbidity would result from construction activities. The project would comply with State water quality standards. Adherence to water quality standards would be monitored.

D. Compliance with Applicable Toxic Effluent Standards or Prohibition Under Section 307 of the Clean Water Act: No toxic effluents that would affect water quality parameters are associated with the proposed project. Therefore, the project complies with toxic effluent standards of Section 307 of the Clean Water Act.

E. Compliance with Endangered Species Act of 1973: The only ESA-listed species identified as potentially existing in the project area is the humpback whale. The Corps made a determination that the project "may affect, but not adversely affect" humpback whales in a letter emailed to the NMFS on 13 June 2014. The NMFS concurred with this determination in a letter dated 9 July 2014, stating that humpback whales were not likely to be adversely affected by the project. This letter reiterated that ESA-listed Western DPS Steller sea lions are unlikely to be found in the Craig area, and consultation for that species is not required for this project.

F. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection. Research, and Sanctuaries Act of 1972: Not applicable; no marine sanctuaries are present near the project site.

G. Evaluation of Extent of Degradation of the Waters of the United States: There are no municipal or private water supplies or freshwater bodies in the area that could be negatively affected by the proposed project. There would be no significant adverse impacts to plankton, fish, shellfish, or wildlife. The project has been designed to avoid impacts to special aquatic sites in the form of eelgrass beds, and it expected to have no or very minor effects on the eel grass beds in the project area.

H. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Environment: Incorporating the following avoidance, minimization, and conservation measures into the proposed project would help to ensure that no significant adverse impacts will occur.

- The Corps will construct the harbor without dredging marine sediment, thus avoiding issues with the disturbance and discharge of potentially contaminated sediment, and keeping damage to eelgrass beds to insignificant levels.

- In-water work between March 15 and June 15 will be avoided. This period coincides with the peak herring spawn and juvenile salmon out-migration activities, when humpback whales and other marine mammals are most likely to be in the project area.

- Fish passage will be incorporated into the breakwater design, in a manner that does not impair the effectiveness of the breakwater.

- Project vessels will be limited to a speed of 8 knots to reduce the risk of collisions with protected species.

- Workers conducting in-water construction will be instructed to watch for marine animals, and cease work if an animal approaches within 50 meters.

- The selected contractor will include an Oil Spill Prevention and Control Plan in its Environmental Protection Plan, which is submitted to the Corps for review and approval.

I. On the Basis of the Guidelines the Proposed Site for the Discharge of Fill Material is: Specified as complying with the requirements of these guidelines, with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects on the aquatic ecosystem.

FINDING OF COMPLIANCE
FOR

Navigation Improvements

Craig, Alaska

1. No significant adaptations of the guidelines were made relative to this evaluation.

2. The principle discharge to waters of the U.S. proposed in this project would be the placement of rock for rubblemound breakwaters; the project requires breakwaters to create a protected harbor basin for boat moorage. The Corps studied ten potential harbor sites in the Craig area. Several of the viable sites, including Fish Egg Island, False Island, and Crab Bay, appeared to have greater ecological value than the proposed Wards Cove location, and would probably require dredging. The selected Wards Cove location has been previously impacted by cannery operations; the location would not require dredging, and can therefore avoid issues with the disturbance and discharge of potentially contaminated sediment, and minimize impacts to eelgrass beds.

3. The planned discharge would not violate any applicable State water quality standards, nor violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

4. Use of the selected disposal site will not harm any endangered species or their critical habitat.

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

6. Appropriate steps to minimize potential adverse impacts of the discharge on aquatic systems include: avoidance of dredging; incorporation of fish passage; suspension of in-water work during herring spawn and salmon out-migration (March 15 to June 15); monitoring for marine animals during construction; safe vessel practices to minimize risk of collisions, chemical releases, and other impacts to marine organisms and the environment.

7. On the basis of the guidelines the proposed site of construction and discharge is specified as complying with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects to the aquatic ecosystem.

Appendix B

Essential Fish Habitat Assessment

ESSENTIAL FISH HABITAT ASSESSMENT

NAVIGATION IMPROVEMENTS
CRAIG, ALASKA

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December 2014

ESSENTIAL FISH HABITAT ASSESSMENT

Navigation Improvements
Craig, Alaska

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

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

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

Project Purpose
The purpose of the proposed action is to construct additional protected vessel moorage space at Craig, Alaska.

Project Authority
The feasibility study for this project was conducted under authority granted by a resolution adopted on December 2, 1970, by the Committee on Public Works of the U.S. House of Representatives, under House Document No. 414, 83rd Congress, 2nd Session.

Project Area Description
The project area is in the near-shore marine environment at the northwest corner of Craig Island (roughly, 55.48°N, 133.16°W), adjacent to the community of Craig, Alaska, and the disused Wards Cover cannery site (figure 1).

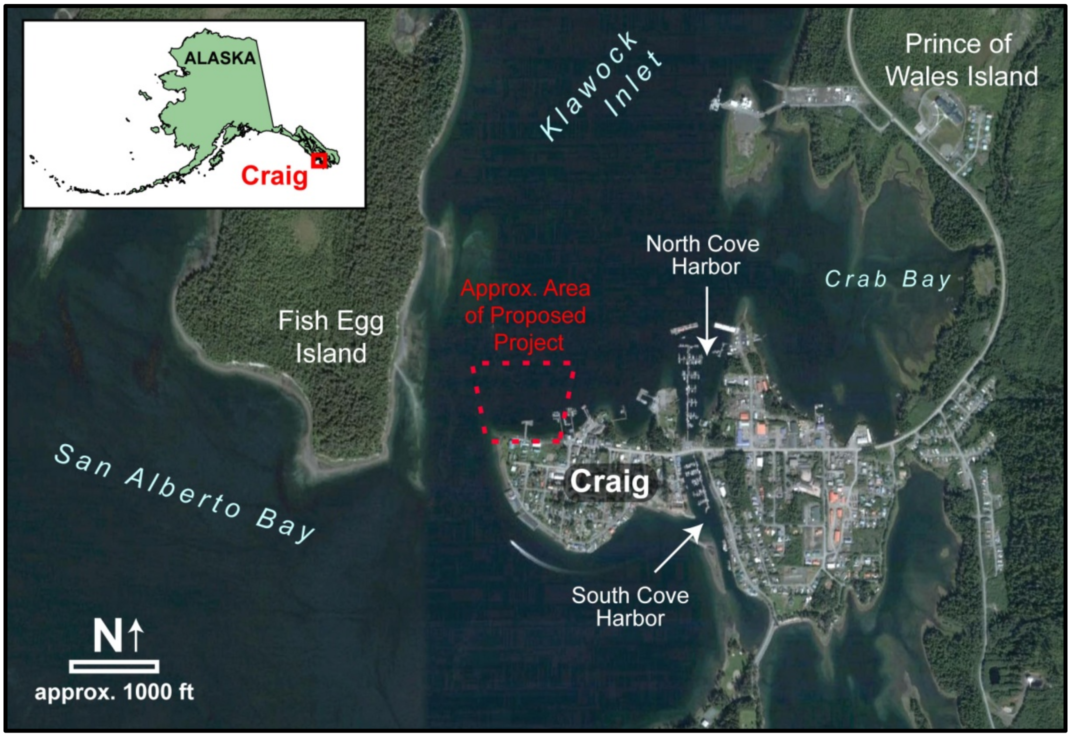

Figure 1. Project site location

Marine substrates and habitats in the waters off Craig Island range from rock, to coarse gravel and cobbles, to sand and mud, reflecting the degree of protection from ocean waves . The southwest and west shoreline is more exposed to swells sweeping up Bucareli Bay from the open ocean, and is more likely to consist of gravel and cobbles. More protected waters, such as the project site in partially enclosed Klawock Inlet, have finer sand and mud substrates. Eelgrass (*Zostera marina*) is found throughout the waters offshore of Craig wherever a suitable substrate (generally fine material such as silt or sand) and adequate sunlight allow it to grow; narrow bed of eelgrass runs through the project area parallel to the north shore of Craig Island. Large kelp species dominate the more rocky or cobble-surfaced seabed along the west and south shore of Craig Island.

An underwater video survey performed by the Corps in April 2014 obtained images along two transects running from near the north shoreline to roughly 700 feet off shore (figure 2). A narrow band of eelgrass was found running parallel to shore just below mean lower low water (MLLW). The eelgrass transitioned abruptly to a dense bed of short-stiped, broad-bladed kelp (thought to be *Saccharina latissima*, commonly known as sugar kelp). The kelp formed an uninterrupted carpet on the seafloor for a few hundred feet. At roughly 450 feet from shore, the brown algae became discontinuous and bottom sediment of sand and shell fragments became visible. As the transect moved further offshore, the algae gradually became more sparse, although algae were still visible when the transect ended about 700 feet from shore in waters approximately 45 feet in depth.

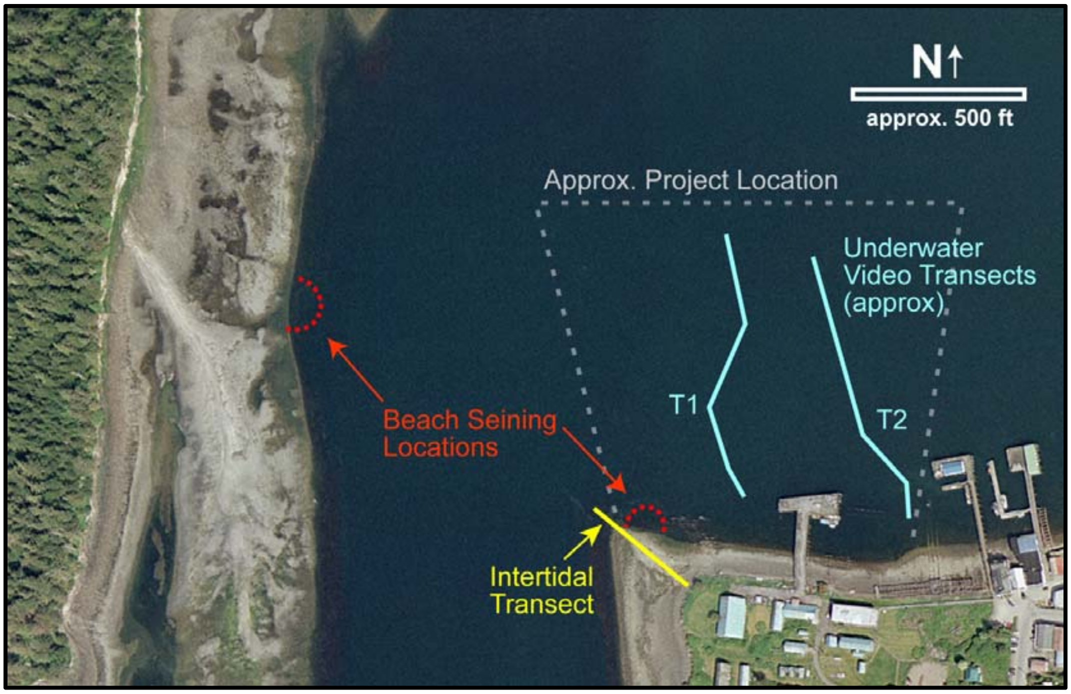

Figure 2. April 2014 study areas

The April 2014 underwater video survey was not able to confirm the western extent of eelgrass present within the project area. However, observations of site conditions suggest that the western extent of the eelgrass bed is similar what was found by the 1998 survey. A reef extends from the northwestern point toward the channel between Craig and Fish Egg Islands. The reef is vegetated with large kelp, (likely *Macrocystis pyrifera*). The heavy growth of kelp indicates very coarse sediment exists along the reef, which would not be suitable substrate for eelgrass. On 16 April 2014 Corps personnel and the City of Craig Harbormaster used a beach seine to capture and examine near-shore fish at two locations in or near the project location. The seine was 37 meters long and composed of tapering panels with mesh sizes ranging from 32mm in the outer panels to 3.2mm at the center. The net was deployed by holding one end on shore while using a skiff to unfurl the net out away from the beach, then bring the other end back to shore about 60 feet away from the starting point. The two ends of the seine were then carefully hauled in to shore, trapping fish and other organisms within the net. The captured fish and other organisms were quickly transferred to aerated buckets of seawater for examination.

The existing pilings and debris within the project area greatly limited the locations within the project area where the seine could be utilized. Therefore, the two locations utilized were the northwest point of Craig Island and the eastern shore of Fish Egg Island. The habitat at the Craig Island location was a mix of eelgrass and small brown algae. The Fish Egg Island location was predominantly eelgrass. The results of this effort are shown in table 1.

Table 1: Results of Beach Seining

NW Point of Craig Island – Species	**Number and Size Range Caught**
Kelp perch	4 (67-116 mm)
Tubesnout	5 (123-154 mm)
Pipefish	3 (130-289 mm)
Pink salmon, juvenile	6 (28-42 mm)
Chum salmon, juvenile	1 (45 mm)
Pinpoint Gunnel	1 (310 mm)
Sculpin sp.	6 (17-69 mm)
Hair Crab	3 (17-80 mm)
Unidentified crab	1 (8 mm)
Shrimp (Mysid)	~ 100 (~10-25 mm)
Amphipod	numerous
Fish Egg Island Location – Species	
Pink salmon, juvenile	1 (35 mm)
Chum salmon, juvenile	2 (40-42 mm)
Tubesnout	5 (125-254 mm)
Silverspot sculpin	4 (22-110 mm)
Shrimp (Mysid)	numerous (~10-25 mm)

The seine snagged on a rock at Fish Egg Island, delaying the collection of the captured fish and may have resulted in a lower catch. The species collected at the Craig Island site reflected its mixed-habitat with kelp-associated species such as Kelp Perch collected in similar numbers as eelgrass-associated species such as tubesnout and pipefish.

Figure 3: Kelp Perch (left) and Pipefish (right) caught at the project site

A larger-scale beach seining study was performed in 2000 by NMFS fishery biologists working from several locations in Klawock Inlet. The seine hauls for that study captured many of the same species seen at the project site in 2014 but yielded greater numbers and diversity of species than those caught at the project site. Species caught during those efforts included juvenile rockfish and flatfish. The NMFS study compared seine catches at sites with eelgrass versus sites with kelp or filamentous algae and conluded that eelgrass and kelp habitats were both important habitat with comparable species richness, but appeared to host fish at different life stages. The youngest salmon and rockfish juveniles appeared to prefer eelgrass but larger juveniles moved into deeper waters and other habitats such as kelp forests. The study concluded it is possible that very young juvenile fish prefer eelgrass because of lower currents and wave action rather than the eelgrass itself.

No herring were caught in the April 2014 seining study. There is a notable herring spawn in the Craig area, generally between mid-March and mid-May, on rockweed, eelgrass and kelp in the intertidal and subtidal zones between +12 feet and -30 feet MLLW. Spawning areas surround Cemetery Island along the west side of Craig Island, in Crab Bay, and on the seaward shore of Fish Egg Island. Adult herring form large winter concentrations in certain bays. ADFG biologist Scott Walker stated that herring seem to avoid the developed northern shore of Craig Island but spawn in the kelp beds on the western shore immediately to the south of the project area.

Herring spawning occurs on rockweed, eelgrass and kelp in the intertidal and subtidal zones between +12 feet and -30 feet MLLW. Spawning areas surround Cemetery Island along the west side of Craig Island, in Crab Bay, and on the seaward shore of Fish Egg Island. Adult herring form large winter concentrations in certain bays. Concentrations are known to occur in the entrance to Trocadero Bay but smaller concentrations also occur in the aforementioned spawning areas. Winter bait fish are caught off the shoreline of Fish Egg Island (City of Craig 2006a). ADFG biologist Scott Walker stated that herring seem to avoid the developed northern shore of Craig Island but spawn in the kelp beds on the western shore immediately to the south of the project area (Walker 2014; City of Craig 2006).

Essential Fish Habitat

NMFS authority to manage EFH is directly related to those species covered under Fishery Management Plans (FMPs) in the United States. The proposed navigation improvement project is within an area designated as EFH for all five species of Pacific salmon, in all their life stages (NMFS 2014):

- Chinook salmon
- Coho salmon
- Pink salmon
- Chum salmon
- Sockeye Salmon

See Appendix B for a description of essential habitat for Pacific salmon. No EFH “habitat areas of particular concern” are in the Corps’ project area.

Assessment of Project Effects on Essential Fish Habitat

Short-term impacts include water quality impacts in the form of increased levels of turbidity, noise from construction operations, pollution in the form of fuel or oils spilled from the dredging equipment, noise from the construction equipment, and disturbance from the movement of equipment through the area.

Short-term Impacts

Water Quality. During the removal of the existing piles and construction of the new breakwater, there is likely to be a temporary increased concentration of suspended sediment within the water column. Placement of the breakwater's base rock will loft sediment into the water column and residual fines on the surface of core and armor rock will also contribute to temporary localized increases in turbidity. However, given the poor condition of the existing piles, it is possible that they could simply be cut or broken at the seabed rather than being extracted. This could reduce the amount of sediment disturbed during removal. Since the existing pilings are located in an area assumed to contain contaminated sediments, minimization of sediment disturbance during demolition is a significant consideration.

Certain types of high-sulfide rock found on Prince of Wales Island have been found to leach potentially damaging concentrations of acid when crushed and incorporated into structures such as road beds. The exact source of rock to be used for the Craig harbor breakwaters has not yet been selected, but the most likely sources are quarries producing limestone or greywacke, materials which would not be expected to generate acid. The final selection of the rock source will take into account the type of rock and its potential to generate acid leachate, and mineral types with a potential to generate acid will be avoided.

Pollution. Fuel and lubricants on the construction vessels are potential sources of spills into the marine environment. The contractor would be required to prepare a spill prevention and response plan and have appropriate spill response materials at the work site.

Waterborne Noise. Fish may be affected and displaced by noise from construction vessels and the placement of rock for the breakwaters. No blasting or pile-driving is anticipated as part of the Federal project, so injurious high-amplitude underwater noise should not result from construction. The placement of rock in the water for the creation of the breakwaters would generate relatively low-amplitude underwater noise likely to cause fish to temporarily move away from the construction site. The noise generated by barges and tugs in transit to and from the work area would be similar to that generated by routine small vessel traffic in the shipping lanes.

Construction-Related Vessel Traffic. The project site is adjacent to an existing busy waterfront area; the construction vessel and barge traffic related to the project would be similar to and an incremental increase over existing vessel traffic.

Long-Term Impacts

Loss and Conversion of Marine Habitat. The installation of the breakwaters would eliminate approximately 8 acres of existing submerged habitat consisting of a combination deep-water benthic communities and shallower kelp beds. The placement of the breakwaters would avoid to the extent practicable the narrow band of eelgrass that runs parallel to shore through the project area; the narrow, sparse bed of eelgrass in the project area is not thought to contribute significantly to salmon EFH. The breakwaters would permanently replace existing habitat with rocky substrate extending from the seabed to the surface, introducing structure and vertical relief that does not currently exist in the project area. The breakwaters can be expected to rapidly colonize with marine algae and invertebrate organisms characteristic of rocky intertidal and subtidal habitats, and with different communities than currently exist at the site. These organisms would include stalked marine algae such as *Fucus* and kelps, barnacles, mussels, anemones, and sea stars. The growth of sessile organisms on the breakwater surface would provide food and cover for shrimp and fish. Based on studies of rubblemound breakwaters installed in a similar setting near Sitka, Alaska (Brockmann and Grossman 2005), the revegetated breakwaters at Craig can be expected to offer habitat for fish such as Pacific herring superior to what currently exists at the project site.

The project area does not contain salmon spawning habitat, and has limited value as juvenile fish rearing habitat. It is most likely to be used by salmon as a migration corridor to and from Crab Creek and other anadromous streams in the region, and its shallow near-shore waters may serve as protection from predators. Fish passage in the near-shore environment is an important consideration. The proposed breakwater has the potential to negatively affect salmon movement through the near-shore environment, by diverting salmon into deeper water and lengthening the travel distance to migrate through the area. The preferred alternative includes a fish-passage gap in the breakwater to minimize the project impact on fish movements. The fish-passage was designed using input from the U.S. Fish and Wildlife Service, Alaska Department of Fish and Game, and the National Marine Fisheries Service (Brockman 2014).

Water Quality. The new small boat harbor will substantially increase the vessel moorage capacity along the Craig waterfront, with the increased risk of fuel spills and long-term environmental degradation that goes with such development.

Avoidance and Minimization of Impacts. Planned measures to limit the project's impact on fish habitat include:

- The project will not include dredging of the harbor basin, in order to preserve the eelgrass beds present within the project area, and to avoid disturbing contaminated sediments.

- The breakwater design will incorporate fish passage to limit the affects of the breakwater on near-shore fish movements.

- To the extent practicable, work below the high tide line will be limited to low tidal stages to reduce turbidity.

- Project vessels will be limited to a speed of 8 knots to reduce the risk of collisions with protected species.

- In-water work between March 15 and June 15 will be avoided. This period coincides with the peak herring spawn and juvenile salmon out-migration activities, when humpback whales and other marine mammals are most likely to be in the project area.

- The selected contractor will include an Oil Spill Prevention and Control Plan in its Environmental Protection Plan, which is submitted to the Corps for review and approval.

Conclusions and Determination of Effect.
The major impact to EFH from the proposed project would be the breakwater's potential to restrict the movement of marine juvenile and adult salmon through the near-shore environment. The inclusion of effective fish passage in the breakwater would substantially diminish this impact. The rock structure of the breakwater is expected to colonize with marine algae within several years of installation, and provide potentially valuable feeding habitat and cover for juvenile salmon in an area where little currently exists.

References.

City of Craig. 2006a. Craig Coastal Management Program. April 2006.

Brockman, Steve, and Grossman, Ed. 2005. A Survey of Herring Spawning Habitat on the New Thompson Harbor Breakwaters, Sitka, Alaska, prepared by U.S. Fish and Wildlife Service, Juneau Office, Southeast Alaska, for U.S. Army Corps of Engineers Alaska District. June 9-12 2005.

Brockman, Steve (USFWS). 2014. Email communication dated 16 Oct 2014, subject: Craig Nav Improvements - fish passage maximum depth and distance?

National Marine Fisheries Service (NMFS). 2013. Alaska Region Essential Fish Habitat (EFH) website, http://www.fakr.noaa.gov/habitat/efh.htm

Walker, Scott (ADFG). Email communication dated 30 May 2014, subject: Craig navigation improvements and essential fish habitat.

Attachment A
Description of Navigation Improvements
Craig, Alaska

The intent of this project is to provide additional protected moorage space for vessels at Craig, where demand for moorage for commercial, subsistence, and recreational vessels exceeds the current supply. The six construction alternatives discussed in the FR/EA are all placed at the same location, and use rubblemound breakwaters of differing configurations to define harbor basins of 7.5, 10.1, 25.1, or 42.5 acres to accommodate different fleet sizes. All of the alternatives avoid the need for dredging, by positioning the mooring basin in sufficiently deep water. Alternative 2b (figure A-1) is the Tentatively Selected Plan. This alternative would require placement of 279,050 cubic yards of rock into the marine environment to create 1,933 combined linear feet of rubblemound breakwater with a footprint of 8.1 acres.

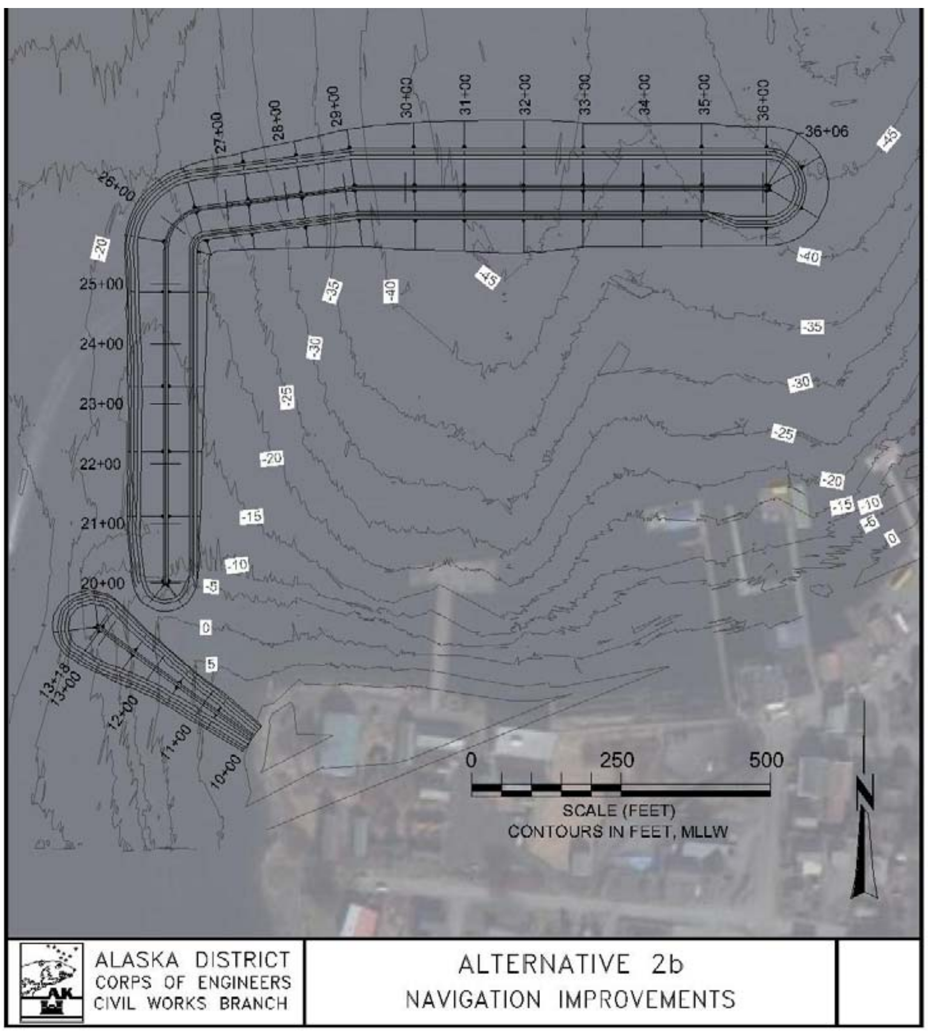

Figure A-1. Layout of Alternative 2b, the Tentatively Selected Plan.

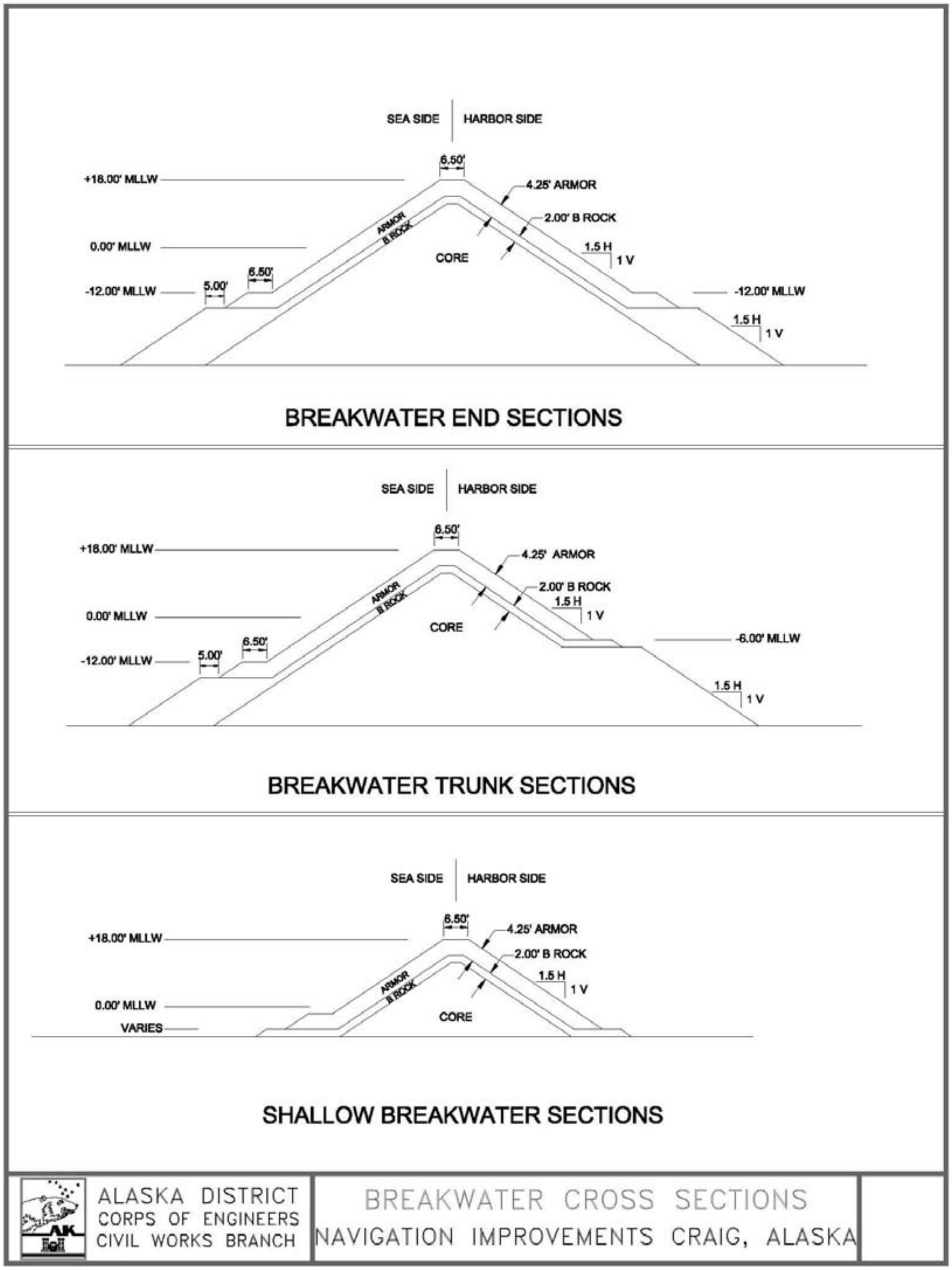

Figure A-2. Typical breakwater cross sections.

Alternative 2b includes a fish-passage gap in the breakwater to minimize the project impact on fish movements. The fish-passage was designed using input from the U.S. Fish and Wildlife Service, Alaska Department of Fish and Game, and the National Marine Fisheries Service.

The project location is offshore of the former Wards Cove cannery. The existing pier, dock, boatway, and numerous pilings would be removed prior to construction, as well as substantial debris from the intertidal and subtidal zones. Rock for the breakwater would be obtained from local established quarries, and brought to the project size by barge.

Figure 2. 2012 aerial view of the proposed project site (view is from the north).

Attachment B

Descriptions of Essential Fish Habitat
in the vicinity of Craig, Alaska

Alaska Stocks of Pacific Salmon

<u>Pink Salmon</u>

Freshwater Eggs
EFH for pink salmon eggs is the general distribution area for this life stage, located in gravel substrates in those waters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes.*

Freshwater Larvae and Juveniles
EFH for larval and juvenile pink salmon is the general distribution area for this life stage, located in those waters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes* and contiguous rearing areas within the boundaries of ordinary high water during the spring, generally migrate in darkness in the upper water column. Fry leave streams in within 15 days and the duration of migration from a stream towards sea may last 2 months.

Estuarine Juveniles
Estuarine EFH for juvenile pink salmon is the general distribution area for this life stage, located in estuarine areas, as identified by the salinity transition zone (ecotone) and the mean higher tide line, within near-shore waters and generally present from late April through June.

Marine Juveniles
Marine EFH for juvenile pink salmon is the general distribution area for this life stage, located in all marine waters off the coast of Alaska from the mean higher tide line to the 200-nautical-mile (nm) limit of the U.S. Exclusive Economic Zone (EEO), including the Gulf of Alaska (GOA), Eastern Bering Sea (EBS), Chukchi Sea, and Arctic Ocean.

Marine Immature and Maturing Adults
EFH for immature and maturing adult pink salmon is the general distribution area for this life stage, located in marine waters off the coast of Alaska to depths of 200 m and range from the mean higher tide line to the 200-nm limit of the U.S. EEO, including the GOA, EBS, Chukchi Sea, and Arctic Ocean. Mature adult pink salmon frequently spawn in intertidal areas and are known to associate with smaller coastal streams.

Freshwater Adults
EFH for pink salmon is the general distribution area for this life stage, located in freshwaters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration*

of Anadromous Fishes and wherever there are spawning substrates consisting of medium to course gravel containing less than 15 percent fine sediment (less than 2-mm-diameter), 15 to 50 cm in depth from June through September.

Chum Salmon

Freshwater Eggs

EFH for chum salmon eggs is the general distribution area for this life stage, located in gravel substrates in those waters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes*.

Freshwater Larvae and Juveniles

EFH for larval and juvenile chum salmon is the general distribution area for this life stage, located in those waters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes* and contiguous rearing areas within the boundaries of ordinary high water and contiguous rearing areas within the boundaries of ordinary high water during the spring. Juveniles generally migrate in darkness in the upper water column. Fry leave streams within 15 days and the duration of migration from a stream towards sea may last 2 months
.

Estuarine Juveniles

Estuarine EFH for juvenile chum salmon is the general distribution area for this life stage, located in estuarine areas, as identified by the salinity transition zone (ecotone) and the mean higher tide line, within near-shore waters from late April through June.

Marine Juveniles

Marine EFH for juvenile chum salmon is the general distribution area for this life stage, located in all marine waters off the coast of Alaska to approximately 50 m in depth from the mean higher tide line to the 200-nm limit of the EEO, including the GOA, EBS, Chukchi Sea, and Arctic Ocean.

Marine Immature and Maturing Adults

EFH for immature and maturing adult chum salmon is the general distribution area for this life stage, located in marine waters off the coast of Alaska to depths of 200 m and ranging from the mean higher tide line to the 200-nm limit of the EEO, including the GOA, EBS, Chukchi Sea, and Arctic Ocean.

Freshwater Adults

EFH for chum salmon is the general distribution area for this life stage, located in freshwaters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes* and wherever there are spawning substrates consisting of medium to course gravel containing less than 15 percent fine sediment (less than 2-mm diameter); finer substrates can be used in upwelling areas of streams and sloughs from June through January.

Sockeye Salmon

Freshwater Eggs
EFH for sockeye salmon eggs is the general distribution area for this life stage, located in gravel substrates in those waters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes*.

Freshwater Larvae and Juveniles
EFH for larval and juvenile sockeye salmon is the general distribution area for this life stage, located in those waters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes* and contiguous rearing areas within the boundaries of ordinary high water. Juvenile sockeye salmon require year-round rearing habitat. Fry generally migrate downstream to a lake or, in systems lacking a freshwater lake, to estuarine and riverine rearing areas for up to 2 years. Fry out migration occurs from approximately April to November and smolts generally migrate during the spring and summer.

Estuarine Juveniles
Estuarine EFH for juvenile sockeye salmon is the general distribution area for this life stage, located in estuarine areas, as identified by the salinity transition zone (ecotone) and the mean higher tide line, within near-shore waters. Under-yearling, yearling, and older smolts occupy estuaries from March through early August.

Marine Juveniles
Marine EFH for juvenile sockeye salmon is the general distribution area for this life stage, located in all marine waters off the coast of Alaska to depths of 50 m and range from the mean higher tide line to the 200-nm limit of the U.S. EEO, including the GOA, EBS, Chukchi Sea, and Arctic Ocean from midsummer until December of their first year at sea.

Marine Immature and Maturing Adults
EFH for immature and maturing adult sockeye salmon is the general distribution area for this life stage, located in marine waters off the coast of Alaska to depths of 200 m and range from the mean higher tide line to the 200-nm limit of the U.S. EEO, including the GOA, EBS, Chukchi Sea, and Arctic Ocean.

Freshwater Adults
EFH for sockeye salmon is the general distribution area for this life stage, located in freshwaters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes* and wherever there are spawning substrates consisting of medium to course gravel containing less than 15 percent fine sediment (less than 2-mm diam.). Finer substrates can be used in upwelling areas of streams and sloughs from June through September. Sockeye often spawn in lake substrates as well as in streams.

Chinook Salmon

Freshwater Eggs
EFH for Chinook salmon eggs is the general distribution for this life stage, located in gravel substrates in those waters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes.*

Freshwater Larvae and Juveniles
EFH for larval and juvenile Chinook salmon is the general distribution area for this life stage, located in those waters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes* (ADF&G 1998a) and contiguous rearing areas within the boundaries of ordinary high water. Juvenile Chinook salmon out-migrate from freshwater areas in April toward the sea and may spend up to a year in major tributaries or rivers, such as the Kenai, Yukon, Taku, and Copper Rivers.

Estuarine Juveniles
Estuarine EFH for juvenile Chinook salmon is the general distribution area for this life stage, located in estuarine areas, as identified by the salinity transition zone (ecotone) and the mean higher tide line, within near-shore waters. Chinook salmon smolts and post-smolt juveniles may be present in these estuarine habitats from April through September.

Marine Juveniles
Marine EFH for juvenile Chinook salmon is the general distribution area for this life stage, located in all marine waters off the coast of Alaska from the mean higher tide line to the 200-nm limit of the EEO, including the GOA, EBS, Chukchi Sea, and Arctic Ocean. Juvenile marine Chinook salmon are at this life stage from April until annulus formation in January or February during their first winter at sea.

Marine Immature and Maturing Adults
EFH for immature and maturing adult Chinook salmon is the general distribution area for this life stage, located in marine waters off the coast of Alaska and ranging from the mean higher tide line to the 200-nm limit of the U.S. EEO, including the GOA, EBS, Chukchi Sea, and Arctic Ocean.

Freshwater Adults
EFH for adult Chinook salmon is the general distribution area for this life stage, located in fresh waters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes* wherever there are spawning substrates consisting of gravels from April through September.

<u>Coho Salmon</u>

Freshwater Eggs

EFH for coho salmon eggs is the general distribution area for this life stage, located in gravel substrates in those waters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes*.

Freshwater Larvae and Juveniles

EFH for larval and juvenile coho salmon is the general distribution area for this life stage, located in those waters identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes* and contiguous rearing areas within the boundaries of ordinary high water. Fry generally migrate to a lake, slough, or estuary and rear in these areas for up to 2 years.

Estuarine Juveniles

Estuarine EFH for juvenile coho salmon is the general distribution area for this life stage, located in estuarine areas, as identified by the salinity transition zone (ecotone) and the mean higher tide line, within near-shore waters. Juvenile coho salmon require year-round rearing habitat and also migration habitat from April to November to provide access to and from the estuary.

Marine Juveniles

Marine EFH for juvenile coho salmon is the general distribution area for this life stage, located in all marine waters off the coast of Alaska from the mean higher tide line to the 200-nm limit of the U.S. EEO, including the GOA, EBS, Chukchi Sea, and Arctic Ocean.

Marine Immature and Maturing Adults

EFH for immature and maturing adult coho salmon is the general distribution area for this life stage, located in marine waters off the coast of Alaska to 200 m in depth, and ranges from the mean higher tide line to the 200-nm limit of the U.S. EEO, including the GOA, EBS, Chukchi Sea, and Arctic Ocean.

Freshwater Adults

EFH for coho salmon is the general distribution area for this life stage, located in freshwaters as identified in ADF&G's *Catalogue of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes* and wherever there are spawning substrates consisting mainly of gravel containing less than 15 percent fine sediment (less than 2-mm diameter) from July to December.

Appendix C

Hydraulics and Hydrology

APPENDIX C

HYDRAULIC DESIGN

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1.0 INTRODUCTION

1.1 Appendix Purpose

This appendix describes the hydraulic design of the Craig Navigation Improvement Project. It provides the background for determining the Federal interest in the major construction features including breakwater construction dredging, and operation and maintenance.

1.2 Project Purpose

The purpose of this study is to identify a design to provide safe and efficient moorage for the design fleet identified in this study. Improvements were screened to ensure the navigation improvement measures were evaluated in detail for the National Economic Development (NED) and locally preferred plan.

1.3 Description of Project Area

Craig is located on a small Island off the west coast of Prince of Wales Island (Figure 1). It is 56 air miles northwest of Ketchikan, 750 miles north of Seattle, and 220 miles south of Juneau.

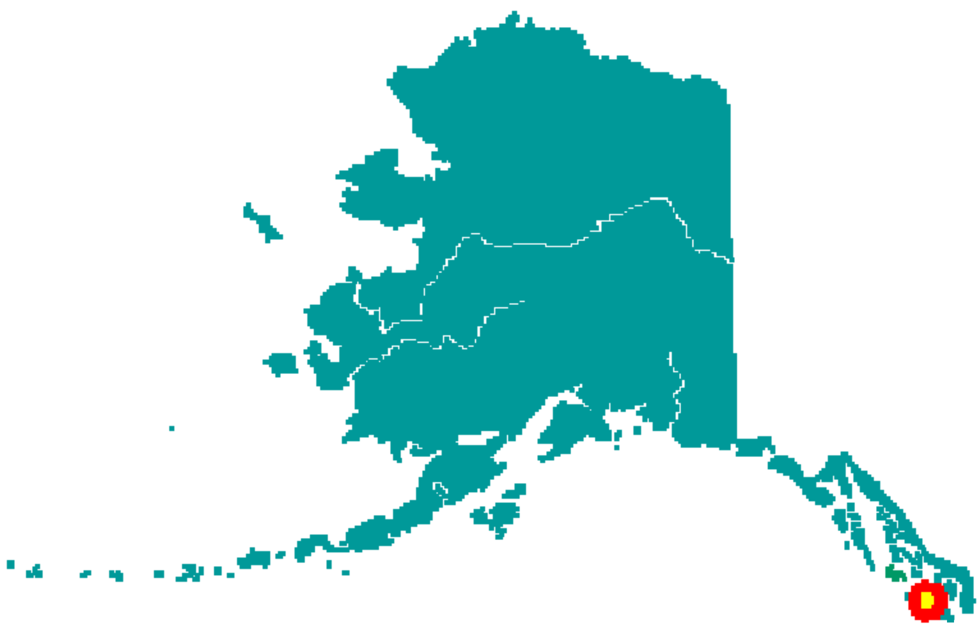

Figure 1 State of Alaska location map with location of Craig.

2.0 CLIMATOLOGY, METEOROLOGY, HYDROLOGY

2.1 Temperature and Precipitation

Craig (Figure 2) is dominated by a cool, moist, maritime climate. Summer temperatures range from 49-63^{o} F. Winter temperatures range from 32 to 42^{o} F. Average annual precipitation is 120 inches, and average annual snowfall is 40 inches (**Table** 1).

Figure 2 Craig's location on Prince of Wales Island

Table 1 Monthly Climate Summary CRAIG, ALASKA (502227)

Period of Record : 9/ 2/1949 to 9/30/2012

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	39.4	41.4	43.1	49.3	55.0	60.1	62.5	63.5	59.2	51.8	44.6	41.7	51.0
Average Min. Temperature (F)	29.6	31.4	31.9	36.2	41.6	47.5	51.2	51.4	48.3	42.0	35.7	33.0	40.0
Average Total Precipitation (in.)	8.24	8.40	8.07	7.41	5.38	3.05	4.13	6.02	10.17	13.06	12.29	10.80	97.04
Average Total SnowFall (in.)	5.1	6.3	5.8	0.4	0.0	0.0	0.0	0.0	0.0	0.0	1.9	3.0	22.5
Average Snow Depth (in.)	1	0	0	0	0	0	0	0	0	0	0	0	0

2.2 Ice Conditions

Craig is ice free year round.

2.3 Tides

Craig is in an area of semi-diurnal tides with two high waters and two low waters each lunar day. The tidal parameters in Table 2 were determined using National Oceanic and Atmospheric Administration published data. The tide data is based on observations made during the months May through June 2007. There was no reported highest observed water level and no lowest observed water level.

Table 2 Tidal Parameters – Craig

Parameter	Elevation (ft)
Highest Astronomical Tide	12.59
Mean Higher High Water (MHHW)	10.17
Mean Sea Level (MSL) *	5.34
Mean Tide Level (MTL) **	5.35
Mean Lower Low Water (MLLW)	0.00
Lowest Astronomical Tide	-2.95

*MSL The arithmetic mean of hourly heights observed over the National Tidal Datum Epoch. Shorter series are specified in the name; e.g. monthly mean sea level and yearly mean sea level.
**MTL The arithmetic mean of mean high water and mean low water.

2.4 Currents

Current data was collected by NOAA off Fish Egg Island from 26 April 2009 through 7 June 2009 (Figure 3). The data collected during that time period indicates that currents can reach up to 1.26 knots (Figure 4). Average current velocities associated with approximate depths are shown in Table 3. No data is available for current velocities in the fall when storms in the Gulf of Alaska are more common.

Over the 28 year period from 1986 to 2014, the highest predicted flood current was 1.5 knots, and the highest predicted ebb current was 1.9 knots, using the Tides and Currents for Windows program.

Figure 3 Location of current meter

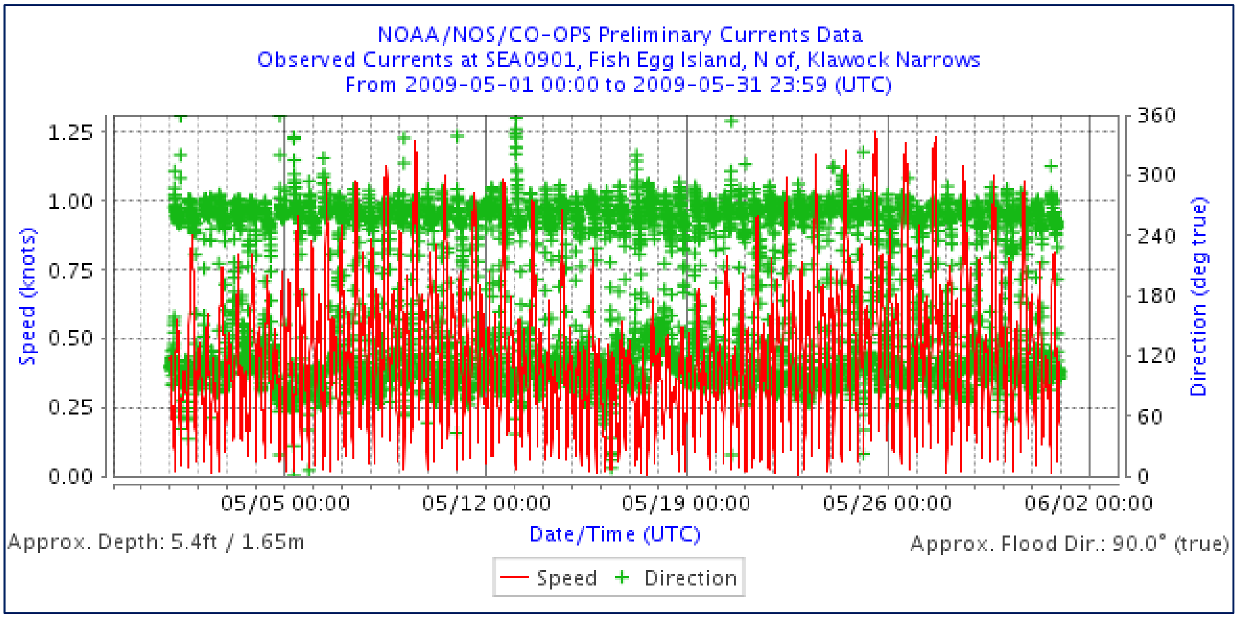

Figure 4. Sample data from May 2009

Table 3 Average Current Velocity

Fish Egg Island, N of, Klawock Narrows (SEA0901) Deployed (UTC): 2009-04-26 18:11:00 to 2009-06-07 17:07:00						
Approximate Depth	5.4 ft	15.3 ft	25.1 ft	34.9 ft	44.8 ft	54.6 ft
Average Velocity [knots]	0.44	0.40	0.38	0.35	0.33	0.30

2.5 Water Level

The effect of an increase in water level needs to be evaluated when designing a navigation project. Water level increase is typically a result of wave set up, storm surge, and tide. Relative sea level rise is a longer term increase in water level and its effects on a project is an additional factor that needs to be considered in a breakwater design.

Wave Setup
Wave setup is the water level rise at the coast caused by breaking waves. The breakwaters evaluated for this project extend beyond the area of breaking waves so wave set up was not considered in the calculations for the Craig Navigation Improvement project.

Storm Surge
Storm surge is an increase in water elevation caused by a combination of relatively low atmospheric pressure and wind driven transport of seawater over relatively shallow and large unobstructed waters. Friction at the air-sea interface is increased when the air is colder than the water, which causes more wind-driven transport. Storm induced surge can produce short term increases in water level, which can rise to an elevation considerably above tidal levels. Craig experiences low pressure events that could contribute to storm surge, but the water is too deep to stack up and cause a significant surge. A rise in the water elevation due to surge has not been a problem reported at Craig, so no storm surge was used in the calculations for the project.

Tide
The mean higher high tide of 10.17 feet was used for the high water elevation.

Sea Level Rise
The Corps of Engineers requires that planning studies and engineering designs over the project life cycle, for both existing and proposed projects consider alternatives that are formulated and evaluated for the entire range of possible future rates of sea-level change (SLC), represented by three scenarios of “low,” “intermediate,” and “high” sea-level change. 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 National Research Council’s (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 sea-level change 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 the Intergovernmental Panel on Climate Change (IPCC) estimates from both 2001 and 2007 to accommodate potential rapid loss of ice from Antarctica and Greenland.

NRC Equations

The 1987 NRC described these three scenarios using the following equation:

$$E(t) = 0.0012t + bt^2$$

in which t represents years, starting in 1986, b is a constant, and $E(t)$ is the eustatic sea-level change, in meters, as a function of t. The NRC committee recommended "projections be updated approximately every decade to incorporate additional data." At the time the NRC report was prepared, the estimate of global mean sea-level change was approximately 1.2 mm/year. Using the current estimate of 1.7 mm/year for GMSL change, as presented by the IPCC (IPCC 2007), results in this equation being modified to be:

$$E(t) = 0.0017t + bt^2$$

The three scenarios proposed by the NRC result in global eustatic sea-level rise values, by the year 2100, of 0.5 meters, 1.0 meters, and 1.5 meters. Adjusting the equation to include the historic GMSL change rate of 1.7 mm/year and the start date of 1992 (which corresponds to the midpoint of the current National Tidal Datum Epoch of 1983-2001), results in updated values for the variable b being equal to 2.71E-5 for modified NRC Curve I, 7.00E-5 for modified NRC Curve II, and 1.13E-4 for modified NRC Curve III. The three GMSL rise scenarios are depicted in Figure 5.

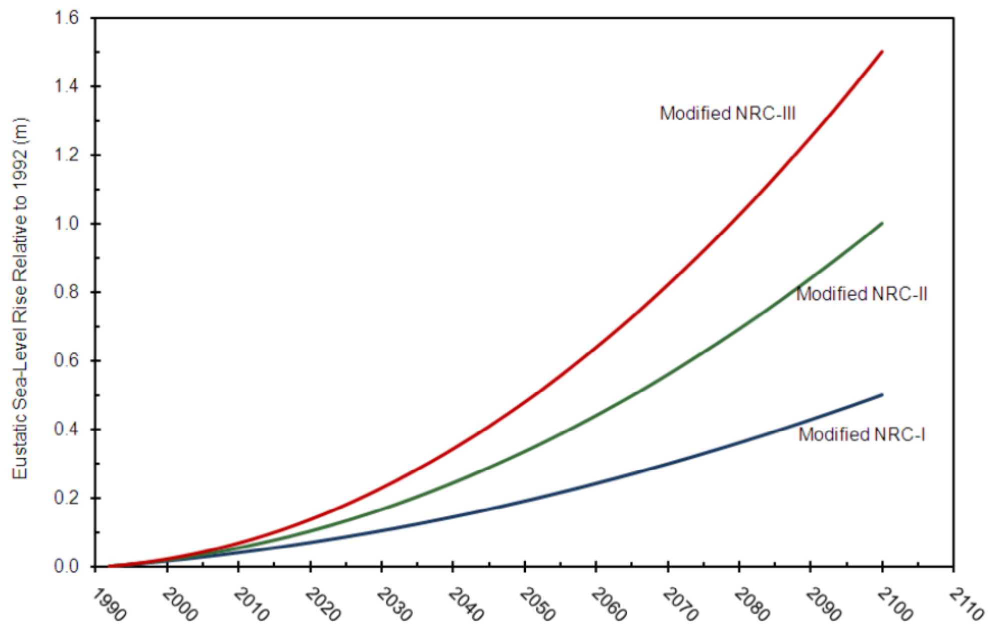

Figure 5 Scenarios for GMSL Rise (based on updates to NRC 1987 equation).

Manipulating the equation to account for the fact that it was developed for eustatic sea level rise starting in 1992, while projects will actually be constructed at some date after 1992, results in the following equation:

$$E(t_2) - E(t_1) = 0.0017(t_2 - t_1) + b(t_2^2 - t_1^2)$$

where t_1 is the time between the project's construction date and 1992 and t_2 is the time between a future date at which one wants an estimate for sea-level change and 1992 (or $t_2 = t_1$ + number of years after construction) . For the three scenarios proposed by the NRC, b is equal to 2.71E-5 for Curve 1, 7.00E-5 for Curve 2, and 1.13E-4 for curve 3.

This sea level rise was then added to a measured sea level trend for the Craig area. There is no sea level trend data for Craig or the Prince of Wales Island area. Guidance in Appendix C of Engineering Circular (EC) 1165-2-212 recommends that the next closest long term gage be used. NOAA has sea level trends published for Ketchikan, Alaska, which is the closest station to Craig. The sea level trend for Ketchikan is -0.007 inches/year. This value was used to obtain the values from the NRCS equation (Table 4). A plot of the values is shown in Figure 6

Table 4 Sea Level Rise Prediction for a 50 Year Project Life.

Sea Level Change	Low	Intermediate	High
	-.04 feet	0.43 feet	1.93 feet

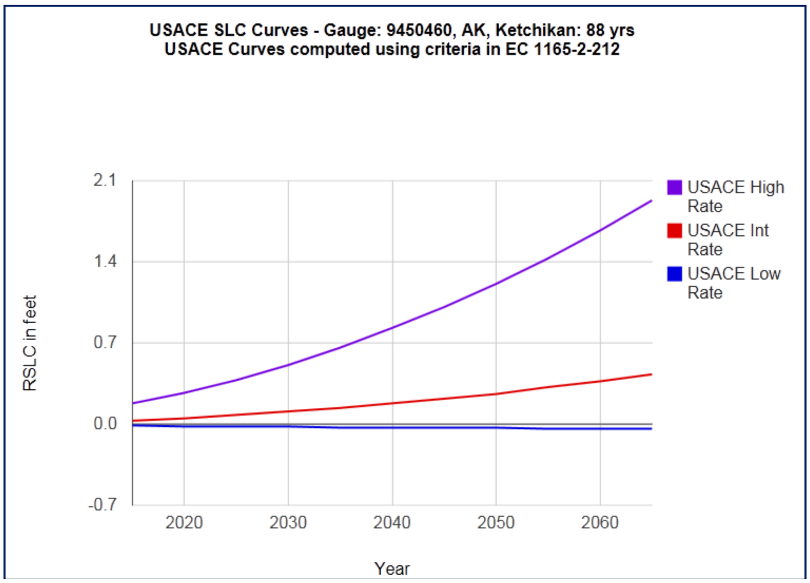

Figure 6 Plot of Sea Level Rise curves

For this study the low level of sea level change was used for calculations. For an assumed construction start in 2015 and a fifty year project life, a project at Craig could see sea level rise as little as -0.04 feet or much as 1.93 feet (Table 4). The design can be adapted to increase the breakwater height in the unlikely event that the High Level of Sea Level Change noted in Table 4 occurs. The proposed design can be modified by adding armor stone or a parapet wall to the breakwater crest to prevent overtopping during storm events.

2.6 Wind

The wind speeds presented in Table 5 were developed by Air Force Combat Climatology Center using historical wind speeds from the Five Finger Coastal-Marine Automated Network (C-MAN) at the Five Finger lighthouse (Figure 7). The Five Fingers data was used since it represented an unobstructed wind from the north. Wind speeds from the Klawok airport were available, but the airport appears to be sheltered from wind from the dominant fetch direction. Instead, north wind from the unobstructed C-MAN site was used. A wind generated southern wave would be minor at the site, so only north winds were evaluated for wave growth. According to the local residents, a southern swell from the Gulf of Alaska passes between Fish Egg Island and the proposed harbor site. The swell was considered for design purposes.

Figure 7 Location of C-MAN station used for wind data

Table 5 Wind Speed Extremal Analysis and Calculated Risk

One-Hour Sustained Wind (Knots)
EXTREME VALUE ANALYSIS
Five Finger AK Buoy - NORTH WIND
55.27 N 133.63 W
PERIOD OF RECORD: 1985-2013

QUANTILES	0.1	0.2	0.5	0.8	0.9	0.95	0.98	0.99	0.999	0.9999
RETURN PERIOD (YRS)	1.1	1.25	2	5	10	20	50	100	1000	10000
VARIATE 1 Hour Sustained Winds (Knots)	37.0	37.6	41.2	50.3	58.0	66.0	77.0	85.4	114.0	143.1

NOTE: The return period is the average elapsed time between occurrences of an event with a certain magnitude or greater.

2.7 Rivers and Creeks in the Project Vicinity

There are no rivers are creeks in the area of the proposed harbor.

2.8 Littoral Drift

Sediment transport has not been reported to be an issue in the area of the proposed harbor and visually does not appear to be an issue. The shore by the proposed harbor area is composed of gravel and does not show signs of movement. The area was previously used as a cannery and had a stable shoreline. Additionally, an existing rubble mound protected harbor south of the proposed harbor at Craig has not experienced infilling since its construction in 1982.

3.0 WAVE ANALYSIS

3.1 Wave Climate

The wave climate at Craig is generally moderate and is subject to short period wind generated waves from the northeast. Local residents have reported that these waves can reach a height of six feet. Long period swell from the Gulf of Alaska reaches the area from the southwest. Swell heights of up to two feet have been reported by the local residents.

3.2 Fetches

The coastline near Craig is oriented generally north east to south west. Fetches were calculated using the average length of nine radial lines at 3 degree spacing, extending from the harbor area to the shoreline. The radial lines used to determine the fetch are shown in Figure 8

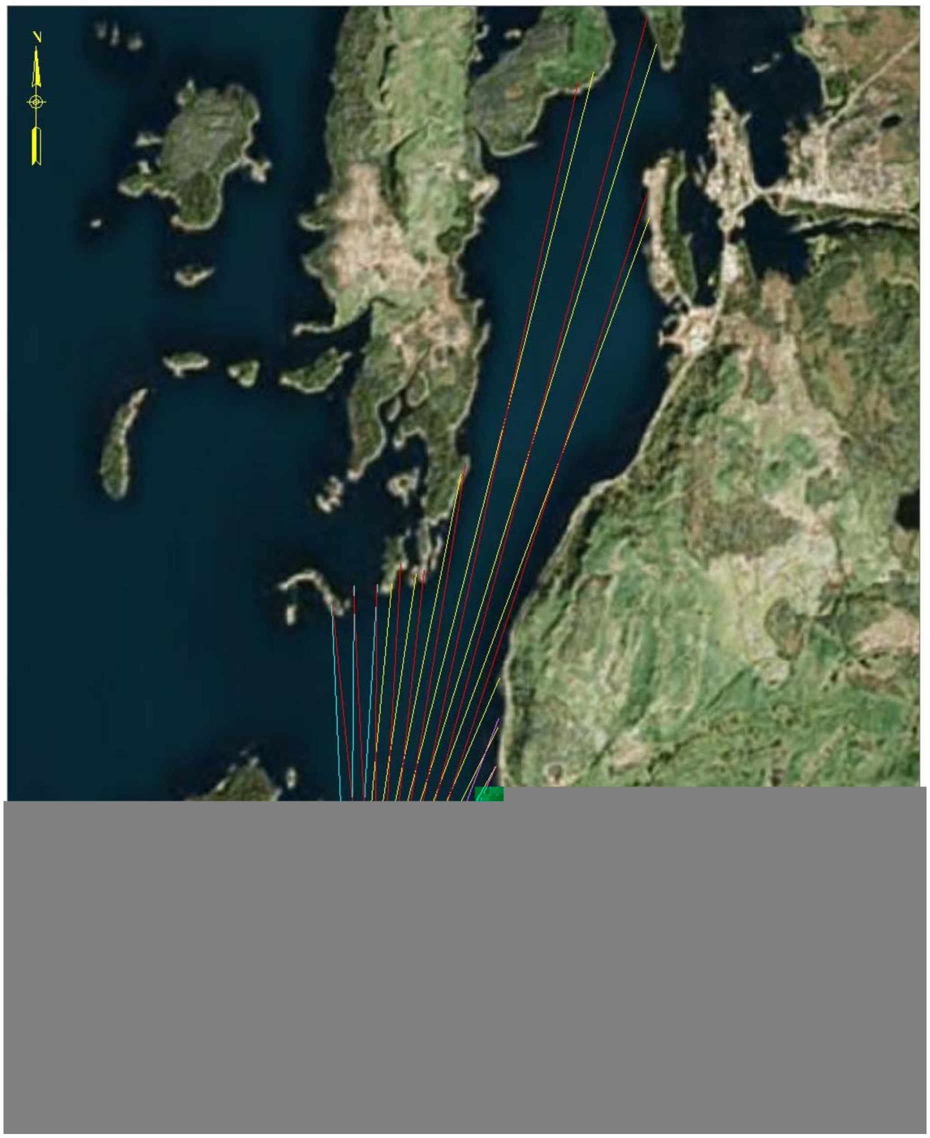

Figure 8 Fetches used in design

3.3 Wave Prediction

Methods described in the Coastal Engineering Manual (CEM), and the Automated Coastal Engineering System (ACES) program, were used to predict wave heights. The design wave was calculated as an average of the results of the two methods. The CEM equations and ACES program predict wave heights based on fetch distances and wind speeds. The fetch distance and wind speed were also used to determine if the wave condition is limited by the fetch length or by the duration of the wind.

The 72.6 year return interval wind was used to determine the design storm wave corresponding to a 50 year design life with a 50% probability of being equaled or exceeded (
Figure 9). The design wave from the northeast is 3.3 feet with a period of 3.0 seconds. The design wave from the north-northeast is 6.6 feet with a period of 4.3 seconds. The design wave from the northwest is 3.3 feet with a period of 2.5 seconds. The wave heights calculated represent the significant wave height, H_s which is the average height of the one-third highest waves of a given group. The design waves are non breaking in depths greater than 8 feet. The design wave correlates well with what long-time residents have seen during extreme storm events from the north east at Craig. The residents also reported a two foot swell that comes from the south between Fish Egg Island and Craig. The 6.6 foot wave will be used as a design wave for the breakwater design.

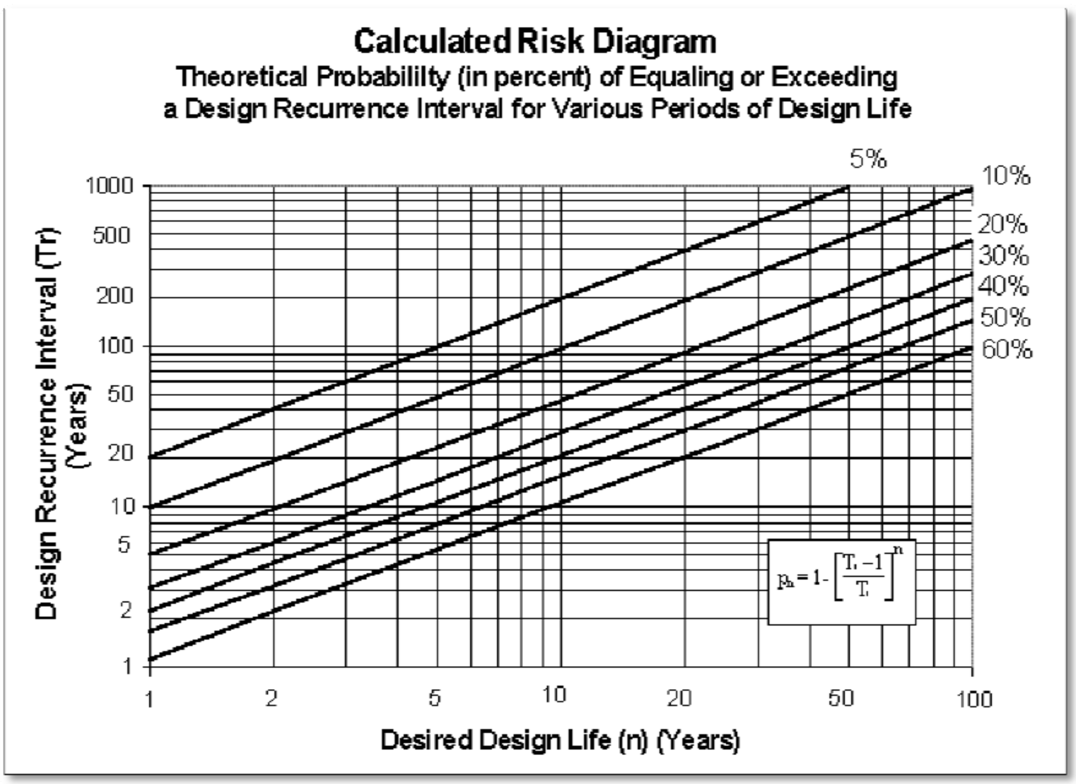

Figure 9 Calculated Risk Diagram

4.0 DESIGN CRITERIA

4.1 Design Vessel and Fleet

The economic analysis generated the vessel demand for this study. The characteristics of the fleet proposed to occupy the various alternatives are shown in Table 6. Proposed harbor plans were laid out to accommodate the identified vessels. The design vessel is 60 feet long with a beam of 18 feet.

Table 6 Fleet Characteristics

Vessel Length [ft]	Design Beam [ft]	Design Draft [ft]
20	10	2.5
28	10	3.5
36	14	5
46	16	5.5
60	18	7

4.2 Entrance Channel and Maneuvering Area

The entrance channel width was determined by criteria given in EM-1110-2-1613. For a two way ship channel with currents between 0.5 to1.5 knots, the width should be 6 times the beam of the design ship. This would be 108 feet. The harbor is open on the eastern side for all of the alternatives, which provides adequate clearance for all boats to exit and return using the two way traffic design criteria.

The maneuvering areas and the fairway widths were designed so that there would be enough room for vessels to turn and dock. Width for turning was determined using a minimum of 1.5 times the length of the largest vessel using the finger piers in that area of the basin.

4.3 Entrance Channel Depth

The entrance depth was checked against the criteria listed in Table 7. Vessels were assumed to be unloaded when entering the harbor, so unloaded drafts were used to calculate the required depths for the entrance and mooring basin depth requirements. The lowest astronomical tide is -2.95 feet MLLW. When this is added to the total required depth noted in Table 7 results in a depth of -12.95 feet MLLW which is usable 100% of the time. The existing bathymetry in the entrance area and maneuvering channel ranges from -20 feet to -45 feet. This provides adequate depth needed for the entrance 100% of the time without the need for dredging.

Table 7 Entrance Channel Criteria

Vessel Draft [ft]	7.0
Pitch, Roll, Heave [ft]	0.5
Squat [ft]	0.5
Tide Allowance [ft]	
Safety Clearance	2.0
Total depth required [ft]	10

5.0 NAVIGATION IMPROVEMENT OPTIONS

Options considered for vessel protection during launching and landing include:
- Floating Breakwater
- Rubblemound breakwater

Floating Breakwater
A floating breakwater consists of a floating structure that can provide wave protection for short period waves with heights up to 4 feet. A floating breakwater is anchored with chain or piles. Because the design wave at Craig is greater than 4 feet, a floating breakwater was dropped from further consideration.

Rubble mound Breakwater
The use of a rubble mound breakwater to provide wave protection is a proven concept. Rubble mound breakwaters have been successfully used in southeast Alaska. Because rubble mound breakwaters have a proven history in similar environments, the decision was made to pursue a rubble mound breakwater option.

6.0 DESIGN PARAMETERS

6.1 Armor Stone

Using Hudson's equation for a wave of 6.6 feet from the north northeast and a K_d of 4 results in an average armor stone size of 2,012 pounds. Typical breakwater cross sections are shown in Figure 10.

6.2 Crest Height

The crest height was set at 18 feet using ACES and equation VI-5-13 in the Coastal Engineering Manual to determine run-up. The mean higher high water level of 10.17 feet was used as the still water level. Storm surge was not included in the calculations since storm surge in not typically an issue at Craig. The crest width was set at 7.0 feet based on armor stone size.

6.3 Water Quality and Circulation

The circulation in the small harbors was evaluated against recommendations outlined in *Planning and Design Guidelines for Small Craft Harbors,* (ASCE Task Committee on Marinas 2020).

The tidal prism ratio (TPR) is the volume of water entering the basin during the flood tide compared with the total basin volume at high tide. For good flushing the TPR needs to be at least 0.25 and preferably 0.35.

The aspect ratio is a measure of the length divided by the width of the basin. The aspect ratio should normally be close to unity for peak flushing efficiency. The maximum aspect ratio for basin should be 1:4. Such geometry will minimize possible zones of stagnation and short-circuiting of circulation cells within the basin.

The area ratio (AR) is the ratio of the basin area to channel cross sectional area (A/a). The size of the fleet and mooring density determines the basin size (A) and the vessel draft, beam, wave conditions, and tides determine the channel cross-section (a). A large A/a value (greater than 200) is preferred. The entire east side of the harbor is open for each of the harbor configurations at Craig and as a result there is no entrance channel, so this parameter is not appropriate to use for circulation evaluation.

6.4 Dredge Material

Dredging will not be required for the alternatives considered.

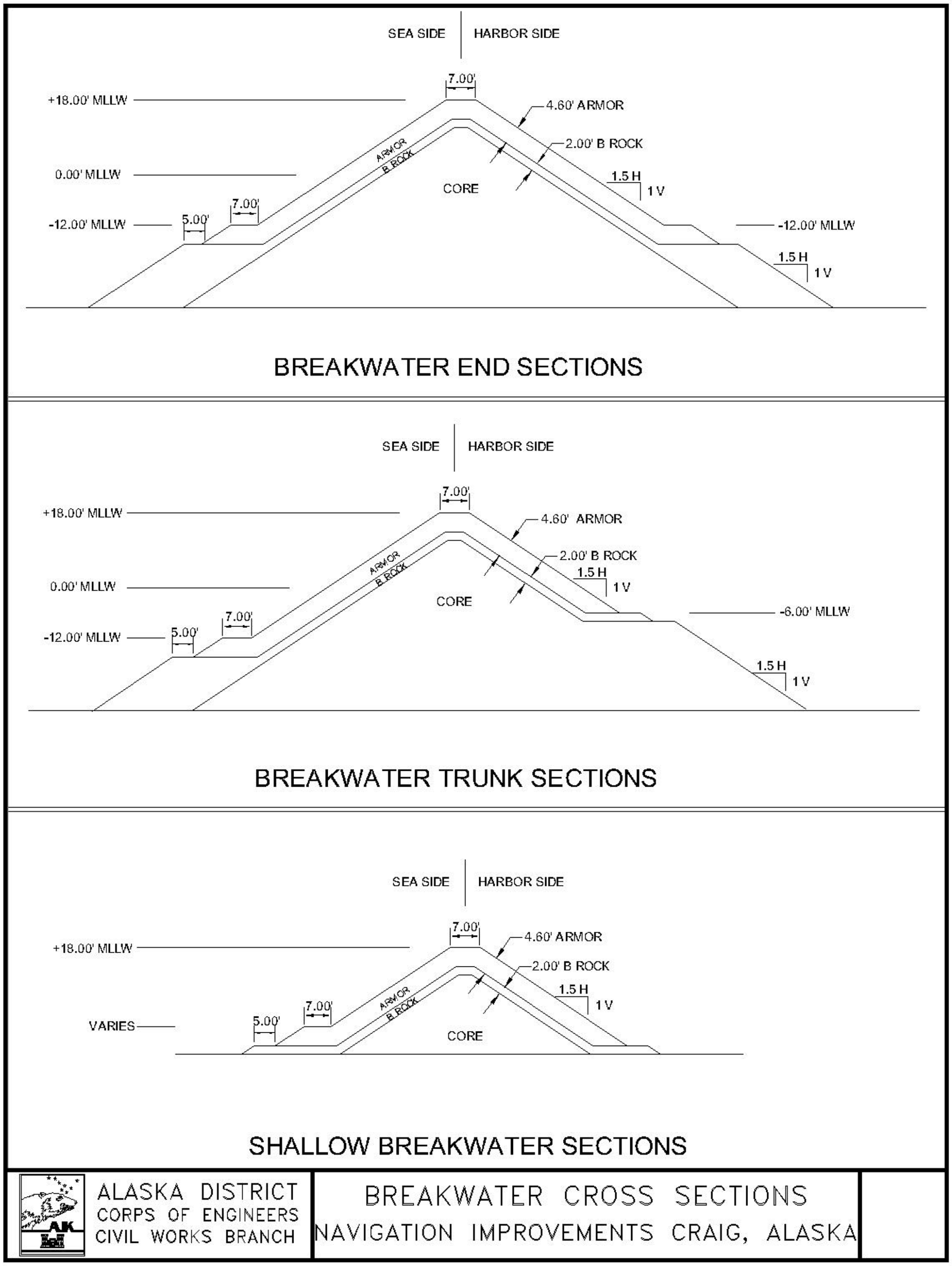

Figure 10 Typical cross sections

7.0 ALTERNATIVES CONSIDERED IN DETAIL

The site for the navigation improvements at Craig was selected during the charrette process at the beginning of the project. Working with the chosen site, several alternatives were considered for navigation improvements. Six plans were evaluated along with a no action alternative.

7.1 No Action

This alternative would leave the community without an additional harbor. Vessels will continue to sustain time lost and damages as they would continue to raft up in the existing harbors. Damages associated with the rafting would continue to occur.

7.7 Alternative 1 – Smaller Basin with Fish Passage

This plan consists of one 1,462 foot, and one 318 foot rubble mound breakwater that would provide an 8 acre basin for 105 boats ranging in from 20 feet to 120 feet. This plan would provide shelter from north storm waves, south swell, and wakes from boats travelling between Fish Egg Island and Craig. This alternative would not impact the area where float planes currently land and take off (Figure 11).

Breakwaters. Stone size and crest elevation are described in Section 6.0 DESIGN PARAMETERS. The breakwater would require approximately 181,000 cubic yards of core rock, 37,600 cubic yards of B rock, and 31,400 cubic yards of armor stone. Typical breakwater cross sections are shown in Figure 10

Shoaling. No shoaling in the entrance is anticipated due to the material type observed on shore and the lack of shoaling experienced by the other harbors at Craig.

Wave Reduction. Diffraction analysis was used to determine the wave height expected for this alternative (Figure 12). The maximum wave height in the proposed basin was calculated to be one foot or less in the mooring area. All directions of wave exposure were taken into account, and the largest wave heights in the basin were generated from the incident wave from the northeast direction.

Circulation. The TPR for alternative 1 is 0.3 which is considered good. The aspect ratio for alternative 1 is 1:2.2, which is below the maximum recommendation of 1:4.

Maintenance. It is not anticipated that there will be a significant loss of stone from the structure over the life of the project. It is estimated that approximately 1,570 cubic yards of armor stone will need to be replaced every 20 years.

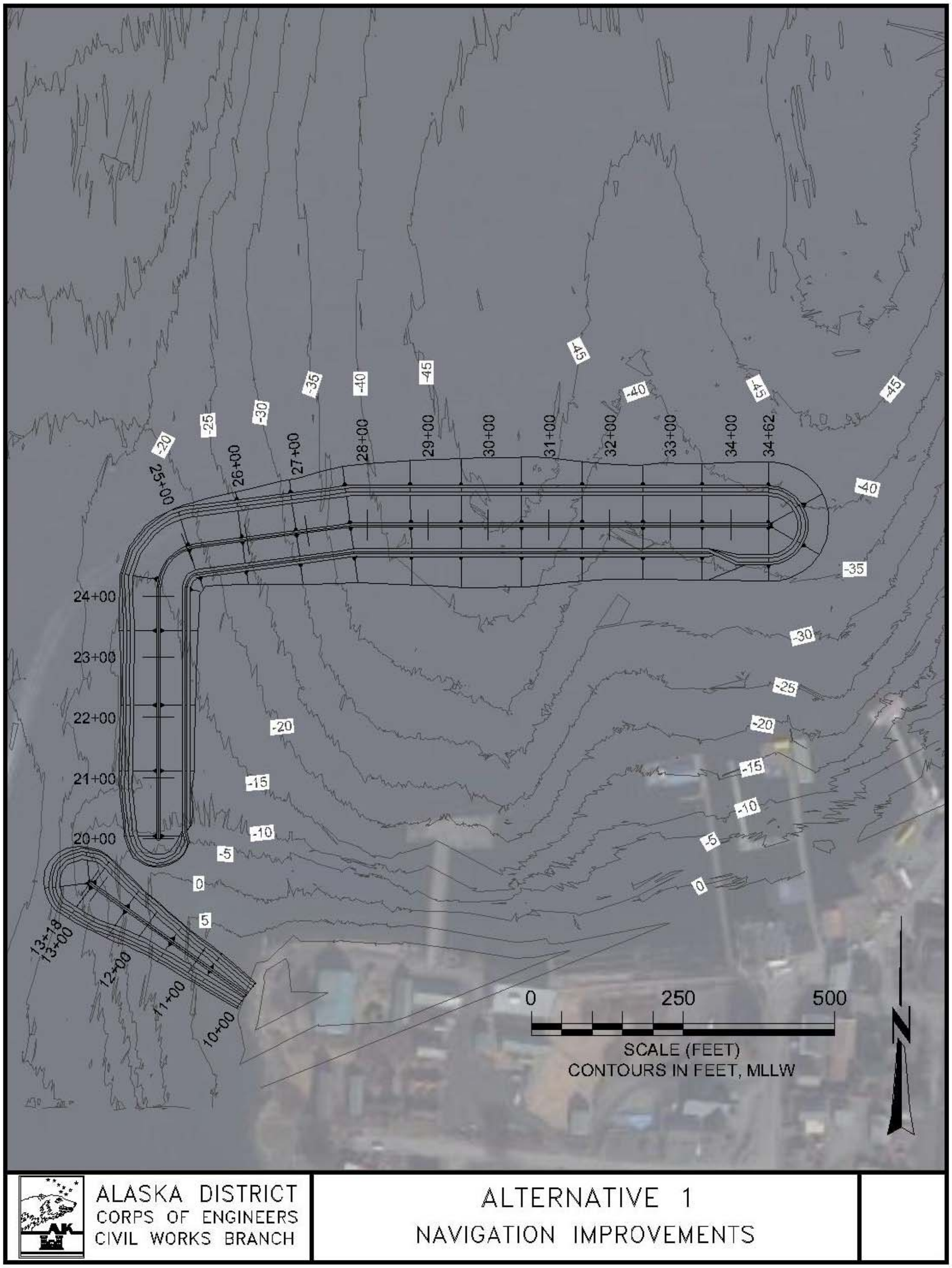

Figure 11 Plan view of Alternative 1

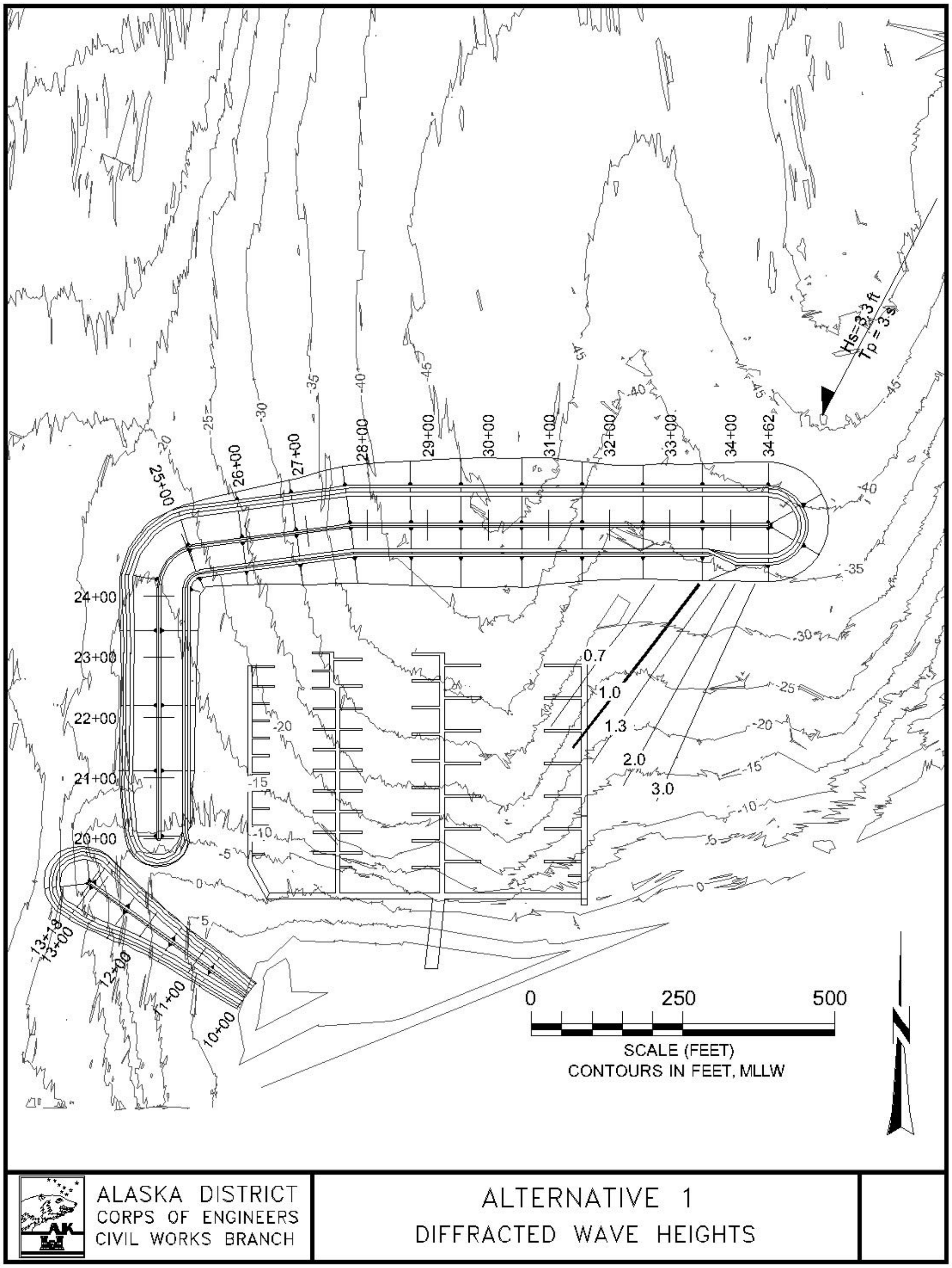

Figure 12 Diffracted wave heights for Alternative 1. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.

7.2 Alternative 2 – Small Basin

This plan consists of one 650 foot and one 850 foot rubble mound breakwater that would provide a 10 acre basin for 145 boats ranging in from 20 feet to 120 feet. This alternative would provide shelter from north storm waves and wakes from boats travelling between Fish Egg Island and Craig. This alternative would not provide adequate protection from the two foot swell noted by the local residents. This alternative allows wave heights in the basin to exceed one foot during extreme events. The east float would need to be over built to withstand waves greater than one foot. Because of the lack of harbor protection, this alternative was dropped from further consideration (Figure 13).

Breakwaters. Stone size and crest elevation are described in Section 6.0 DESIGN PARAMETERS. The two breakwaters would require approximately 156,500 cubic yards of core rock, 34,500 cubic yards of B rock, and 27,000 cubic yards of armor stone.

Shoaling. No shoaling in the entrance is anticipated due to the material type observed on shore and the lack of shoaling experienced by the other harbors at Craig.

Wave Reduction. All directions of wave exposure were taken into account, and the largest wave heights in the basin were generated from the incident wave from the north –northeast direction. Diffraction analysis was used to determine the wave height expected for this alternative (Figure 14). The maximum wave height in the proposed basin would be greater than one foot.

Circulation. The TPR for this alternative is 0.3 which is considered good. The aspect ratio is 1:1, which is below the maximum recommendation of 1:4.

Maintenance. It is not anticipated that there will be a significant loss of stone from the structure over the life of the project. It is estimated that approximately 1,350 cubic yards of armor stone will need to be replaced every 20 years.

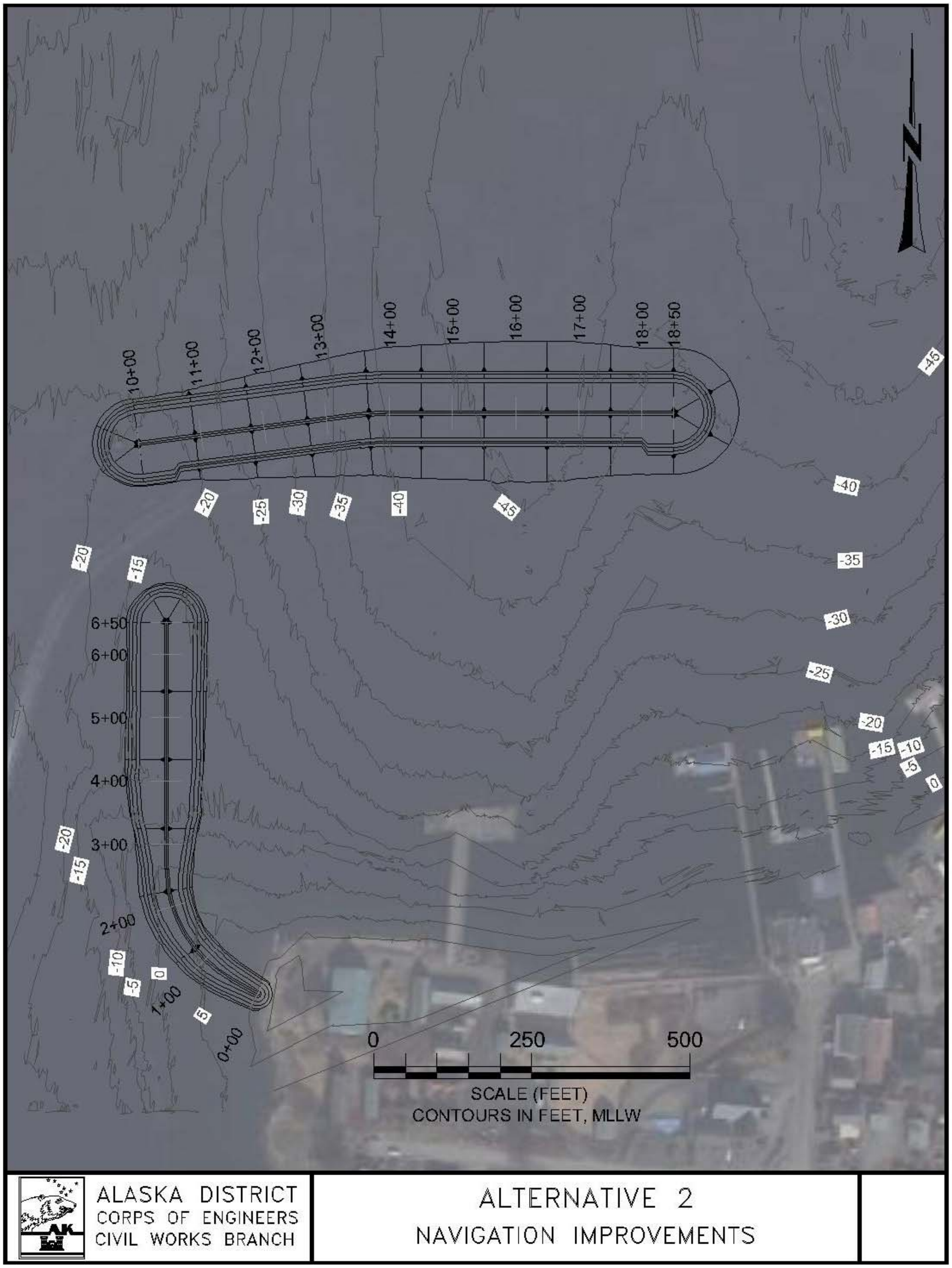

Figure 13 Plan view of Alternative 2

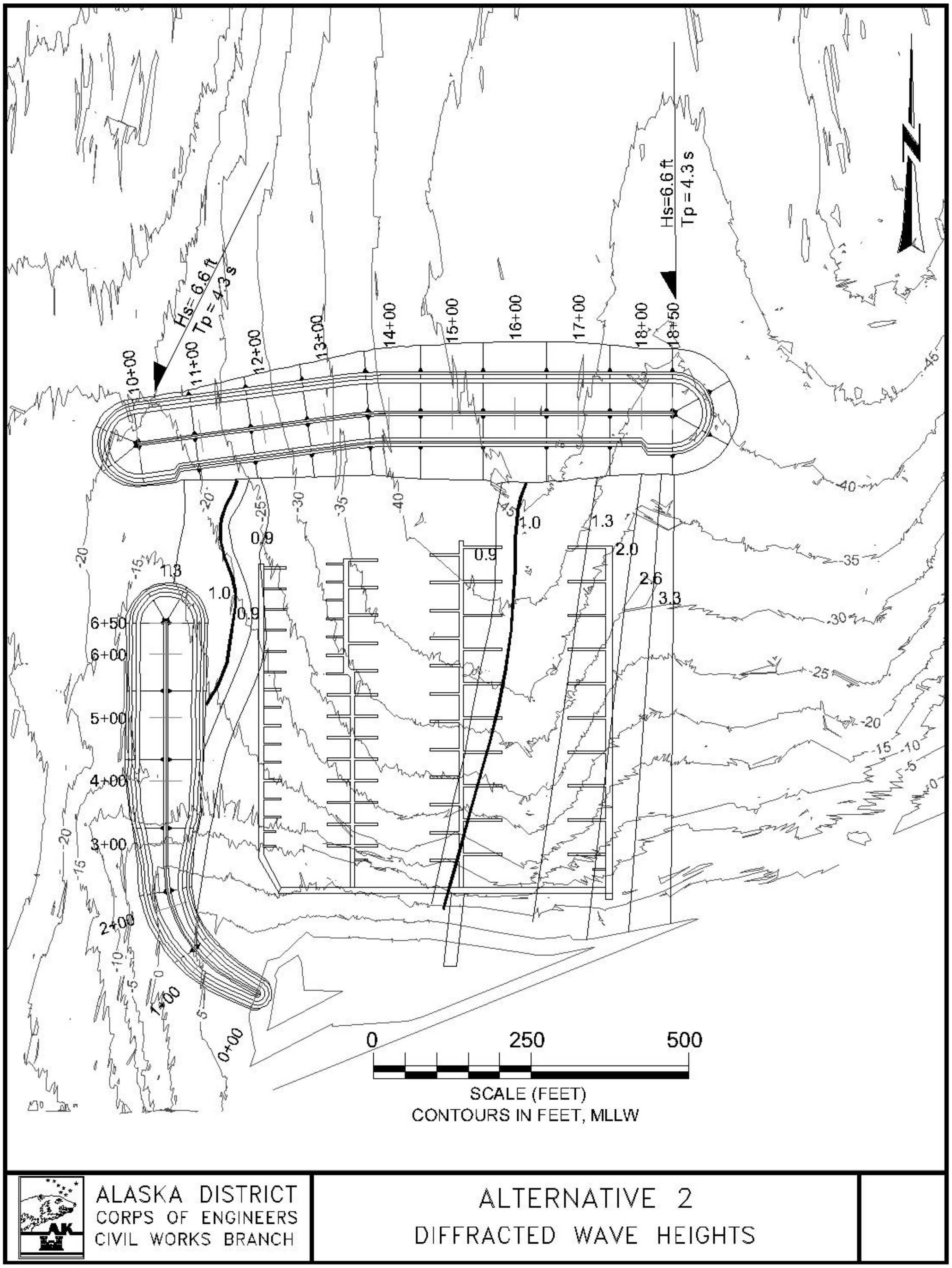

Figure 14 Diffracted wave heights for Alternative 2. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.

7.5 Alternative 2a – Small Basin with Two Entrances

This plan consists of one 956 foot, and one 957 foot rubble mound breakwater that would provide a 10 acre basin for 145 boats ranging in from 20 feet to 120 feet. This alternative would provide shelter from north storm waves, south swell, and wakes from boats travelling between Fish Egg Island and Craig. This alternative would not impact the area where float planes currently land and take off (Figure 15).

Breakwaters. Stone size and crest elevation are described in Section 6.0 DESIGN PARAMETERS. The two breakwaters would require approximately 220,000 cubic yards of core rock, 47,500 cubic yards of B rock, and 35,500 cubic yards of armor stone. Typical breakwater cross sections are shown in Figure 10

Shoaling. No shoaling in the entrance is anticipated due to the material type observed on shore and the lack of shoaling experienced by the other harbors at Craig.

Wave Reduction. Diffraction analysis was used to determine the wave height expected for this alternative (Figure 16 and Figure 17). All directions of wave exposure were taken into account, and the largest wave heights in the basin were generated from the incident wave from the north –northeast direction. Diffraction analysis was used to determine the wave height expected for this alternative (Figure 23). The maximum wave height in the proposed basin was would be greater than one foot.

Circulation. The TPR for alternative 2a is 0.3 which is considered good. The aspect ratio for alternative 2a is 1:1.5, which is below the maximum recommendation of 1:4.

Maintenance. It is not anticipated that there will be a significant loss of stone from the structure over the life of the project. It is estimated that approximately 1,775 cubic yards of armor stone will need to be replaced every 20 years.

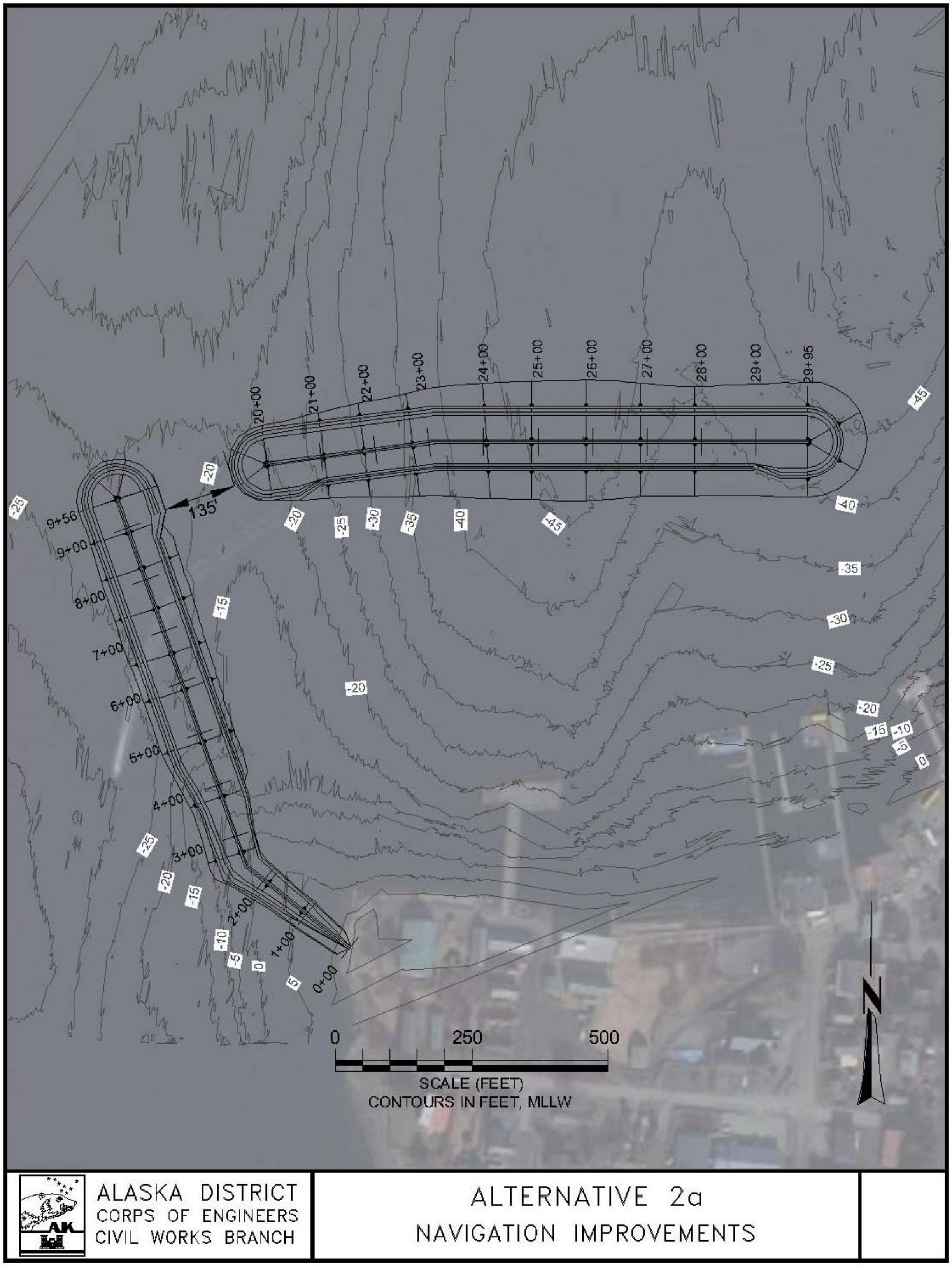

Figure 15 Plan view of Alternative 2a

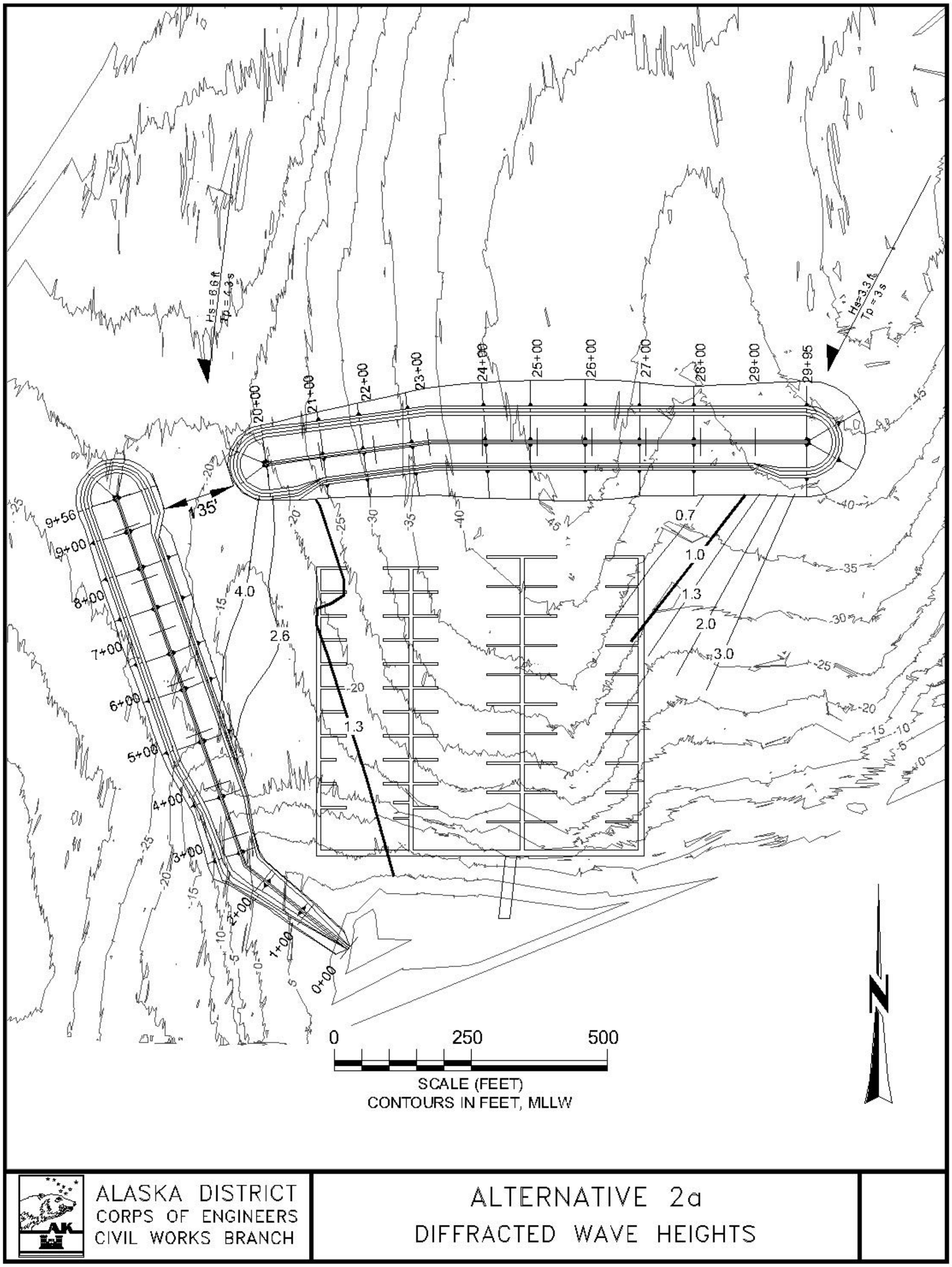

Figure 16 Diffracted wave heights for Alternative 2a. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.

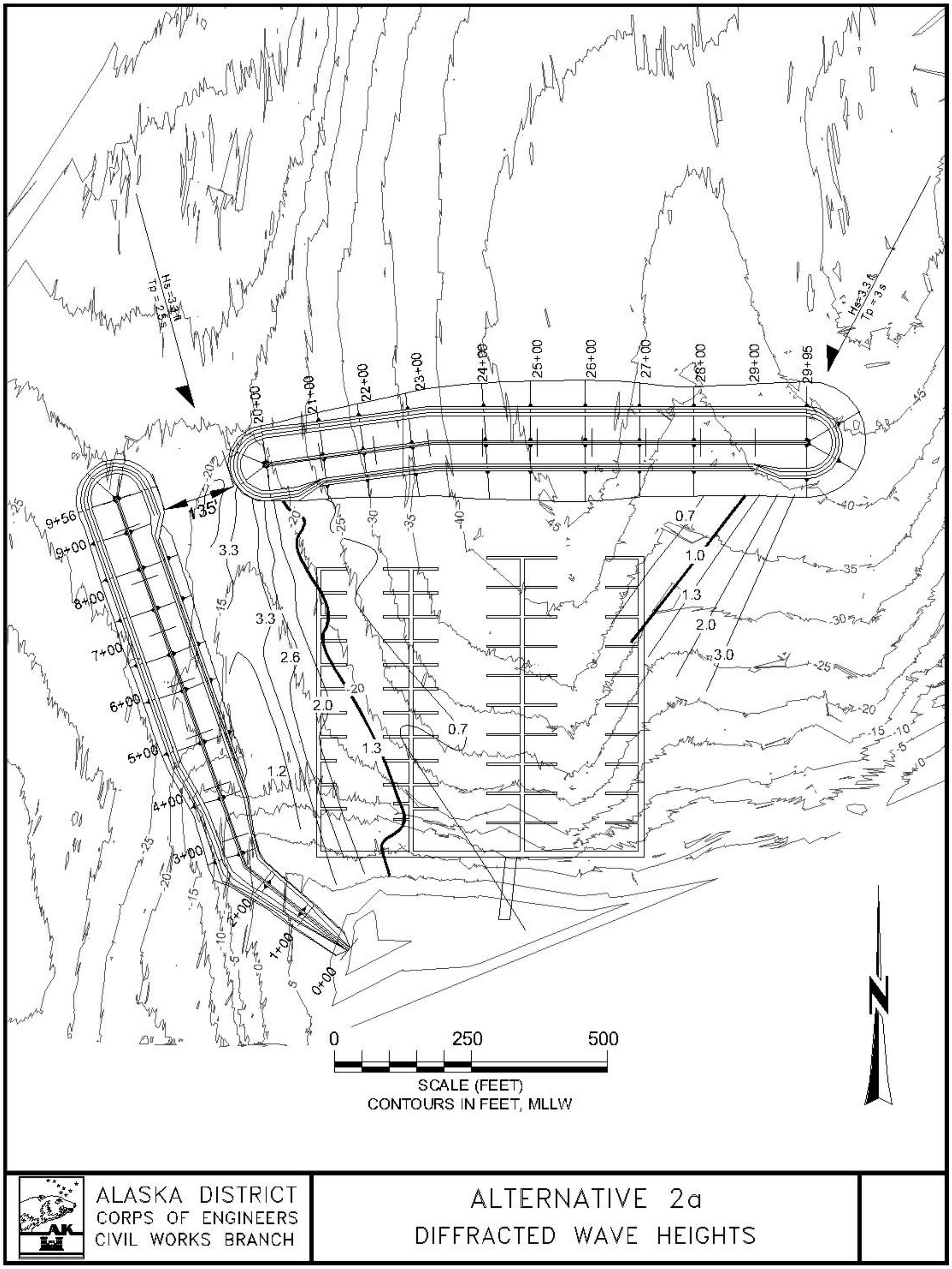

Figure 17 Diffracted wave heights for Alternative 2a. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.

7.6 Alternative 2b – Small Basin with Fish Passage

This plan consists of one 1,606 foot, and one 318 foot rubble mound breakwater that would provide a 10 acre basin for 145 boats ranging in from 20 feet to 120 feet. This plan would provide shelter from north storm waves, south swell, and wakes from boats travelling between Fish Egg Island and Craig. This alternative would not impact the area where float planes currently land and take off (Figure 18).

Breakwaters. Stone size and crest elevation are described in Section 6.0 DESIGN PARAMETERS. The breakwater would require approximately 205,500 cubic yards of core rock, 43,000 cubic yards of B rock, and 31,500 cubic yards of armor stone. Typical breakwater cross sections are shown in Figure 10

Shoaling. No shoaling in the entrance is anticipated due to the material type observed on shore and the lack of shoaling experienced by the other harbors at Craig.

Wave Reduction. Diffraction analysis was used to determine the wave height expected for this alternative (Figure 19). The maximum wave height in the proposed basin was calculated to be one foot or less in the mooring area. All directions of wave exposure were taken into account, and the largest wave heights in the basin were generated from the incident wave from the northeast direction.

Circulation. The TPR for alternative 2b is 0.3 which is considered good. The aspect ratio for alternative 2b is 1:15, which is below the maximum recommendation of 1:4.

Maintenance. It is not anticipated that there will be a significant loss of stone from the structure over the life of the project. It is estimated that approximately 1,575 cubic yards of armor stone will need to be replaced every 20 years.

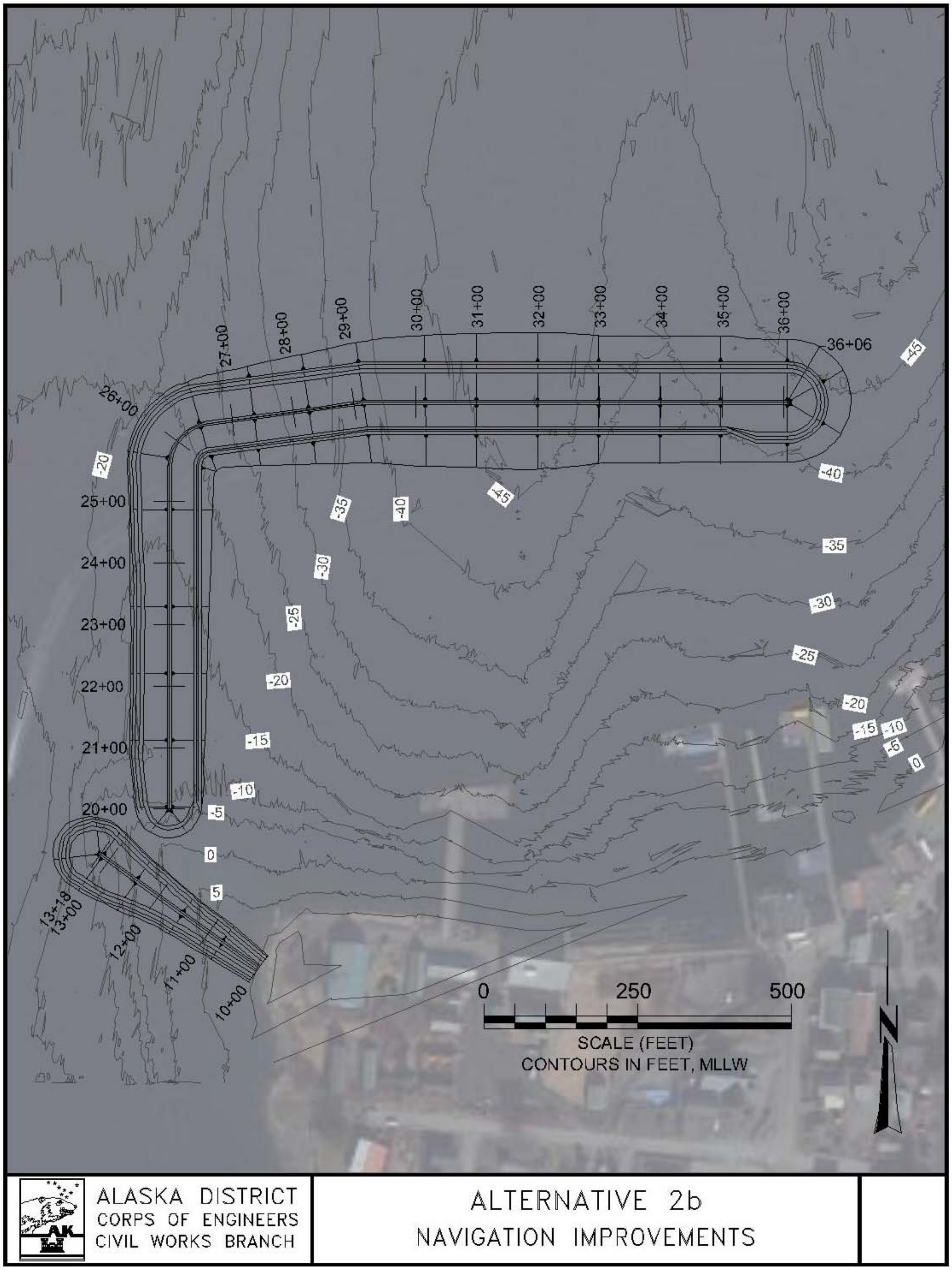

Figure 18 Plan view of Alternative 2b

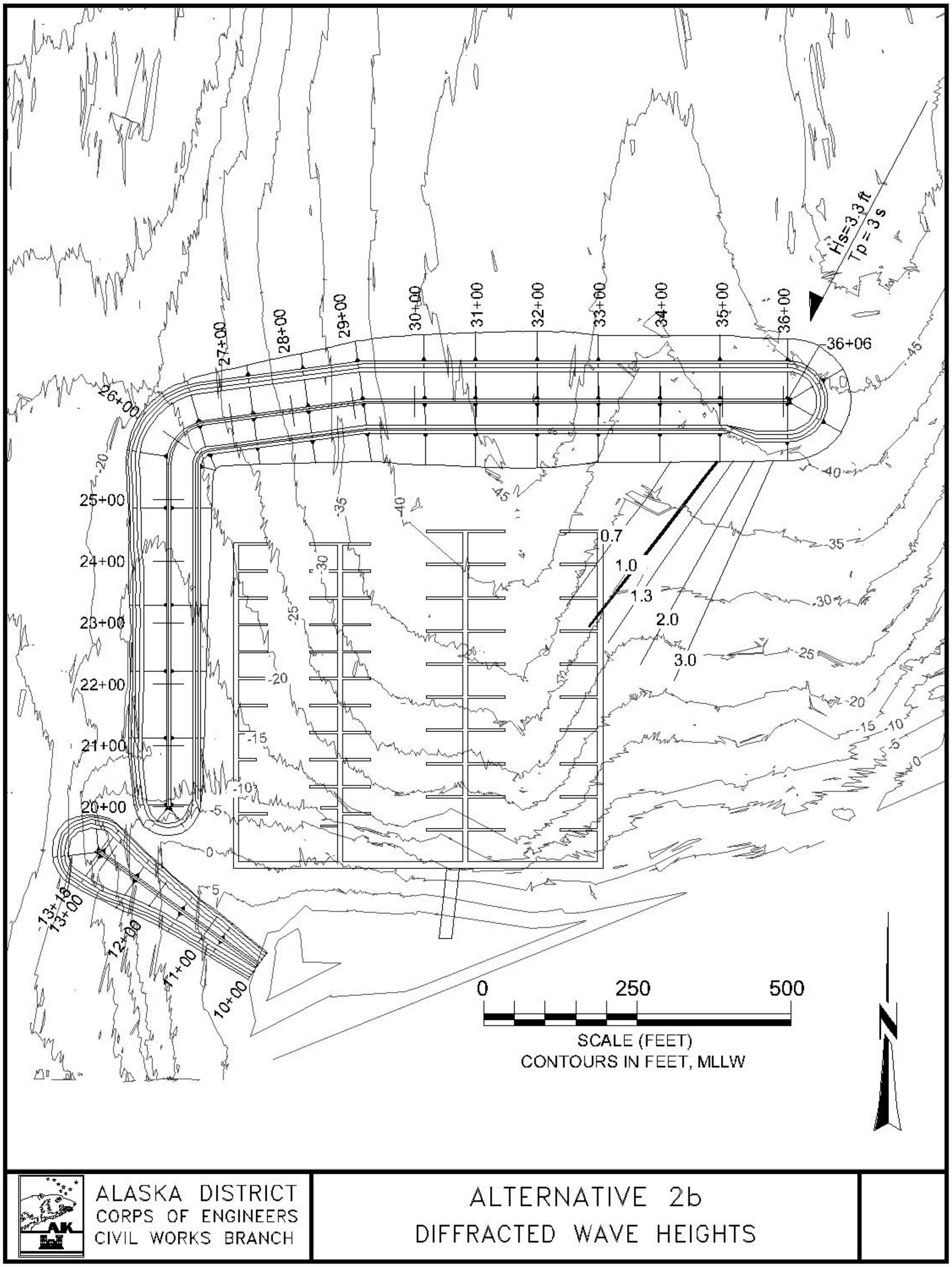

Figure 19 Diffracted wave heights for Alternative 2b. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.

7.3 Alternative 3 – Medium Size Basin

This plan consists of one 650 foot and one 1,450 foot rubble mound breakwater that would provide a 25 acre basin for 303 boats ranging in from 20 feet to 120 feet. This alternative would provide shelter from north storm waves, but would not provide adequate protection from the two foot swell noted by the local residents. This alternative allows wave heights in the basin to exceed one foot during extreme events. The outer east floats would need to be over built to withstand waves greater than one foot. This alternative would also impact the area where float planes currently land and take off. Because of the lack of harbor protection and the impact on float plane traffic, this alternative was dropped from further consideration (Figure 20).

Breakwaters. Stone size and crest elevation are described in Section 6.0 DESIGN PARAMETERS. The two breakwaters would require approximately 310,500 cubic yards of core rock, 55,000 cubic yards of B rock, and 36,500 cubic yards of armor stone. Typical breakwater cross sections are shown in Figure 10

Shoaling. No shoaling in the entrance is anticipated due to the material type observed on shore and the lack of shoaling experienced by the other harbors at Craig.

Wave Reduction. All directions of wave exposure were taken into account, and the largest wave heights in the basin were generated from the incident wave from the north –northeast direction. Diffraction analysis was used to determine the wave height expected for this alternative (Figure 21). The maximum wave height in the proposed basin would be greater than one foot.

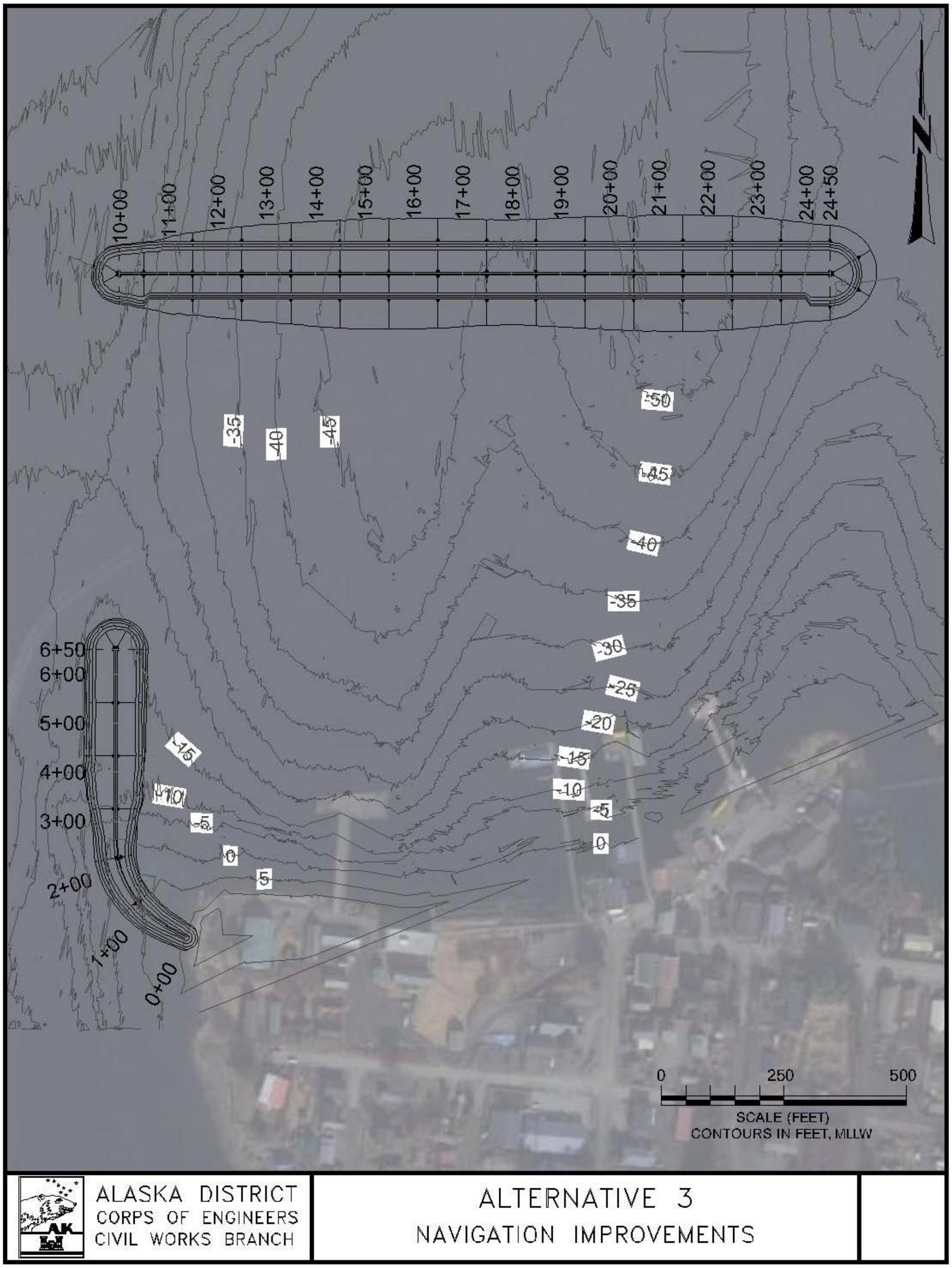

Figure 20 Plan view of Alternative 3

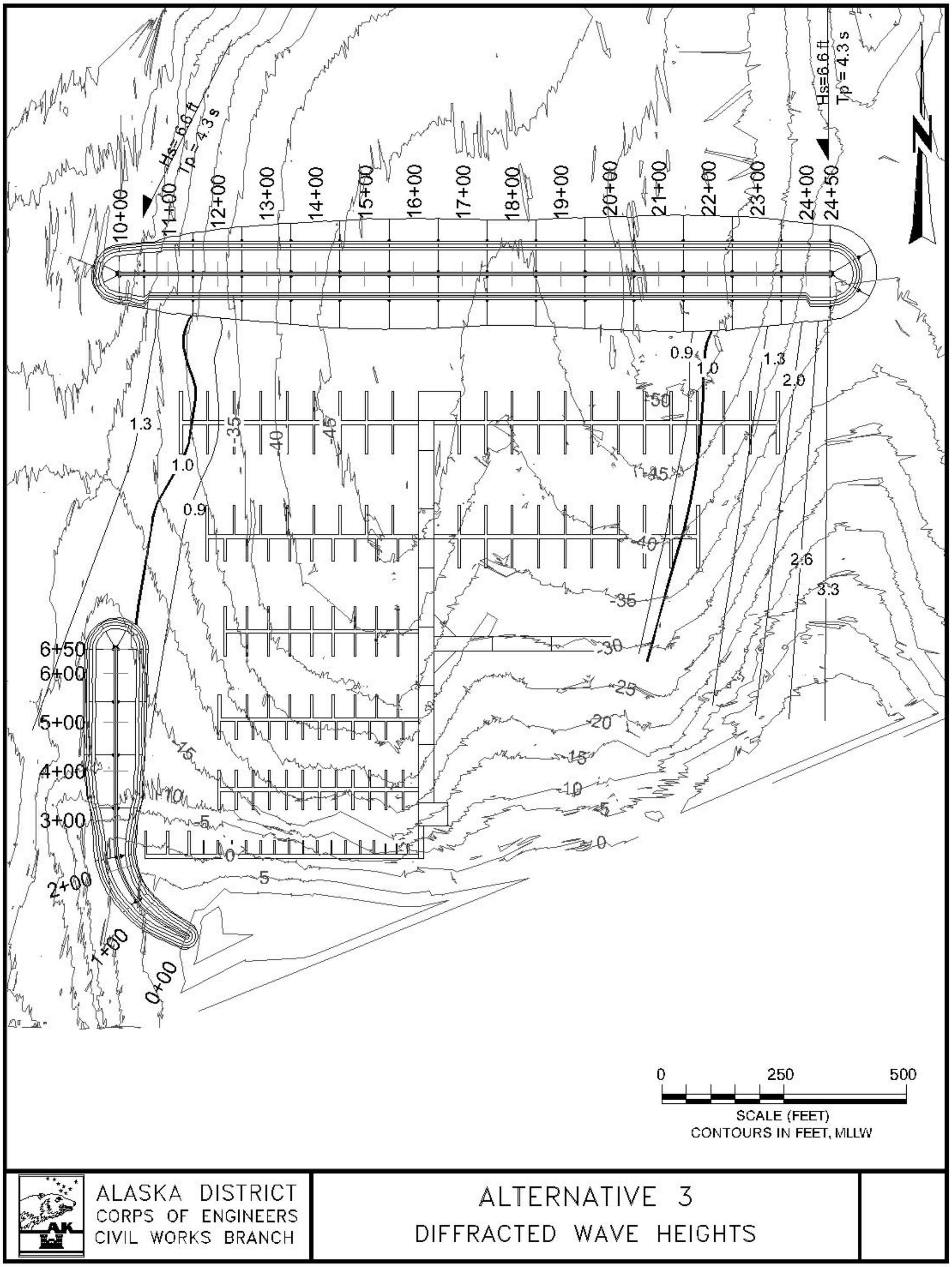

Figure 21 Diffracted wave heights for Alternative 3. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.

7.4 Alternative 4 – Large Basin

This plan consists of one 650 foot and one 1,600 foot rubble mound breakwater that would provide a 42 acre basin for 530 boats ranging in from 20 feet to 120 feet. This alternative would provide shelter from north storm waves, but would not provide adequate protection from the two foot swell noted by the local residents. This alternative allows wave heights in the basin to exceed one foot during extreme events. The outer east floats would need to be over built to withstand waves greater than one foot. This alternative would also impact the area where float planes currently land and take off. Because of the lack of harbor protection and the impact on float plane traffic, this alternative was dropped from further consideration (Figure 22).

Breakwaters. Stone size and crest elevation are described in Section 6.0 DESIGN PARAMETERS. The two breakwaters would require approximately 313,500 cubic yards of core rock, 55,000 cubic yards of B rock, and 36,500 cubic yards of armor stone. Typical breakwater cross sections are shown in Figure 10

Shoaling. No shoaling in the entrance is anticipated due to the material type observed on shore and the lack of shoaling experienced by the other harbors at Craig.

Wave Reduction. All directions of wave exposure were taken into account, and the largest wave heights in the basin were generated from the incident wave from the north –northeast direction. Diffraction analysis was used to determine the wave height expected for this alternative (Figure 23). The maximum wave height in the proposed basin was would be greater than one foot.

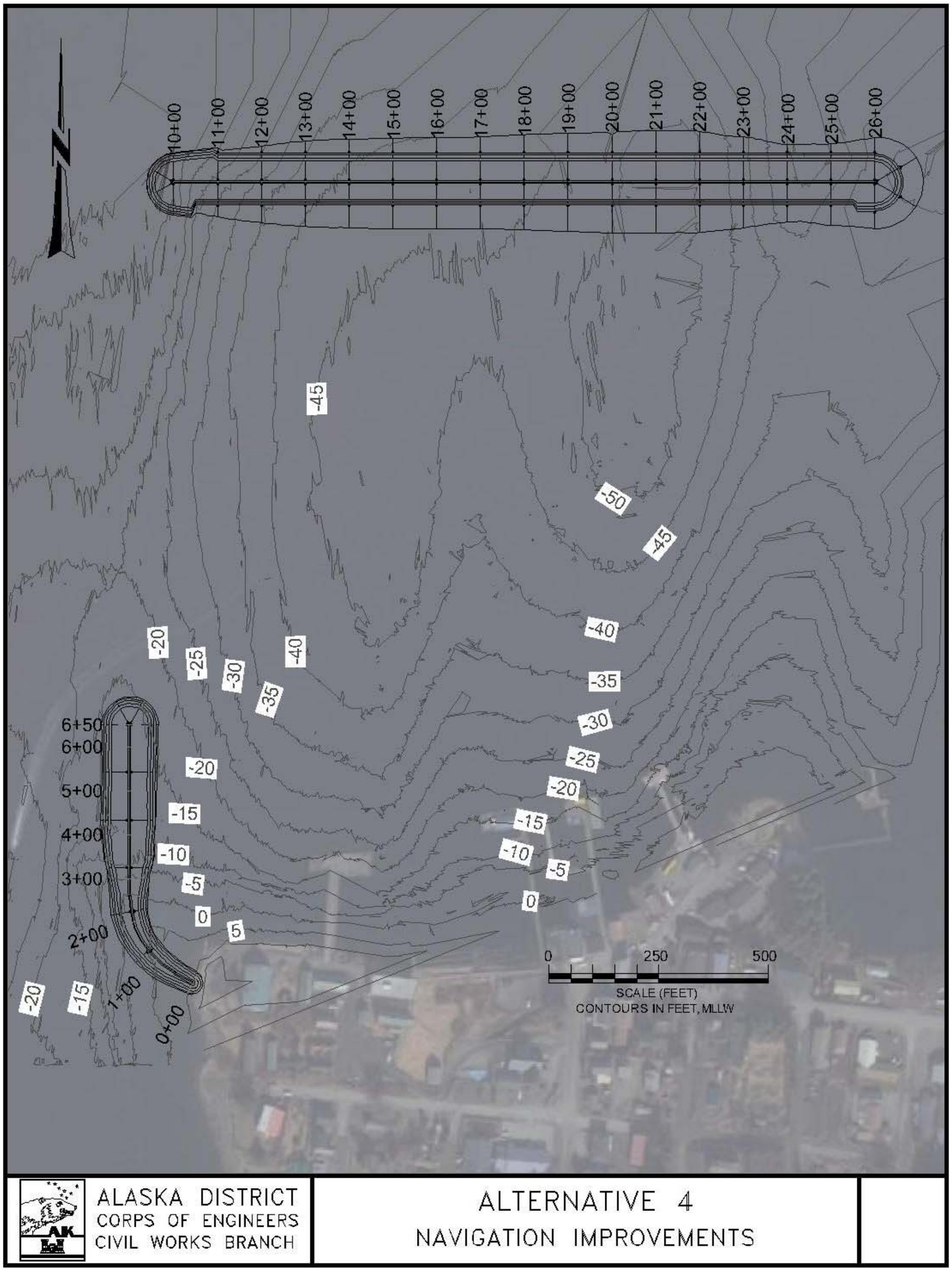

Figure 22 Plan view of Alternative 4

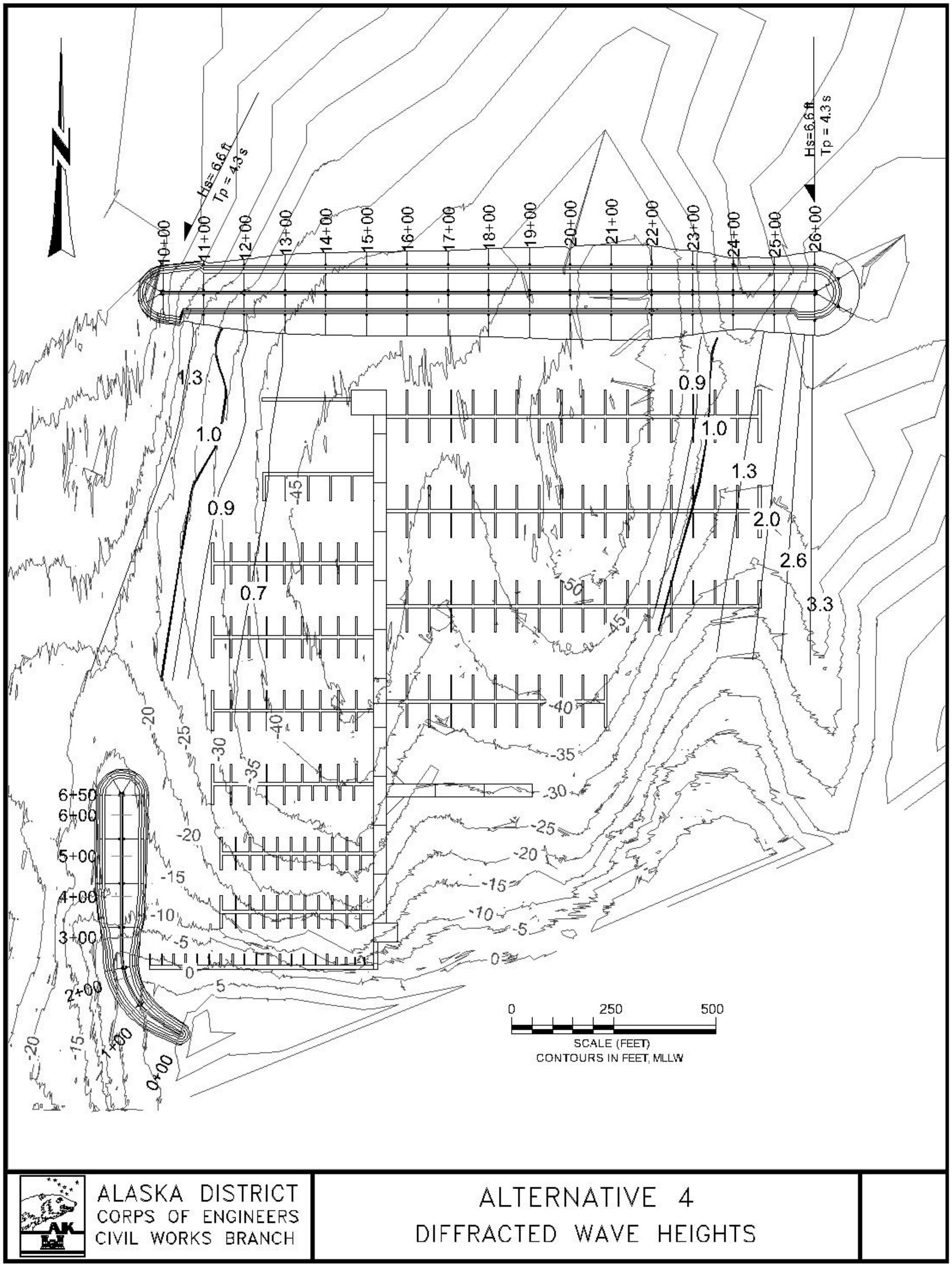

Figure 23 Diffracted wave heights for Alternative 4. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.

8.0 NAVIGATION AIDS

The Coast Guard will require a fixed navigation aid for the breakwater. During development of plans and specifications the Coast Guard will be contacted to determine the navigation aid requirements.

9.0 CONSTRUCTION CONSIDERATIONS

The breakwater construction is anticipated to take two years to complete. It is expected that the stone for the breakwater will come from Craig. Construction can occur throughout the year with the exception that no in-water work will be performed between 15 March and 15 June in order to avoid the peak herring spawn and juvenile salmon out-migration periods as well as the period when humpback whales and other marine mammals are most likely to be present in the project area. In order to attract a number of bidders, it is recommended that the project be advertised early in the year to maximize the number of contractors to bid on this project.

11.0 REFERENCES

American Society of Civil Engineers Task Committee on Maninas. *Planning and Design Guidelines for Small Craft Harbors, Revised Edition.* New York: American Society of Civil Engineers, 2012.

ASCE Task Committee on Marinas 2020. *Planning and Design for Small Craft Harbors: Third Edition.* ASCE, 2012.

U.S Army Corps of Engineers. "EM 1110-2-1615 Hydraulic Design of Small Boat Harbors." 1984.

U.S. Army Corps of Engineers. "Coastal Engineering Manual." 2008.

U.S. Army Corps of Engineers. "Shore Protection Manual." 1984.

Appendix D

Economics

Craig Small Boat Harbor
Navigation Improvements
Draft Economics Appendix D

Craig, Alaska

December 2014

U.S. Army Corps
of Engineers

Alaska District

CRAIG SMALL BOAT HARBOR NAVIGATION IMPROVEMENTS
ECONOMICS APPENDIX B
CRAIG, ALASKA

CONTENTS

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I. OVERVIEW OF REGION AND COMMUNITY

This section provides general background information pertaining to the socioeconomic composition of the study area. This information enables planners and report reviewers to understand the community, infrastructure, the level of economic activity generated, and the potential of the area to support the project under consideration.

A. Problem Statement

The problem statement for this study, as defined at the planning charette, is: Insufficient moorage creates overcrowded conditions and inadequate upland facilities services cause operational inefficiencies, damage to vessels and marine infrastructure, and lost economic opportunities at Craig, Alaska.

B. Location and Setting

Craig is located on a small island off the west coast of Prince of Wales Island and is connected by a small causeway. Craig is 56 air miles northwest of Ketchikan, 750 air miles north of Seattle, Washington, and 220 miles south of Alaska's state capital Juneau. It lies at approximately 55.47 degrees North latitude, and -133.15 degrees West longitude. Craig is in the Ketchikan recording district. The community encompasses 6.7 square miles of land and 2.7 square miles of water.[1] Figure B-1 shows the location of Craig in Alaska.

[1] State of Alaska Division of Community and Regional Affairs. Community Database Online – Craig. http://commerce.alaska.gov/cra/DCRAExternal/community/Details/03f82d00-0463-4dfc-b0e5-536ef93f176e

Figure B-1. Location of Craig in Alaska

Source: ©Google Earth. Citation added by the Alaska District.

C. Climate

Prince of Wales Island is dominated by a cool, moist, maritime climate. Summer temperatures range from 49 to 63 degrees Fahrenheit. Winter temperatures range from 32 to 42 degrees F. Average annual precipitation is 120 inches, and average annual snowfall is 40 inches. Gale winds are common in the fall and winter months.[2]

D. History

The Tlingit and Haida peoples have historically used the area around Craig for its rich resources. With the help of local Haidas, a fish saltery was built on nearby Fish Egg Island in 1907 by Craig Miller. Between 1908 and 1911, he constructed the Lyndenburger Packing Company and cold storage plant at the present site of Craig. In 1912, a post office, school, sawmill, and salmon cannery were constructed. Production at the cannery and sawmill peaked during World War I. A city government was formed in 1922. Excellent pink salmon runs contributed to development and growth through the late 1930s. Some families from the Dust Bowl relocated to Craig during this time. During the 1950s, the fishing industry collapsed due to depleted salmon runs. In 1972, Ed Head built a large sawmill six miles from Craig near Klawock, which provided year-round jobs and helped to stabilize the economy. Head Mill was sold in the early 1990s to Viking Lumber. Today, Craig is predominantly a fishing community.[3]

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[2] Ibid.

[3] Ibid.

E. Demographics

The following demographic information provides relevant characteristics to the local economy: population, age distribution, race and ethnicity, local school enrollment, employment, household and per capita income, and poverty status.

1. Population

According to the 2010 US Census, Craig is home to 1,201 people. In 2013, the State of Alaska estimated the population of Craig to be 1,195 persons.[4] The population has been relatively stable since 2000. The 2000 Census showed Craig's population to be 1,397 persons. The State of Alaska estimated that Craig's population dropped to 1,250 people in 2001, and the population has remained steadily in the 1,100 to 1,300 people range in the intervening years. The maximum population since 2001 was 1,251 people in 2011, while the minimum was 1,120 in 2007. Figure B-2 shows the population of the City of Craig for the years 2000 through 2013.

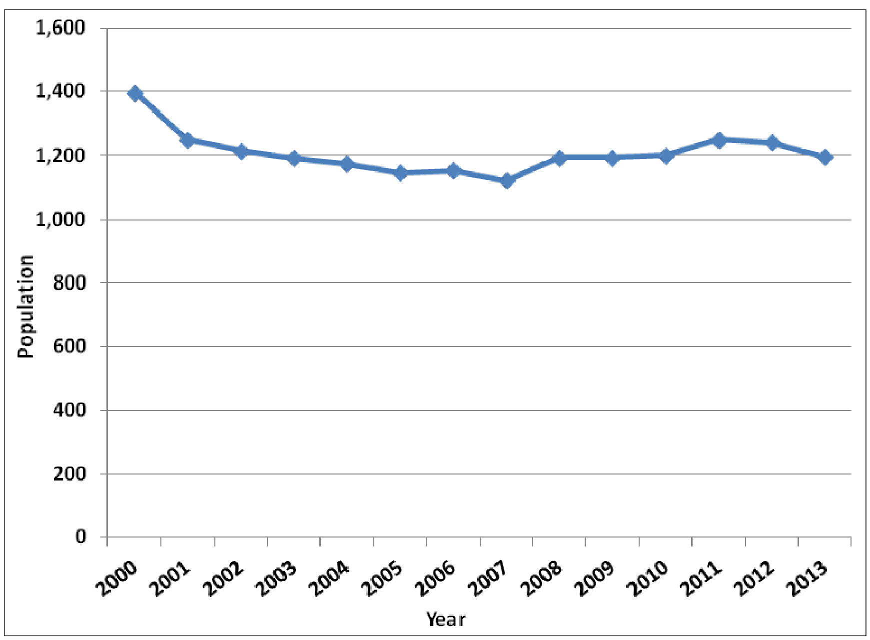

Figure B-2. Craig Population, 2000 through 2013

Source: State of Alaska Department of Labor and Workforce Development, Research and Analysis Section.

[4] State of Alaska Department of Labor and Workforce Development, Research and Analysis Section, population estimates. http://laborstats.alaska.gov/pop/popest.htm

According to the 2010 Census, the population of Craig consists of 23 percent Alaska Native. This is compared to 16.0 percent for the State of Alaska.[5] The majority of the population in Craig is listed as white, at 75 percent. The gender breakdown of Craig's population was approximately 55 percent male and 45 percent female compared to 52 percent male and 48 percent female in the State of Alaska. The median age of Craig residents is 36.4 years. This suggests a relatively older population than the rest of the state. The 2010 median age for the State of Alaska is 33.8 years.

Figure B-3 shows a comparison of the Craig population by age groups as reported by the 2000 and 2010 Censuses. This data shows the population of Craig has aged between 2000 and 2010. According to Census data, 72 percent of Craig's population was 44 years or younger in 2000 compared to only 62 percent of the population in 2010.[6]

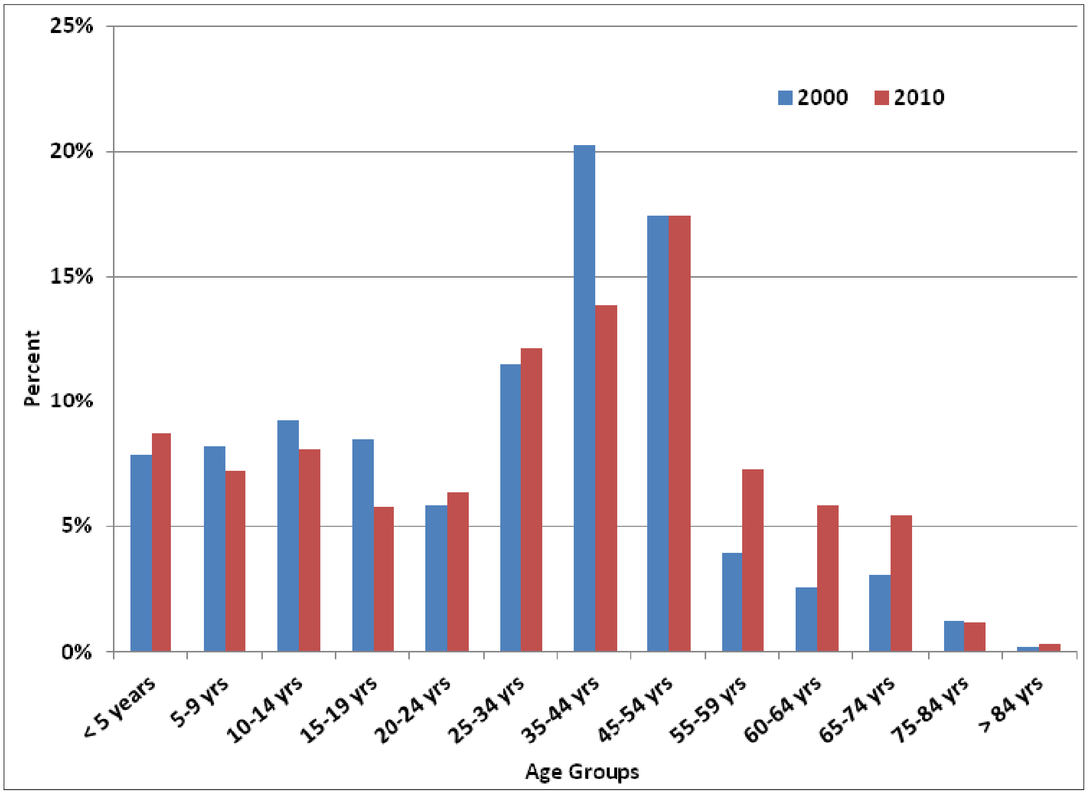

Figure B-3. Craig, Percent of Population by age group, 2000 and 2010 comparison

Source: US Census, 2000 and 2010

[5] The 2010 US Census is the most recent data available for employment and income levels. The figures are estimates based on a sample, and are subject to sampling variability.

[6] 2000 and 2010 US Census Data accessed via the State of Alaska Department of Labor and Workforce Development, Research and Analysis Section.

2. School Enrollment

There are five schools in Craig; all are part of the Craig City School District: Craig Alternative High School serves grades 9 through 12; Craig Elementary School, grades Pre-K through 5; Craig High School, grades 9 through 12; Craig Middle School, grades 6 through 8; and PACE Correspondence School, grades K through 12. Total enrollment in the Craig City School District Schools was 587 students as of Fiscal Year 2014. Looking to recent history, school enrollment peaked in fiscal year 2004 with an enrollment of 974 students, and has shown a decreasing trend since that time.[7] This decrease in school enrollment could be due, at least in part, to the aging Craig population as described in the previous section.

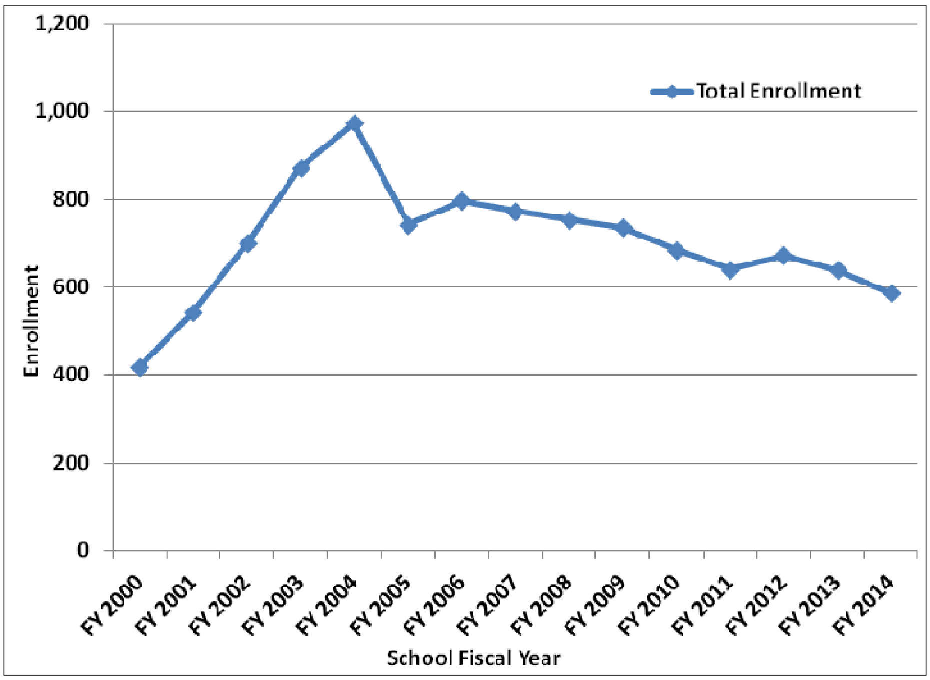

Figure B-4. Craig City School District Total Enrollment, 1999-2014

Source: State of Alaska Department of Education and Early Development

3. Employment and Income

Employment in Craig is dominated by the local government and trade, transportation, and utilities industries. These industries comprised just over 50 percent of the total employment in Craig in 2012.[8] Figure B-5 shows the composition of Craig employment by industry. According to data from the State of Alaska Department of Labor and Workforce Development

[7] State of Alaska Department of Education and Early Development, Statistics and Reports. http://education.alaska.gov/stats/

[8] State of Alaska Department of Labor and Workforce Development, Research and Analysis Section. Alaska Local and Regional Information, Craig, 2012. http://live.laborstats.alaska.gov/alari/details.cfm?yr=2012&dst=01&dst=03&dst=04&dst=06&dst=12&dst=09&dst=11&dst=07&r=5&b=21&p=69

(ADOL&WD), the top occupations in Craig in 2012 were cashier with 26 employees, followed by personal care and service worker with 19 employees, and combined food preparation and serving workers with 14 employees.

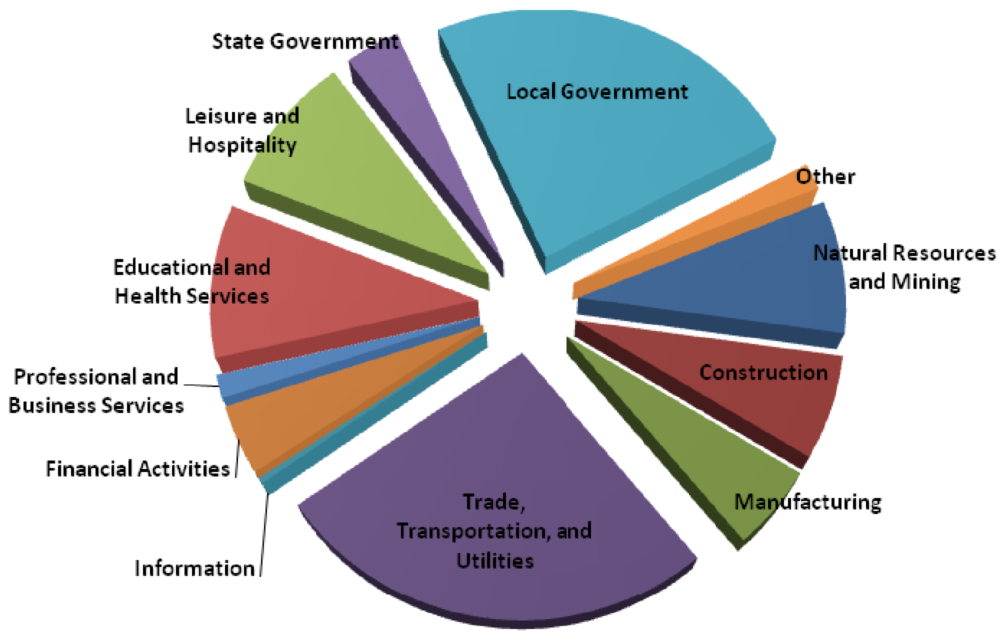

Figure B-5. 2012 Craig Employment by Industry

Source: State of Alaska Department of Labor and Workforce Development, Research and Analysis Section, Alaska Local and Regional Information

Data from ADOL&WD shows that in 2012, 73 percent of workers in Craig were employed in the private sector, followed by 24 percent in local government, and 3 percent in state government.[9] Table B-1 summarizes the ADOL&WD employment data for Craig.

[9] Ibid.

Table B-1. Craig Worker Characteristics, 2012

Craig Worker Characteristics, 2012	Value	Percent
Residents age 16 and over	**868**	
Residents employed	**554**	
Female workers	267	48%
Male workers	286	52%
Workers age 45 and over	246	44%
Workers age 50 and over	182	33%
Total Wages	**$16,198,351**	
Sector Employed in:		
Private	402	73%
Local Government	133	24%
State Government	19	3%
Peak quarterly employment	**476**	
Workers employed all four quarters	**339**	

Source: State of Alaska Department of Labor and Workforce Development, Research and Analysis Section, Alaska Local and Regional Information

The 2008 through 2012 5-year data from the American Community Survey (ACS)[10] reports that Craig had a total potential workforce (population over 16 years of age) of 960 (margin of error +/- 103) at that time. Of those, 713 (MOE +/- 85) were considered in the labor force, with 650 (MOE +/- 82) employed and 63 (MOE +/- 43) unemployed.[11]

The unemployment level does not account for all of the non-working adults in Craig. There were also 247 residents, 26 percent of the potential workforce, who were considered not in the labor force according to the ACS.[12] This means that they were not working and not looking for work. Many factors can play into the decision to search for jobs, including: scarce availability, informal searching (through communal connections), and seasonal shifts in job opportunities and subsistence activities. Were these individuals included, the unemployment rate for the community would be 32 percent rather than the 9 percent reported by the ACS. It is important to recognize the definitional differences of the potential workforce and the actual labor force for an accurate understanding of local economic conditions.

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[10] The 2010 Census differed from past Censuses in that it collected only data related to general population statistics and did not collect income or employment information which had previously been ascertained using the Census "long form". Instead, the Census Bureau now uses the American Community Survey (ACS) to collect more detailed social and economic information from a sample of the American population. The ACS provides detailed and useful data, but it is based on a sample of the population, rather than the decennial census which attempts to count every person. As the ACS is based on a small sample size in an already small population of some communities in Alaska, it can be subject to high sampling variability and large margins of error. This analysis uses the 2008-2012 American Community Survey 5-Year Estimates to report current labor market and other economic conditions in Craig, but notes significant margins of error as appropriate.

[11] US Census Bureau, American Community Survey, 2008-2012 5-Year Data. Accessed through State of Alaska Department of Labor and Workforce Development, Research and Analysis Section. http://live.laborstats.alaska.gov/cen/acsdetails.cfm

[12] Ibid

The ACS reports that Craig has a total of 517 households (MOE +/- 60) with a median income of $58,015 per year (MOE +/- 9,184). In Craig, 214 persons (MOE +/- 93) live below the poverty level. In addition to regular income, the community had 92 of its residents (MOE +/- 29) collecting Social Security Income, 35 (MOE +/- 22) with public assistance income, and 69 (MOE +/- 22) collecting retirement income.[13]

In addition to wage earning jobs, many Craig residents practice a subsistence lifestyle.

Commercial fishing also plays an important role in the local economy. According to the State of Alaska Department of Fish and Game (ADF&G), 151 Craig residents held commercial fishing permits in 2010 and 107 residents held crew member licenses.[14] For 2012, the most recent year for which complete harvest data is available, the Commercial Fisheries Entry Commission (CFEC, a division of ADF&G) reports that 149 permit holders had a total of 274 permits issued, 191 of which were actually fished. Of the 191 permits fished, a total of 6.1 million pounds of fish were landed for estimated gross earnings of $8.9 million, or about $46,450 per permit fished. The majority of the harvest, 5.8 million pounds or 65 percent, was salmon, with the remaining harvest comprised of crab, halibut, herring, groundfish, shellfish, and sablefish.[15] Detailed information about commercial fisheries is presented in the Marine Resource Assessment Section.

F. Infrastructure

Craig is located on Prince of Wales Island. There is a road system on the island connecting the local communities, but Prince of Wales Island must be accessed by plane or ferry. Freight arrives by cargo plane, barge, and ferry in Hollis. A paved road exists between Hollis, Craig, Klawock, and the airport.

Craig is connected by a paved road to the Inter-Island ferry system in Hollis, which then serves Ketchikan and other cities in Southeast Alaska.

1. Marine Facilities

There are two small boat harbors in Craig: North Cove and South Cove. There is also a small transient float and dock in the downtown area. The J.T. Brown Marine Industrial Center was completed in 2006 and includes a dock and boat launch. Figure B-6 shows the existing facilities in Craig.

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[13] Ibid

[14] State of Alaska Department of Fish and Game, Commercial Fisheries Entry Commission. Permit Holder & Crew Member Counts by City of Residence for 2010. http://www.cfec.state.ak.us/cpbycen/2010/Mnu.htm

[15] State of Alaska Department of Fish and Game, Commercial Fisheries Entry Commission. Permit & Fishing Activity by Year, and City, Craig 2012. http://www.cfec.state.ak.us/gpbycen/2012/201429.htm

Figure B-6. Existing Craig Marine Infrastructure

Source: ©Google Earth. Citations added by USACE.

The South Cove harbor is a Federal, Corps of Engineers project. The harbor was authorized by the Rivers and Harbors Act, 2 March 1945 (House Doc. 558, 76th Congress, 3rd Session) as adopted, and provides for a 225-foot by 700-foot mooring basin and an entrance channel 100-feet wide by 500-feet long to a depth of 11 feet below Mean Lower Low Water (MLLW). The mooring basin provides 120 slips. Dredging at South Cove was first conducted in 1957, then in 1973, and again in 1992. Two overlapping breakwaters protect the mooring basin. Construction of the breakwaters was completed in January 1982.

Figure B-7. South Cove Harbor

North Cove harbor provides approximately 102 slips. A floating breakwater protects the majority of vessels moored at this harbor.

Figure B-8. North Cove Harbor

The City Dock also provides about 12 slips.

The Wards Cove Packing property consists of approximately five acres of upland and five acres of tide/submerged land located on Klawock Inlet adjacent to the Craig commercial and retail district. The property was used as a fish cannery starting in the early 1920s. Primary infrastructure at one time included the bulk fuels facility, a fish processing plant, and a boat maintenance and storage facility that included wood boat ways and a "steam donkey" winch house. The City of Craig now owns this property which includes a dock and fuel dock.[16]

The dock is a 200-foot by 25-foot wood pile supported pier and a 145-foot long by 6,000 square foot wide wood pile supported dock. The dock is surrounded by old wood pilings.[17]

The old fuel dock is a wood pile supported pier and dock with a building on the dock and an attached ramp and float. The building has been primarily vacant in recent years and the float and ramp have been subleased to various charter operators.[18]

There is also an old marine way and haulout which is a wooden-beam structured traditionally used to haul vessels out of the water for maintenance repair, and storage. The structure is no longer used.[19]

2. Ferry

The Inter-Island Ferry Authority operates daily between Hollis and Ketchikan. Hollis is 30 miles from Craig. This ferry enables transportation of passengers, cargo, and vehicles to Prince of Wales Island. The Inter-Island Ferry estimates that an average of 52,000 passengers per year used the ferry for travel between Hollis and Ketchikan from 2002 through 2013. The ferry transported an estimated 3 million pounds of seafood from Prince of Wales Island in 2013 with an ex-vessel value of $15 million.[20]

3. Airport

Scheduled air transportation to Ketchikan is available from the nearby Klawock Airport. A state-owned seaplane base at Klawock Inlet and a U.S. Coast Guard heliport are maintained in Craig.

The Craig Coast Guard heliport is a 70-foot by 70-foot wood pad. There are two sea plane bases in Craig – the Craig Sea Plane base owned by the City of Craig and the privately-owned El Capitan Lodge Sea Plane base.

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[16] Ward Cove Cannery Site Development Plan, Craig Planning Department. July 2006.

[17] Ibid

[18] Ibid

[19] Ibid

[20] The Inter-Island Ferry Authority By the Numbers. http://www.interislandferry.com/

4. Utilities and Services

The municipal facilities and services available in Craig include: piped water and sewer, refuse collection, landfill, police, fire and EMS, health clinic, library, schools, local transportation, swimming pool, parks and recreation, planning, daycare assistance, and jail.

The City of Craig operates the public water system including distribution, wastewater collection, and wastewater treatment. A landfill is operated by the City of Klawock.

Electricity is provided by the Alaska Power and Telephone Company through a combination of hydropower and diesel.

G. Government

The City of Craig was incorporated in 1922 as a second-class city under the law of the Territory of Alaska. It became a first class city in 1973. The City functions under a mayor/council form of government with the day-to-day operations overseen by a city administrator. There are six council members and a mayor, all of whom are elected.[21]

By 1974, the City Council created the planning and zoning commission. The commission is charged with responsibility for preparing and implementing the comprehensive plan, preparing and implementing zoning and subdivision ordinances, and for other planning and platting duties as assigned by the council or by ordinance.[22]

Today, Craig is a first class city in the Prince of Wales-Hyder Census Area. There are three different classifications of city governments in Alaska – home-rule, first-class, and second-class cities. A community must have a least 400 permanent residents to form a home-rule or first-class city. First- and second-class cities are general law cities: State law defines their powers, duties, and functions. All local governments in Alaska have certain fundamental duties such as conducting elections and holding regular meetings of the governing bodies.[23]

The City of Craig levies a 6.00 mill property tax. Craig's total 2013 property tax revenue was $516,969, or $417 per capita (based on a 2013 population of 1,243). Craig also levies a 5 percent sales tax with total 2013 revenue of $1,704,780 and a 6 percent alcohol tax with 2013 revenues of $115,149. The total 2013 per capita tax revenue in Craig was $1,880.[24]

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[21] City of Craig, Comprehensive Plan. Prepared by HDR Alaska, Inc., 2000.

[22] Ibid

[23] Local Government in Alaska. Prepared by Local Boundary Commission Staff, Alaska Department of Community and Economic Development. March 2004.

[24] State of Alaska, Department of Commerce, Community, and Economic Development. Alaska Taxable 2013. January 2014. http://commerce.alaska.gov/dnn/dcra/OfficeoftheStateAssessor/AlaskaTaxableDatabase.aspx

II. MARINE RESOURCE ASSESSMENT

This section describes the fisheries resources in the Craig area, the historical catch and values, fisheries management institutions and practices, and expectations for the future.

A. Overview

Craig small boat harbor facilities primarily support fishing vessels: commercial, subsistence, charter, and recreational. Therefore, the future demand for harbor facilities is dependent upon the viability of fishery resources in the region. The purpose of this section is to describe these resources, including historical catch information. Historical information serves as the basis for examining how the Craig fleet has utilized fisheries and responded to changes in availability and regulation. This section focuses on the current and future outlooks for the fisheries of importance to the Craig fleet.

B. Fisheries Management Institutions

Commercial fisheries of Alaska fall under a mix of state and federal management jurisdiction. In general, the state has management authority for all salmon, herring, and shellfish fisheries, whereas the federal government has management authority for the majority of groundfish fisheries, excepting those within 3 nautical miles of shore and a few others. The Pacific halibut fishery is managed by the International Pacific Halibut Commission.[25]

The State of Alaska took management control of its fishery resources from the federal government soon after statehood in 1959. Enactment of the Magnuson Fishery Conservation and Management Act (MFCMA) of 1976 asserted federal authority over the Exclusive Economic Zone (EEZ) from 3 to 200 miles offshore of the US coasts, with the waters inshore of 3 miles under state jurisdiction. The State of Alaska Department of Fish and Game (ADF&G) is the primary state fisheries management agency and the National Marine Fisheries Service (NMFS) is the primary federal fisheries management agency.[26] The specific fisheries management institutions are:

- Alaska Board of Fisheries (BOF)
- Alaska Department of Fish and Game (ADF&G)
- Commercial Fisheries Entry Commission (CFEC)
- National Marine Fisheries Service (NMFS)
- North Pacific Fishery Management Council (NPFMC)
- Pacific States Marine Fisheries Commission (PSMFC)
- International Pacific Halibut Commission (IPHC)

[25] State of Alaska Department of Fish and Game, Special Publication No. 0509. "Commercial Fisheries of Alaska", June 2005.

[26] ibid

1. Board of Fisheries

The BOF[27] is responsible for considering and adopting regulations to allocate resources between user groups; establish fish reserves and conservation areas, fishing seasons, quotas, and bag limits size restrictions, means and methods, habitat protection, stock enhancement; and to develop commercial, subsistence, sport and personal use fisheries.

The BOF consists of seven members serving three-year terms. Members are appointed by the governor and confirmed by the legislature. Members are appointed on the basis of interest in public affairs, good judgment, knowledge, and ability in the field of action of the board, with a view to providing diversity of interest and points of view in the membership.

The Board of Fisheries' main role is to conserve and develop the fishery resources of the state. This involves setting seasons, bag limits, methods and means for the state's subsistence, commercial, sport, guided sport, and personal use fisheries, and it also involves setting policy and direction for the management of the state's fishery resources. The board is charged with making allocative decisions, and the department is responsible for management based on those decisions.

2. Alaska Department of Fish and Game

The ADF&G[28] is a research and regulatory agency. The division of Commercial Fisheries within ADF&G is charged with research and management of the commercial fisheries in Alaskan waters, which covers waters within 3 nautical miles of shore. Division biologists conduct research on migratory patterns, gear types, and the relative abundance of fish stocks. The department also has the authority to open and close commercial fishing periods based on preseason catch goals and biological considerations.

3. Commercial Fisheries Entry Commission

The CFEC[29] helps to conserve and maintain the economic health of Alaska's commercial fisheries by limiting the number of participating fishers. The Commission issues permits and vessel licenses to qualified individuals in both limited and unlimited fisheries, and provides due process hearings and appeals. The CFEC is a regulatory and quasi-judicial agency of the state. The commission consists of three members appointed by the governor and confirmed by the legislature. The governor designates one member of the commission as chairman. Members of the commission serve four year terms.

[27] http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.main

[28] http://www.adfg.alaska.gov/index.cfm?adfg=home.main

[29] http://www.cfec.state.ak.us/

4. National Marine Fisheries Service

The NMFS[30] administers the National Oceanic and Atmospheric Administration's (NOAA) programs that support the domestic and international management and harvest of marine resources. The Alaska Regional office, located in Juneau, coordinates Federal and State resource management and research, and monitors and coordinates openings and closures of the fisheries within the Exclusive Economic Zone (EEZ). It is responsible for planning and implementing fishery management conservation programs, including fishery management plans established by the North Pacific Fishery Management Council.

Using the tools provided by the Magnuson-Stevens Act, NOAA's National Marine Fisheries Service assesses and predicts the status of fish stocks, ensures compliance with fisheries regulations, and works to reduce wasteful fishing practices. The Alaska Region of NOAA fisheries oversees sustainable fisheries that produce about half the fish caught in US waters, with responsibilities covering 842,000 square nautical miles. The Alaska Regional also works to ensure the viability of protected species – principally marine mammals – and to protect and enhance Alaska's marine habitat. NOAA's National Marine Fisheries Service works to promote sustainable fisheries and to prevent lost economic potential associated with overfishing, declining species and degraded habitats.

5. North Pacific Fishery Management Council

The NPFMC[31] is one of eight regional councils established by the Magnuson-Stevens Fishery Conservation and Management Act in 1976 to manage fisheries in the 200-mile EEZ. NPFMC is a body of 11 voting members who are appointed to the Council by the region's governors and the Secretary of Commerce. The NPFMC meets five times a year to allocate resources, set management policy, hear testimony from the industry, and consider issues important to the industry that fall under the Council's authority. The Council primarily manages groundfish in the Gulf of Alaska, Bering Sea, and Aleutian Islands, targeting cod, Pollock, flatfish, mackerel, sablefish, and rockfish species. Two major functions of the Council are the development and maintenance of fishery management plans for those fisheries under its authority in need of conservation and management. The Council also has authority under the 1982 North Pacific Halibut Act to develop regulations, including limiting access, for participants in the Alaska halibut fisheries. Resource allocations are divided by specie, by region, and according to the priorities of the Magnuson Act. The NPFMC has management authority from the 3-mile State boundary to the 200-mile EEZ boundary. Fisheries regulations developed by the Council are required to meet numerous regulatory standards and must be approved by the Secretary of Commerce.

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[30] https://alaskafisheries.noaa.gov/

[31] http://www.npfmc.org/

6. Pacific States Marine Fisheries Commission

The PSMFC[32] is one of three interstate commission dedicated to resolving fishery issues. The commission is comprised of 15 members appointed by State legislatures, State governors, and State fishery directors. Representing California, Oregon, Washington, Idaho, and Alaska, the PSMFC does not have regulatory or management authority: rather, it serves as a forum for discussion and works for coast wide consensus to State and Federal authorities. PSMFC addresses issues that fall outside state or regional management council jurisdiction. The goal is to promote and support policies and actions directed at the conservation, development, and management of fishery resources of mutual concern to member States through a coordinated regional approach to research, monitoring, and utilization.

7. International Pacific Halibut Commission

The IPHC[33] was established in 1923 by a convention between Canada and the Unites States for the preservation of the halibut fishery of the North Pacific Ocean and the Bering Sea. The convention was the first international agreement providing for the joint management of a marine resource. The Commission's authority was expanded by several subsequent conventions, the most recent being signed in 1953 and amended by the protocol of 1979. The IPHC is considered a public international organization. The IPHC conducts numerous projects annually to support both major mandates: stock assessment and basic halibut biology. The 6-member Commission meets annually to review all regulatory proposals, including those made by the scientific staff and the Conference Board, which represents vessel owners and fishers. The commission sets area quotas and seasons for the purpose of stock conservation. The measures recommended by the Commission are submitted to the two governments for approval. Upon approval, the regulations are considered Federal regulations and are enforced by the appropriate agencies of both governments.

8. Other Fishery Management Agencies

Also instrumental in data compilation, research and marketing are the Alaska Seafood Marketing Institute, the Alaska Fisheries Development Foundation, the Officer of International Trade, and the University of Alaska.

C. Fishery Management Techniques

Fisheries management techniques can take a variety of forms from size and type of gear, to hours, days, or time of year to harvest, and other types of permit restrictions. Alaska fisheries are managed for sustainability and while other parts of the world have suffered huge stock declines as a result of fishery management techniques, Alaska has not experienced that same

[32] http://www.psmfc.org/

[33] http://www.iphc.int/

fate. In most cases, subsistence fishing takes priority over commercial, charter, and recreational fishing.

Subsistence uses of wild resources are defined as 'noncommercial, customary and traditional uses' for a variety of purposes. These include:

> *Direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation, for the making and selling of handicraft articles out of nonedible by-products of fish and wildlife resources taken for personal or family consumption, and for the customary trade, barter, or sharing for personal or family consumption (AS 16.05.940[32]).*

Under Alaska's subsistence statute, the Alaska Board of Fisheries must identify fish stocks that support subsistence fisheries and, if there is a harvestable surplus of these stocks, adopt regulations that provide reasonable opportunities for these subsistence uses to take place. Whenever it is necessary to restrict harvests, subsistence fisheries have a preference over other uses of the stock (AS 16.05.258).[34]

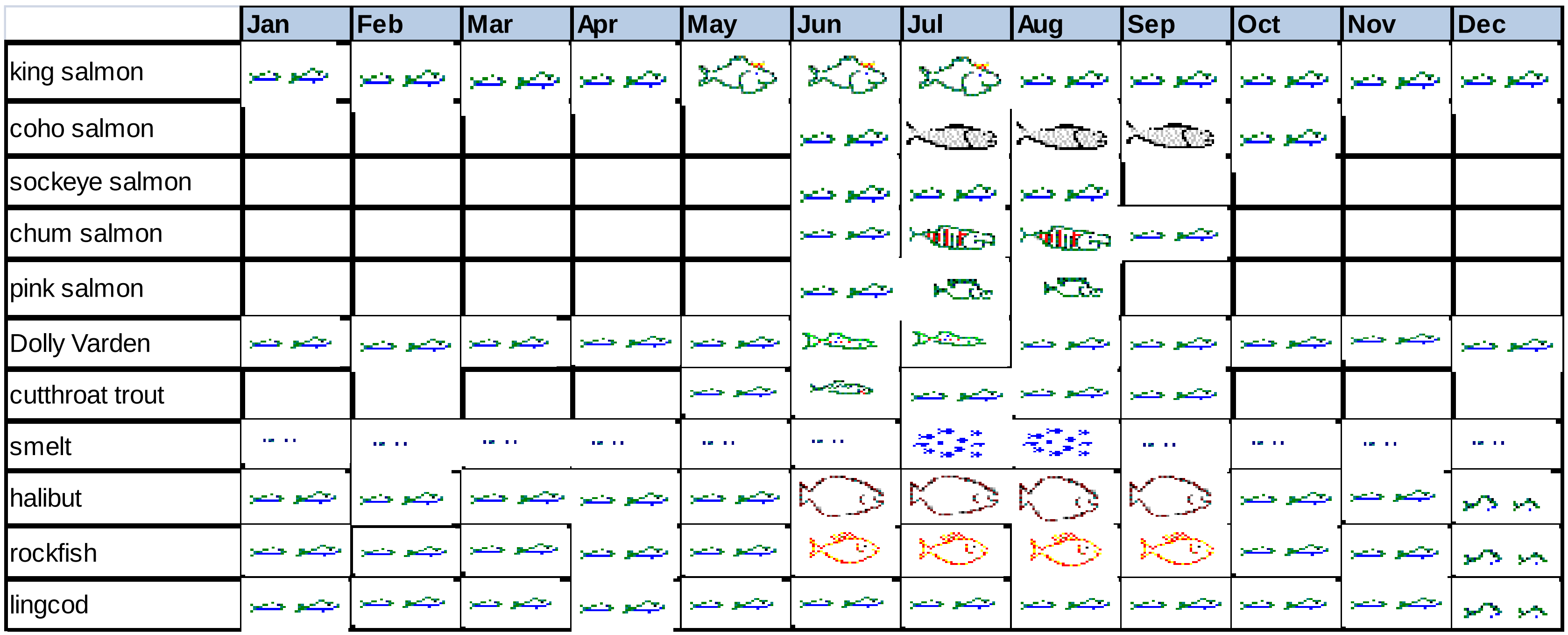
Special consideration is given to subsistence fishing in the Corps' Planning Guidance Notebook (Engineer Regulation 1105-2-100, Appendix E, Civil Works Missions and Evaluation Procedures, Section E-14 d, Subsistence Fishing); which states:

> *This is fishing, primarily for personal or family consumption, by those whose incomes are at or below the minimum subsistence level set by the Department of Commerce. For cost allocation purposes subsistence fishing is considered commercial fishing.*

[34] http://www.adfg.alaska.gov/index.cfm?adfg=fishingSubsistence.main

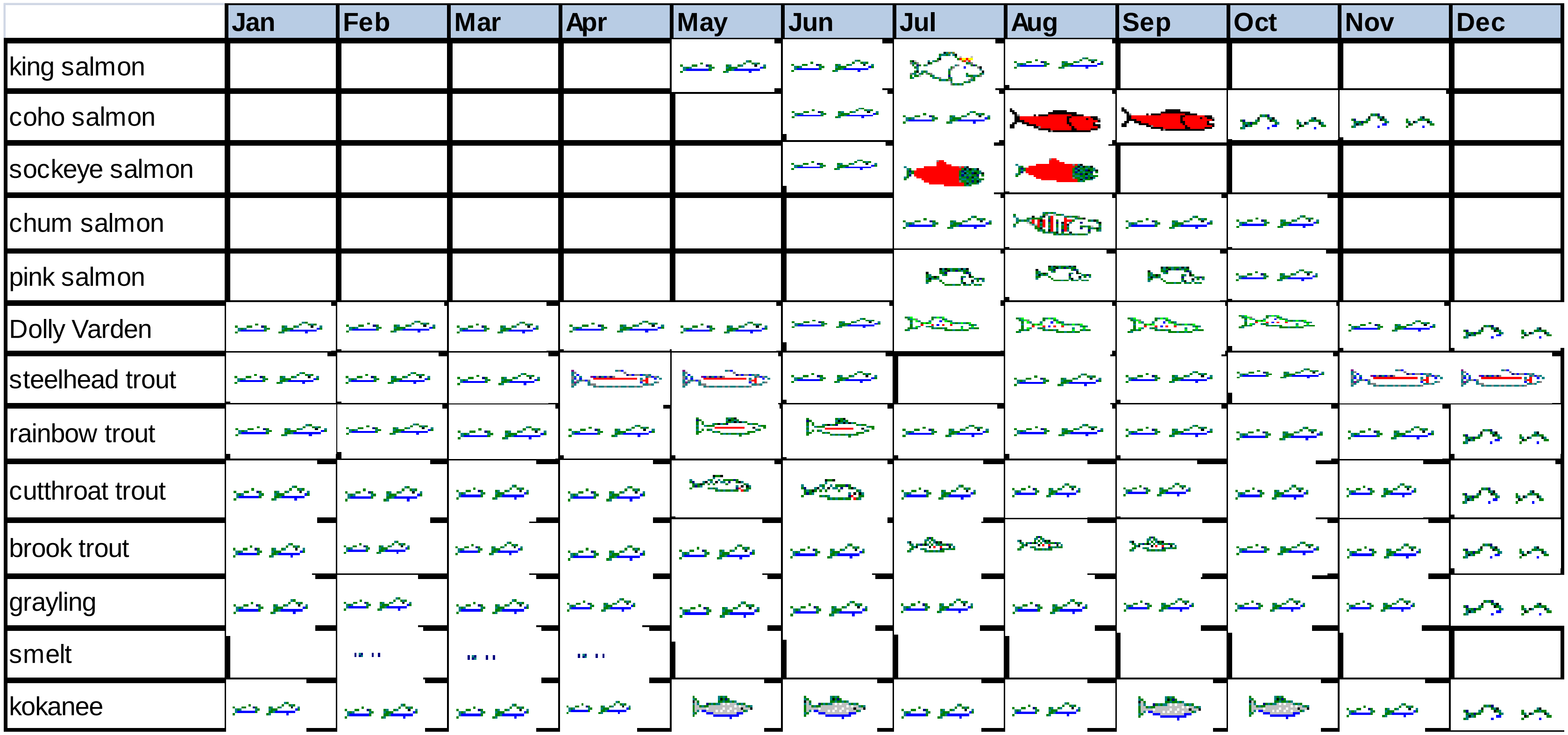
D. Harvest Timelines and Periods of Operation for Fisheries

Timing and location are critical when fishing in Alaska waters. The Alaska Department of Fish and Game publish runtime tables for sport fishers in order to maximize fishing success. The following graphics show saltwater and freshwater fish availability for Southeast waters that include Petersburg, Wrangell, Prince of Wales Island, and Ketchikan. The table indicates when fish are present (little fish) or at their peak availability (larger fish) in the saltwater area south of Fredrick Sound.



Source: Alaska Dept of Fish and Game http://www.adfg.alaska.gov/index.cfm?adfg=fishingSportFishingInforuntiming.main&chart=runktks

Figure B-9. Saltwater Fish Runtime Tables



Source: Alaska Dept of Fish and Game http://www.adfg.alaska.gov/index.cfm?adfg=fishingSportFishingInforuntiming.main&chart=runktk

Figure B-10. Freshwater Fish Runtime Tables

E. Commercial Fisheries

1. Types of vessels

According to CFEC data, there were 245 commercial fishing permits for Prince of Wales residents in 2013 (the most recent year for which complete data is available). Craig residents totaled 121 fishing permits for that same year or about half of all the fishing permits from Prince of Wales islanders.

Data from 2012 shows that almost 30 percent of Craig vessel owners had aluminum and 40 percent had fiberglass hulls. The vessels averaged 33 feet in length and were about 35 years old. In Alaska, it is common for commercial fishing vessels to be used for more than one type of fishing activity and to use multiple gear types. In Craig, most vessels had two gear types each. Table B-2 provides additional details on vessels owned by Craig residents.

Table B-2. Vessel Characteristics for Craig Boat Owners

Vessel Characteristics	Average (Mean)	Median
Year Built	1977	1978
Age (in the year 2012)	35 yrs.	
Number of Gear Types per Vessel	2	2
Horsepower	172.4 hp	150
Fuel Tank Capacity	590.3 gal.	300
Hold Tank Capacity	798.1 cu. ft.	480
Live Tank Capacity	454.3 cu. ft.	173.5
Length	33.0 '	35
Aluminum	21.9 '	19
Concrete	45.3 '	45
Fiberglass/Plastic	34.6 '	36.5
Iron/Steel/Alloy	50.3 '	50
Rubber	11.0 '	11
Wood	41.1 '	40

Source: Alaska Department of Fish and Game, Commercial Fisheries Entry Commission.

Most vessels in Craig are commercial fishing vessels with a few vessels operating as tenders/packers (7 vessels) or freezer/canners (2 vessels). Almost 64 percent of the vessels have diesel engines with the balance operating on gas engines. Power troll vessels represent about 42 percent of the fleet followed by longline vessels at 37 percent. See Table B-3.

Table B-3. Additional Vessel Characteristics for Craig Boat Owners

Additional Vessel Characteristics	# of Vessels	% of Total Vessels
Total Number of Vessels Surveyed	148	100%
Engines		
Diesel	94	63.5
Gas	54	36.5
Refrigeration	24	16.2
Registered for a Salmon Net Area	20	13.5
Company or Partnership Owned Vessels	4	2.7
Hull Type		
Aluminum	44	29.7
Concrete	3	2
Fiberglass/Plastic	60	40.5
Iron/Steel/Alloy	6	4.1
Rubber	1	0
Wood	34	23
Type of Activity (See note to table)		
Freezer/Canner	2	1.4
Tender/Packer	7	4.7
Commercial Fishing	147	99.3
Gear(s) Intended to be Used (*See note to table*)		
Diving Gear	34	23
Gill Net - Drift	11	7.4
Gill Net - Herring	4	2.7
Longline	55	37.2
Mechanical Jig	8	5.4
Pot Gear	31	20.9
Ring Net	1	0.7
Seine - Purse Seine	15	10.1
Seine - Beach Seine	1	0.7
Trawl - Beam	2	1.4
Troll - Dinglebar	8	5.4
Troll - Hand	34	23
Troll - Power	62	41.9
Other Gear Types	25	16.9

Source: Alaska Department of Fish and Game, Commercial Fisheries Entry Commission.

Note to table: Vessels can be used for more than one activity and can use multiple gear types. As a result, in these categories a vessel may be counted multiple times. Some vessels may not be counted at all if the activity or gear information was not provided on the vessel license application.

2. Landed Weights and Ex-Vessel Values

According to the CFEC, the total commercial harvest by Prince of Wales Island residents in 2013 was more than 27 million pounds. Since Craig has the only land based seafood processor on the island, most of these fish would be delivered to that processor. The five species of salmon comprise the majority of the harvest with 90 percent of the pounds landed and 75 percent of the total value. Earnings per fisherman have steadily increased in the last 14 years reaching a high of $81,855 in 2013. Earnings per fisherman are based on the total earnings divided by the number of fishermen who fished. Due to confidentiality restrictions and limited participation, gross earnings will be understated for some fisheries.
See Table B-4.

Table B-4. Prince of Wales Island – All fisheries combined

Year	Number of fishermen who fished	Total pounds landed	Estimated gross earnings	Earnings per fishermen	Earnings in 2014 dollars
2000	246	8,646,745	$6,454,848	$26,239	$37,346
2001	246	13,579,049	$6,822,300	$27,733	$38,379
2002	237	9,700,222	$5,438,840	$22,949	$31,156
2003	254	10,591,222	$6,999,064	$27,555	$36,420
2004	251	13,098,655	$9,261,664	$36,899	$47,541
2005	243	13,105,924	$9,006,401	$37,063	$46,335
2006	242	8,889,527	$9,982,272	$41,249	$49,968
2007	240	14,547,800	$12,175,268	$50,730	$60,119
2008	254	11,452,073	$14,470,378	$56,970	$64,570
2009	255	15,023,471	$11,441,805	$44,870	$50,260
2010	246	15,843,299	$14,318,540	$58,205	$64,061
2011	227	19,392,630	$17,080,457	$75,244	$80,231
2012	231	16,676,578	$17,090,831	$73,986	$77,170
2013	245	27,079,337	$20,054,585	$81,855	$82,779

Note: 2009 and 2010 Salmon pounds landed and estimated gross earnings are understated due to confidentiality of data.

Figure B-11 shows the Prince of Wales Island historical fishing activity for all species from 2000 through 2013. Gross earnings are displayed in 2014 dollars.

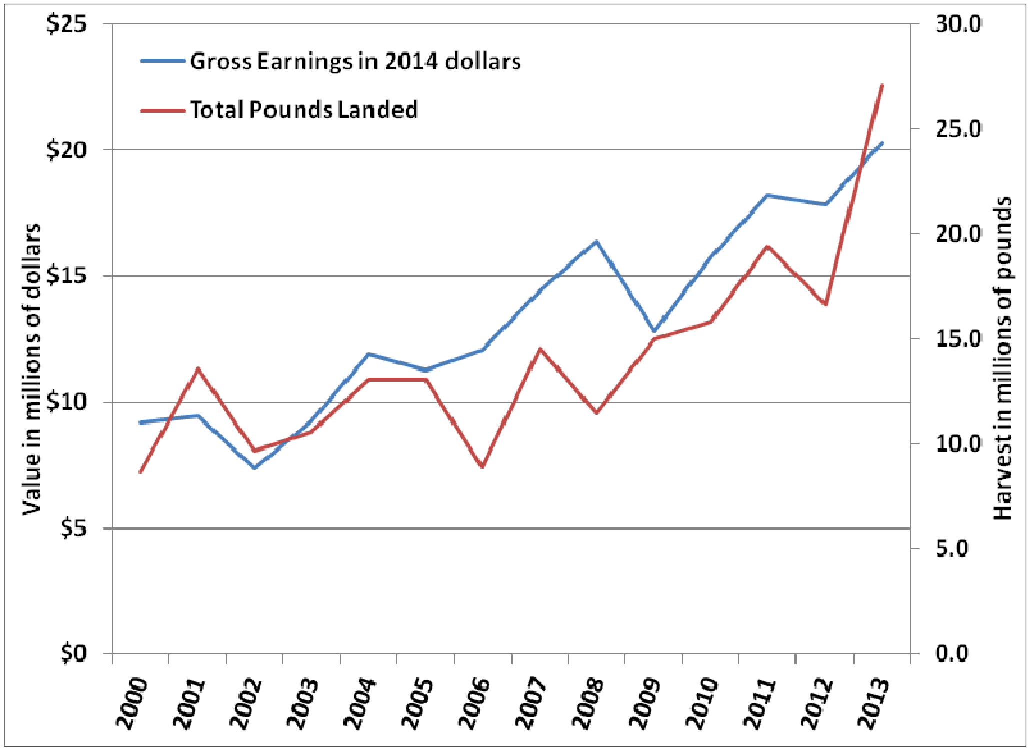


Figure B-11. Prince of Wales Island Historical Harvest

Fisherman with Craig, Alaska mailing addresses comprise about 42 percent of the total pounds landed from the Prince of Wales Islanders and about 52 percent of the total earnings in 2013. Pounds landed and earnings have steadily increased since 2000, reaching a high of 11.4 million pounds in 2013. Earnings per fisherman reached a high of $87,307 in 2013 which is slightly higher (about 5 percent) than the earnings by all Prince of Wales Islanders. See Table B-5.

Table B-5. Craig Residents – All fisheries combined

Year	Number of fishermen who fished	Total pounds landed	Estimated gross earnings	Earnings per fishermen	Earnings in 2014 dollars
2000	124	3,344,382	$3,396,094	$27,388	$38,981
2001	116	4,795,555	$3,374,881	$29,094	$40,262
2002	115	3,918,228	$2,951,369	$25,664	$34,842
2003	113	4,212,357	$3,627,786	$32,104	$42,432
2004	122	6,513,013	$5,373,341	$44,044	$56,746
2005	115	4,095,305	$4,958,380	$43,116	$53,902
2006	116	3,297,933	$5,711,628	$49,238	$59,646
2007	106	4,436,204	$6,110,615	$57,647	$68,316
2008	119	4,771,762	$7,824,845	$65,755	$74,527
2009	121	5,388,789	$5,773,321	$47,713	$53,445
2010	115	5,573,720	$7,409,382	$64,429	$70,912
2011	108	7,175,298	$8,930,243	$82,687	$88,168
2012	120	6,103,817	$8,871,945	$73,933	$77,114
2013	121	11,412,585	$10,443,123	$86,307	$87,280

Note: 2009 and 2010 Salmon pounds landed and estimated gross earnings are understated due to confidentiality of data.

Figure B-12 shows the total pounds landed and catch value for all fisheries combined for those fishers with Craig, Alaska mailing addresses from 2000 through 2013.

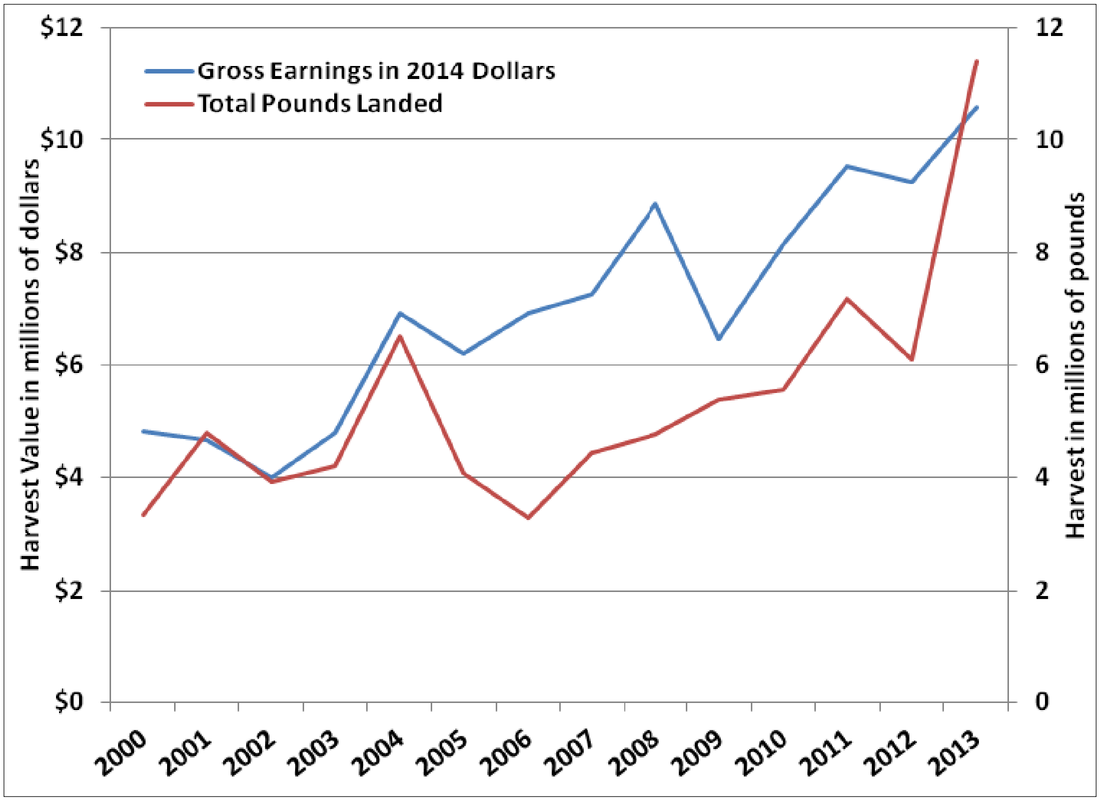


Figure B-12. Craig Residents Historical Harvest

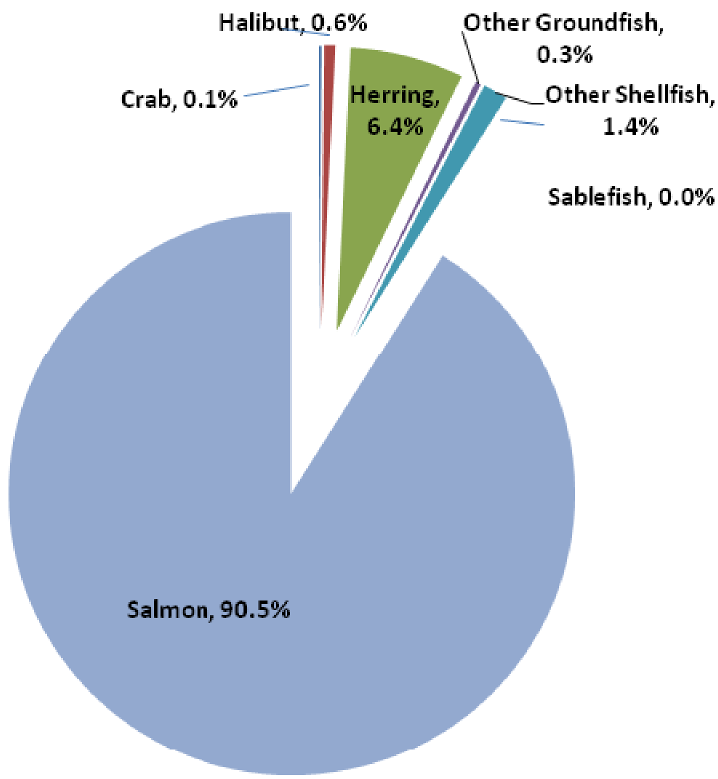


Figure B-13. Species Harvest Percentages (total pounds landed) 2013 for Prince of Wales Island Residents

Salmon species represented more than 90 percent of the total pounds landed for the Prince of Wales Island fishers during the calendar year 2013. This is typical of previous years' harvests. Herring came in a distant second with about 6 percent of the total harvest. All other fisheries were one percent or less of the total catch.

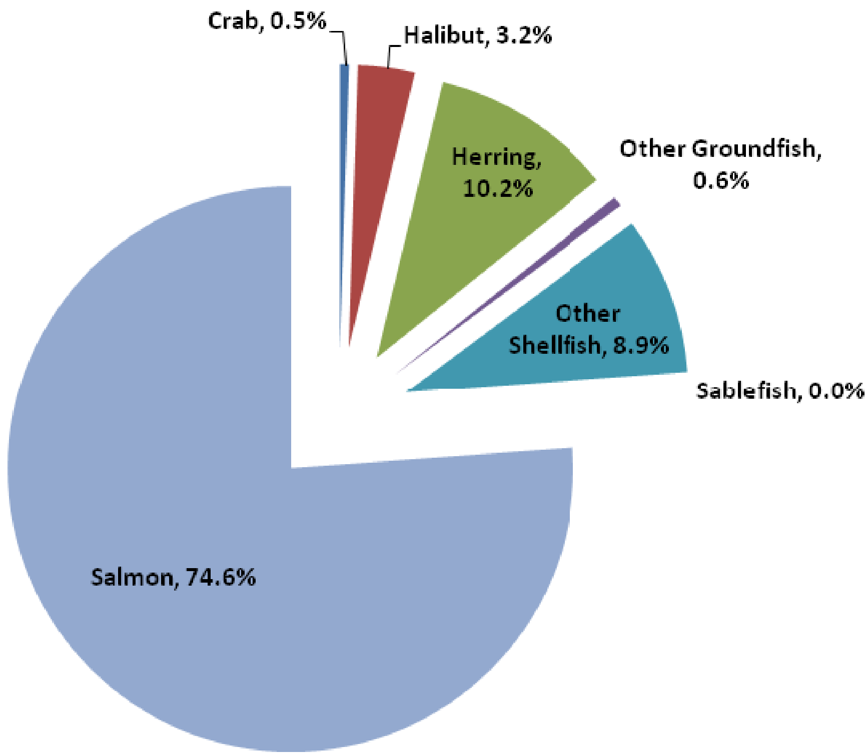


Figure B-14. Species Value Percentages (total value) 2013 for Prince of Wales Island Residents

In contrast, the total value of landed salmon for the Prince of Wales Islanders was about 75 percent of all species harvested. Herring was second at 10 percent of the total value, followed by other shellfish with almost 9 percent of the total value. Other fisheries, like sablefish and crab, are high value fisheries but because of limited participation, harvest and value are not disclosed.

There are 10 buyer/sellers registered with the State of Alaska Department of Fish and Game for 2014 for Prince of Wales Island companies. Two have Klawock addresses while the rest have Craig addresses. Half of them are registered as catcher/sellers, three are shore-based processors, and two are direct marketers.

3. Salmon

Five Pacific salmon species spawn and have directed fisheries in Alaska: sockeye or red salmon; pink salmon; chum or dog salmon; king or Chinook salmon; and coho or silver salmon. Chinook or king salmon is Alaska's state fish and is one of the most important sport and commercial fish native to the Pacific coast of North America. It is the largest of all Pacific salmon and garners the highest price per pound of all the salmon species. Pink salmon comprise the greatest number of fish and total poundage of all the salmon species harvested in Southeast. Biological escapement goals for pink salmon were met or exceeded for the 2013 fishing season. The 2014 pink salmon harvest is expected to be average.[35]

Table B-6. Southeast Alaska Salmon Statistics (2013 Salmon Season)

Species	Avg. Wt. (pounds)	Avg. Price per Pound	Number of Fish (thousands)	Lbs. of Fish (thousands)	Est. Value US$ (thousands)
Southeast					
Chinook	13.0	$6.70	200	2,601	$17,423
Sockeye	6.0	$1.85	910	5,488	$10,140
Coho	5.7	$1.17	3,504	19,987	$23,410
Pink	3.5	$0.40	89,234	313,714	$124,742
Chum	8.2	$0.52	10,220	83,415	$43,638
Totals			**104,067**	**425,206**	**$219,354**
Estimates based on fish tickets, inseason estimates, and reports from Area Managers.					

Source: ADF&G, October 10, 2013

4. Herring

Commercially exploitable quantities of Pacific herring occur in Alaska from its southern boundary at Dixon Entrance (55° N) to Norton Sound (64° N). Herring spawn in nearshore areas and deposit their eggs on intertidal and subtidal vegetation. Spawning begins as early as late March in southern Southeast Alaska and continues through mid July in the northern Bering Sea. Southeast Alaska commercial herring fisheries occur during the winter when herring are harvested for use primarily as bait, and during the spring when herring are harvested for their roe. The roe harvest includes the traditional sac roe fisheries and, in recent years, spawn-on-kelp pound fisheries. Herring is harvested by purse seine and drift gillnet fishers. These vessels are represented in the Craig fleet by 10 and less than 3 percent. The future of the herring fishery in Southeast appears stable.

5. Other Shellfish

Southeast Alaska shellfish commercial fisheries include red and blue king crab, tanner crab, Golden king crab, Dungeness crab, pot shrimp, and beam trawl shrimp. These fisheries are managed for sustainable harvests and have experienced closures in recent years and limited harvest times in order to maintain the fish stock. Table B-7 shows the most recent published

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[35] Special Publication 14-10 – Run Forecasts and Harvest Projections for 2014 Alaska Salmon Fisheries and Review of the 2013 Season by the Alaska Department of Fish and Game, Divisions of Sport Fish and Commercial Fisheries published April 2014.

data for commercial harvests of shellfish in Southeast waters. About 20 percent of the Craig vessel owners participate in shellfish fisheries using pot gear.

Table B-7. Southeast Alaska Registration Area A Shellfish Statistics

Area Season	Fishery	Harvest (lbs)	Approximate Ex-vessel Value
2005/2006	Red and blue king crab	209,799	$ 1,099,000
2010/2011	Tanner crab	891,344	2,425,059
2010/2011	Golden king crab	687,505	4,656,267
2010/2011	Dungeness crab	3,245,265	5,525,404
2010/2011	Pot shrimp	556,574	1,519,447
2010/2011	Beam trawl shrimp	132,383	107,813
	Total	**5,722,870**	**$ 15,332,990**

Source: ADF&G December 2011

6. Other species

Groundfish such as halibut and sablefish are also harvested by Craig and Prince of Wales Island residents. However, the participation rate for these fisheries is low and the harvest and values is not disclosed.

7. Local Processing Facilities

Silver Bay Seafoods is an integrated processor of frozen, headed and gutted salmon for domestic and export markets. The company began in 2007 as a single salmon processing facility in Sitka, Alaska. Today, Silver Bay is one of the largest seafood companies in Alaska, operating five domestic processing facilities throughout Alaska and the West Coast.

Silver Bay combines state of the art processing plant and favorable logistics to support its operations; competent management and key personnel; an established fish buying system; and ownership by fishermen who represent over 80 percent of the committed fishing effort.[36]

While salmon and herring production were the primary focus in the beginning, Silver Bay continues to explore areas to offer more value-added products to its customer base.

[36] http://www.silverbayseafoods.com/facilities.html

Figure B-15. Silver Bay Seafoods processing plant

Source: Silver Bay Seafoods website: http://www.silverbayseafoods.com/facilities.html

In 2007, the City of Craig solicited for a lease arrangement that would result in construction and operation of both the cold storage and seafood processing plant facilities. After a successful initial year of production in Sitka, Silver Bay Seafoods submitted its own proposal for a processing and freezing facility closely patterned after the Sitka plant.

The City of Craig Assembly chose Silver Bay's proposal, recognizing Silver Bay's competitive advantages of possessing a unique combination of ownership interests, plant efficiencies, and an ability to maximize processing capacity from owner fleet commitments. SBS Craig opened in 2009. During the 2013 Salmon Season, SBS Craig employed 246 workers for salmon processing and equipment maintenance. Since the plant opening in 2009, Craig residents have enjoyed a steady increase in seafood harvest. See Figure B-12.

Silver Bay Seafoods reports a processing capacity of approximately 1.1 million pounds per year under current operations. The company reports that they plan to expand their capacity to 1.5 million pounds by the 2015 season, which will process the catch of 8 to 12 additional commercial fishing vessels.

8. Outlook for Commercial Fisheries

The outlook for commercial fishing in the Craig and Prince of Wales Island area is considered good. Salmon stocks are healthy and in some cases increasing. Herring and shellfish fisheries experience low participation and are probably supplemental to the primary salmon fishing endeavors. Likewise, participation in groundfish and sablefish fisheries experience low participation. Commercial fishing is expected to continue to be a viable industry for Craig and the Prince of Wales Island residents and the Silver Bay Seafoods land-based processor in Craig will attract more commercial fishers to the region.

F. Sport Fisheries

Most sport fishing effort occurs from late May through early September. Chinook fishing usually peaks in June with both May and July being very good for the Prince of Wales Island area. Coho peaks in August with good catches in both July and September. Halibut fishing also peaks during the summer months. The majority of the Chinook and halibut effort occurs on the west coast of the island.

One of the most popular freshwater fisheries with anglers every year is the coho fishing found on Prince of Wales Island. Most anglers target the "fall run" coho that usually begin entering Prince of Wales Island streams in late August and peak in September. However a few island streams contain runs of "summer run" coho and these fish can be found in fresh water as early as late June (with July and August being the best time to fish for these returning salmon). The largest run of summer run coho on the island occurs at the outlet of Neck Lake near Whale Pass (this is a hatchery return) and this fishery remains good from late June through August. By far the largest coho return in the area is to the Klawock River. The Klawock River Hatchery releases millions of coho smolt annually, and the best time to fish for Klawock coho is from late August through September. There are many other fine coho streams to choose from on the island as almost all streams that contain anadromous salmon have a coho run.

The best months for steelhead fishing on the island are April and May, but a few fall run fish can be found throughout the winter in some of the larger streams. The majority of steelhead runs on the island are small and number less than 200 returning adults annually.

Table B-8. Prince of Wales Island Sport Fish Hours per Harvest

WEEK	Chinook	Chum	Coho	Halibut	Pinks	Rockfish
5/06-5/12	23	-	-	17	-	32
5/13-5/19	14	-	-	11	-	6
5/20-5/26	20	-	-	8	-	5
5/27-6/02	20	-	-	5	-	6
6/03-6/09	12	2000	294	6	-	2
6/10-6/16	6	1429	53	4	2500	2
6/17-6/23	5	167	6	3	59	1
6/24-6/30	5	370	5	2	152	1
7/01-7/07	7	313	3	2	145	1
7/08-7/14	9	500	2	2	79	1
7/15-7/21	15	99	1	2	42	1
7/22-7/28	12	370	1	2	22	1
7/29-8/04	15	233	1	2	19	1
8/05-8/11	22	286	1	2	23	1
8/12-8/18	41	625	1	2	17	1
8/19-8/25	69	1250	1	2	13	2
8/26-9/01	90	588	1	3	76	1

Source: State of Alaska Department of Fish and Game, Prince of Wales Island, Sport Fishing

G. Subsistence Fisheries

Subsistence uses of wild resources include direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation, for the making and selling of handicraft articles out of non-edible by-products of fish and wildlife resources taken for personal or family consumption, and for the customary trade, barter, or sharing for personal or family consumption.[37] Fish comprise the largest number of pounds for the subsistence harvest followed by land mammals and marine invertebrates. Most methods of subsistence harvest require a vessel to get to the harvest grounds.

Table B-9. Prince of Wales Island Subsistence Activity (1997)

Resource	Percent Using	Percent Attempting to Harvest	Reported Harvest	Units	Estimated Harvest	Avg Lbs Harvested per Household	Per Capita Lbs Harvested
All Resources	98.8	91.3	115,789	Lbs.	406,934	669.3	230.66
Fish	96	79.8	63,819	Lbs.	224,289	368.9	127.13
Land Mammals	80.9	59.5	854	Ind.	3,001	135.1	46.56
Marine Mammals	8.7	6.4	90	Ind.	316	29.32	10.1
Birds and Eggs	15.6	12.7	552	Ind.	1,940	2.64	0.91
Bird Eggs	4	2.3	150	Ind.	527	0.26	0.09
Marine Invertebrates	80.3	49.1	14,354	Lbs.	50,446	82.97	28.59
Vegetation	74	67.6	9,372	Lbs.	32,938	54.17	18.67

Source: Alaska Department of Fish and Game, Community Subsistence Information System, Harvests by Community. The most recent harvest data for the Craig is 1997.

H. Charter Fisheries

The Alaska Department of Fish and Game issues licenses for guide and charter services in the state. Depending on the targeted fishery, the requirements could include vessel registration, guide/charter license, fishing tags, logbook submittal requirements, and other reporting functions. Charter and guide services follow roughly the same harvesting window as the commercial and subsistence fisheries with some restrictions on total catch.

Targeted species for charter and guide services are generally the five salmon species and halibut, though there are other fishing opportunities as well. The State of Alaska Department of Commerce lists four active businesses in Craig that primarily offer charter fishing excursions. These vessels are generally smaller class (in the 28-32 foot range) in order to

[37] State of Alaska Department of Fish and Game, Subsistence Fishing home page (also from Alaska Statute 16.05.940[32]). http://www.adfg.alaska.gov/index.cfm?adfg=fishingSubsistence.main

offer a more intimate setting and strong customer service. Charter/guide companies will often partner with the local inns and B&B's or provide accommodations as a side business.

I. Fisheries Outlook Summary

The fishing industry off Prince of Wales Island is strong and growing in popularity. The total harvest in 2013 was 218 percent of the recent 10-year average harvest of 51.6 million fish, and 287 percent of the long-term average harvest since 1962 of 39.2 million fish for the Southeast region.[38] The biological stock is healthy and the addition of the land-based processing plant at Craig offers opportunities for commercial and charter fishers to timely deliver and process catch for shipping while the harvest is fresh.

[38] Special Publication 14-10 – Run forecasts and Harvest Projections for 2014 Alaska Salmon fisheries and Review of the 2013 Season, published April 2014 by the Alaska Department of Fish and Game.

III. METHODOLOGY

This section describes the methods used to conduct the economic analysis of additional navigation improvements at Craig, Alaska. Primary data collection efforts included an Office of Management and Budget (OMB)-approved mail-out survey, personal interviews, and other follow-up research and data gathering.

Justification for a proposed action is determined by comparing average annual costs (including project first costs, interest during construction, and operations and maintenance expenses) with an estimate of the average annual benefits derived from the project. Application of an appropriate discount rate and period of analysis make benefits and costs comparable on an equivalent time value of money. For this analysis, the Federal Fiscal Year 2015 discount rate of 3.375 percent was used, and a 50-year project period of analysis.

The 50-year period of analysis begins in the first year which benefits begin accruing. In this case, that is the first year a project can be utilized, or 2017. This is also the year to which benefits are discounted back. All benefits are calculated in current year dollars.

The identification of project benefits under the National Economic Development (NED) criteria is based on increases in the net value of national output of goods and services, expressed in monetary units. It includes the value of goods and services that are and are not marketed. Benefit cost analysis is the technique used to identify the value of the effects. Included are categories of benefits that can be assigned tangible monetary values directly resulting from harbor development.

A. Evaluation Framework

USACE planning is conducted by comparing with- and without-project forecasts of future conditions in the study area. To ensure that plan alternatives are economically efficient, it is necessary to impose the condition of economically rational behavior on individuals and firms in both project conditions. The evaluation results in the identification of a theoretical willingness to pay for the project outputs which is used to express the NED benefits, regardless of who will actually pay. Several economic analysis methods are used for this study, and will be described in subsequent sections.

B. Data Collection Techniques

As this is a small boat harbor project located in a rural Alaskan community, there is limited empirical data with which to conduct economic analysis. To address the lack of data, the Alaska District conducted an OMB-approved mail-out survey to vessel owners and fishing permit holders in the region of Craig. The results of this survey are the primary inputs to the Craig benefits model. Supplemental data was collected through informal interviews and additional follow-up research.

1. Mail Survey

The purpose of the Craig Small Boat Harbor Survey was to gather primary data from Craig harbor users, identify and describe existing conditions, and determine potential benefits from navigation improvements. In accordance with Corps procedures, survey questions were developed using approved surveys found on the IWR website and recently-approved Alaska District surveys. A copy of the Craig Small Boat Harbor Survey and the results analysis report are attached to this document. The survey was approved by the Office of Management and Budget on February 5, 2013 and an OMB number and disclosure was included on each survey mailed.

a. Research Questions

The survey gathered information about use patterns and expenditures from boaters who used existing Craig small boat harbor facilities during 2012. The study was administered in the spring of 2013, so 2012 was the most recent complete boating and fishing season. The responses to the questions allowed the study team to identify the existing and project the expected future without-project conditions by documenting vessel characteristics, existing use of the harbor, and anticipated future use of the harbor.

b. Sampling Strategy

Surveys were mailed to vessel owners and permit holders with 2012 fishing permits in the Prince of Wales Island region. The population of potential Craig harbor users was obtained from three State of Alaska Department of Fish and Game (ADF&G) databases: permit holders with a Prince of Wales Island mailing address, permit holders with 2012 permits for waters around Prince of Wales Island, and 2012 vessel owners indicating that Prince of Wales Island communities were homeports. In addition, a database of current Craig harbor users and the Craig harbor waitlist provided by the City of Craig was matched to the permit and vessel database in order to include all current and potential users of an expanded harbor.

In total, 1,527 surveys were mailed to boaters and permit holders in the region. There were 338 survey responses, and 117 surveys returned as undeliverable for an overall response rate of 24 percent.

c. Collection Procedures

The Alaska District mailed the survey questionnaires with an enclosed cover letter under the signature of the City Administrator for Craig. The letter and survey clearly stated that the distribution was on behalf of research efforts by the US Army Corps of Engineers. Each survey mailed also included a redeemable coupon for a free cup of coffee or tea on behalf of the City of Craig. This was a suggestion by the City of Craig to increase survey response levels, and was offered and paid for by the City of Craig.

Each questionnaire included a pre-addressed return envelope to encourage returns. Additional survey questionnaires were also available from the City of Craig offices. Potential respondents were advised that completed surveys could be mailed directly to the Alaska District and could also be returned to the Craig City office or Craig harbormaster’s office.

d. Follow-up Procedures

Each questionnaire was assigned a unique identification number for follow-up purposes. As surveys were returned, responses were entered into the response database by survey number to identify who had responded. A tally of responses was taken to determine if response levels had reached the survey goal. Craig City and harbormaster staff encouraged local residents to respond to surveys, but no formal reminder was sent due to an acceptable level of survey responses from the first round of mailings.

e. Survey Data Analysis

Alaska District economics staff prepared a Microsoft Excel database for data entry. Surveys were returned via mail directly to the Alaska District and the data was entered. The database included quality control techniques to ensure accuracy of responses. After data entry was complete, the Alaska District economics team analyzed the responses.

2. Interviews

While survey response data serves as the primary input for the economic analysis, there is additional data needed. Informal interviews were conducted with project stakeholders throughout the study process. This includes significant data gathering at the planning charette held in Craig on November 6-8, 2012 and on follow-up site visits in February 2014 and September 2014. The City of Craig also provided valuable follow-up information such as the current harbor slip list and waiting list. Additional interviews included the local fish processing facility, the Craig harbormaster, recreational boaters, and charter operators.

3. Additional Research

Some other input data for the economic analysis was gathered through research. This includes fishery information and vessel operating practices. These items will be described in more detail as appropriate in the following sections.

IV. EXISTING CONDITIONS

This section describes the existing conditions at Craig small boat harbor facilities. This includes information about current facilities, usage, and vessel types. The data forms the basis for the overall demand for moorage at Craig, including current overcrowding or unmet moorage demand.

The specific issues described in this section are the foundation for analysis of the costs of these items in the future without project (FWOP) and future with project conditions (FWP). These issues are based on information gathered during the planning charette, with more specific data gathered through the Craig Small Boat Harbor Survey.

A. Current Harbor Facilities

Existing moorage facilities in Craig include the North Cove and South Cove harbors, as described in the Overview of Region and Community section of this report. There is a small amount of other moorage available in Craig at various docks. There is a boat launch ramp at North Cove. Table B-10 summarizes the amount of moorage at Craig.

Table B-10. Existing Craig moorage capacity

Facility	Number of slips	Feet of transient moorage
North Cove Harbor	102	700
South Cove Harbor	120	125
City Dock		350
False Is. Dock		223
Total	**222**	**1,398**

Source: City of Craig, Comprehensive Plan, 2000.

Current facilities are overcrowded and the harbormaster maintains a waitlist. The City of Craig’s Comprehensive Plan from 2000 stated that Craig is the busiest port on Prince of Wales Island. This is likely still true as Craig has the largest population of all communities on Prince of Wales Island, and has the largest harbor facilities.

Many of the wait-listed vessels are accommodated by rafting at the various docks along the north side of Craig Island. Rafting also occurs to a lesser extent at the South Cove Harbor.

Based on local observations, storm-induced waves impact the South Cove breakwater during the worst storms. Vessel and dock damages occur from impacts and rubbing of rafted vessels during storm events. Rafting of vessels up to five deep occurs at North Cove due to overcrowding and unprotected docks along the north side of Craig Island. Vessel and dock damages similar to that at the South Cove are experienced along the north side docks. Overcrowding also causes delays in departing during critical times to reach the fishing grounds during the limited open fishing seasons.

B. Harbor Use

The existing Craig small boat harbor facilities for the purposes of this analysis are considered the North and South Cove harbors. These facilities typically operate at capacity during the fishing season. The City of Craig provided data regarding the current vessel use of these harbors.

1. North Cove

Records from the City of Craig regarding the use and availability of slips at the North Cove Harbor are shown in Table B-11.

Table B-11. North Cove Harbor slips and usage

North Cove	0-20’	21-27’	28-36’	37-45’	46-60’	>60’	Unknown	Total
Number of slips	0	6	6	49	35	0	3	99
Permanent boats	3	3	12	29	24	0	2	73
Transient boats	0	2	5	7	9	1	0	24
Open slips	0	0	0	1	2	0	2	5

Source: City of Craig records as of July 2013.

2. South Cove

Table B-12 shows the slip availability and usage for the South Cove Harbor.

Table B-12. South Cove Harbor slips and usage

South Cove	0-20’	21-27’	28-36’	37-45’	46-60’	>60’	Unknown	Total
Number of slips	34	48	22	15	0	0	0	119
Permanent boats	11	24	20	8	1	0	1	65
Transient boats	15	9	9	2	0	0	0	35
Open slips	9	8	0	4	0	0	0	21

Source: City of Craig records as of July 2013

3. Vessels in Slips too Small

Due to limited moorage availability, some vessels which currently use the North or South Cove harbors are in slips which are too small for their vessels. Vessels which are greater than three feet in length overall than their current slip are in slips too small. Vessels in too small of a slip can create maneuvering issues and be exposed to vessel damages.

Table B-13. Vessels in slips too small (by vessel length, not slip size), North and South Cove Harbors

Vessel length	0 – 20’	21’ – 27’	28’ – 36’	37’ – 45’	46 – 60'	>60'
Number of vessels	0	3	17	13	22	0

Source: City of Craig records as of July 2013

Note: Vessels are deemed too big for their current slip if the vessel length overall is greater than 3-feet than the length of stall.

4. Wait Listed Vessels

The City of Craig maintains a waitlist for moorage. Boaters interested in obtaining a permanent slip may apply and pay a fee to be on the waitlist for the appropriate size of their vessel. The City of Craig assigns stalls to vessels on the waitlist as they become available. According to the City of Craig, it is the responsibility of the waitlist applicant to examine their assigned stall and respond within 30 days of notification of a stall assignment. If the stall is not satisfactory, two more offers will be made as openings occur. After a total of three offers, with none being accepted, the applicant's name will be dropped to the bottom of the waiting list.[39] Table B-14 presents a summary of the Craig waiting list.

Table B-14. Craig Waitlist, by vessel length

Vessel length	0 – 20'	21' – 27'	28' – 36'	37' – 45'	46 – 60'	>60'	Total
Number of vessels on waitlist	6	20	25	15	10	2	78

Source: City of Craig records, as of July 2013.

Boaters on the Craig waitlist have faced lengthy waits for permanent moorage, as shown in Table B-15. The average wait time for all vessels is almost six years. The amount of time that vessels spend on waitlists supports the limited moorage availability in the region.

Table B-15. Wait times (average, maximum, and minimum) by slip length

Slip length	0 – 20'	21' – 27'	28' – 36'	37' – 45'	46 – 60'	>60'	All Sizes
Average Wait time (years)	4.76	6.20	5.81	5.83	6.07	2.92	5.79
Max Wait time (years)	11.12	14.21	13.20	13.92	12.81	2.92	14.21
Min Wait time (years)	1.13	1.10	1.12	1.10	2.09	2.92	1.10

Source: City of Craig records as of July 2013.

5. Permanent Vessels

Vessels with permanent moorage at existing Craig small boat harbors are described in Table B-11 and Table B-12. These vessels have moorage agreements with the City of Craig, pay a fee for their moorage, and have a designated slip for their vessel.

According to the Craig Small Boat Harbor Survey, 23 percent of potential harbor users already utilize permanent moorage at Craig.

6. Transient Vessels

Boaters who are on the waitlist for permanent slips, or those who do not need permanent slips can sign up to use transient moorage at Craig. Vessels with transient moorage agreements will utilize either transient docks or available slips (as directed by the harbormaster) on an as-needed basis. Given the lack of available permanent slips, and the frequent harbor use

[39] City of Craig, Moorage Waiting List Application and Contract.

required by some commercial fishermen, transient moorage represents a significant component of overall use of the facilities.

Table B-16 presents the number of transient vessels which used transient moorage at Craig in 2012. Limited data is available regarding the specific entrances and exits to the harbor by each of these vessels. Data from 2012 is utilized throughout this analysis as that was the year for which the Craig Small Boat Harbor survey gathered user data.

Data from the Craig Small Boat Harbor survey show that 48 percent of potential Craig boaters utilized transient moorage at Craig in 2012.

Table B-16. Number of Transient Vessels which used Craig in 2012

Vessel Type	Number
Dive vessel	33
Seine	101
Troll	115
Skiff	55
Pleasure	65
Sport	55
Work	11
Tender	5
Tug	3
Barge	4
Power Skiff	20
Total	**467**

Source: City of Craig records as of April 2013.

7. Boat Launch Users

There are boat launch ramps at the existing small boat harbor facilities. During the season, these ramps typically serve smaller vessels, often engaged in recreational or subsistence boating, who have a more occasional need to access the water. Boat owners who reside in Craig, or store their vessels in Craig during the off-season may utilize the boat launch ramps for pre- and post-season launching and loading of vessels.

According to the results of the Craig Small Boat Harbor survey, approximately 7 percent of potential Craig harbor users reported utilizing boat launch facilities in 2012.

C. Proximity to Other Harbors

Boaters in the region of Prince of Wales Island have several options for alternate harbor facilities. The Craig Small Boat harbor survey asked potential Craig boaters where their vessels were homeported in 2012. Table B-17 presents the responses to this question.

Table B-17. Craig Survey Respondents Vessel Homeports

Homeport	Number of Responses	Percent of Responses
Craig, AK	96	38.25%
Cordova, AK	1	0.40%
Hollis, AK	2	0.80%
Hoonah, AK	1	0.40%
Hydaburg, AK	2	0.80%
Juneau, AK	5	1.99%
Ketchikan, AK	24	9.56%
Klawock, AK	11	4.38%
Petersburg, AK	14	5.58%
Point Baker, AK	3	1.20%
Port Protection, AK	2	0.80%
Sitka, AK	10	3.98%
Thorne Bay, AK	5	1.99%
Wrangell, AK	5	1.99%
Other Alaska	10	3.98%
Outside Alaska:		
California	2	0.80%
Oregon	5	1.99%
Montana	1	0.40%
Washington	46	18.33%
British Columbia	6	2.39%
Total	**251**	

Source: Craig Small Boat Harbor Survey Results.

After Craig, the most popular homeport location is Washington, followed by Ketchikan, Petersburg, and Klawock. The distances between Craig and each of these locations is shown in Table B-18.

Table B-18. Distances between Craig and nearby harbors

Port/Community	One-way distance to Craig (nautical miles)
Seattle, WA	716
Ketchikan, AK	121
Petersburg, AK	113
Klawock, AK	5

Source: NOAA’s Distances Between United States Ports, 2012, and estimates using Google Earth.

In Klawock, moorage is provided for about 100 transient and permanent vessels at a partially protected float system.

Figure B-16. Klawock Small Boat Harbor

The City of Ketchikan operates six boat harbors: Bar Harbor South, Bar Harbor North, Thomas Basin, Casey Moran, Knudson Cove, and Hole-In-The-Wall Harbor. Table B-19 summarizes the capacities of these harbors.

Table B-19. Ketchikan Small Boat Harbor Capacity

Harbor Name	Harbor Capacity (number of slips)
Bar Harbor North	303
Bar Harbor South	520
Hole in the Wall Harbor	27
Knudsen Cove Harbor	54
Thomas Basin	240
Casey Moran	45

Source: Demand for Harbors, Dockage, and Other Navigational Needs for Small Boats and Commercial Fishing Vessels in Alaska. Cornell University Human Dimensions Research Unit, May 2006.

Table B-20 presents the total waitlist for moorage at Ketchikan small boat harbor facilities from 2003 through 2011. The City of Ketchikan reports that the drop in the waitlist in 2006 was attributed to the implementation of an annual fee of $20 to remain on the waitlist and the completion of a project to replace two floats at Bar Harbor South. The decreases in 2009 and 2011 are thought to be from the general economic downturn.

Table B-20. Ketchikan Small Boat Harbor Waitlist, 2003-2011

Year	Vessels
2003	210
2004	229
2005	191
2006	132
2007	170
2008	185
2009	114
2010	113
2011	112

Source: City of Ketchikan, as of February 2012.

Primary harbor facilities at Petersburg include 700 slips, 105 transient spaces, 2 tidal grids, working floats, and boat launching facility. Table B-21 describes the capacity of small boat harbor facilities in Petersburg.

Table B-21. Petersburg Small Boat Harbors Capacity

Facility Name	Capacity
Kupreanof Float	8
Middle Harbor	260
North Harbor	148
Papke's Landing	9
South Harbor	220

Source: Demand for Harbors, Dockage, and Other Navigational Needs for Small Boats and Commercial Fishing Vessels in Alaska. Cornell University Human Dimensions Research Unit, May 2006 and Marine Exchange of Alaska website for Petersburg: http://www.mxak.org/ports/southeast/petersburg/petersburg_facilities.html.

D. Moorage Demand Analysis

In the most general sense, the City of Craig has a demand for moorage which exceeds the current supply based upon the fact that the City maintains a waitlist for slips. The alternative harbors as described above already operate at or near capacity and maintain waitlists. This shows that these other harbors cannot be used as a substitute for lack of capacity at Craig. This is further supported by the significant distance between the larger alternate harbor locations and Craig. There are many reasons why a boater may choose to seek moorage at a particular harbor – other than just availability of slips. This analysis utilizes the results of the Craig Small Boat Harbor survey to estimate demand for moorage at Craig.

1. Total Moorage Demand

There are several pieces of information gleaned from survey data utilized to determine moorage demand. Survey response data regarding moorage was broken into categories to represent likely harbor users. The surveyed population represents the population of potential Craig harbor users. Therefore, the response rates from the sample of survey respondents can be applied to the population to determine how specific survey responses apply to the population.

First, this analysis examined the home addresses of survey respondents. A total of 359 surveys were mailed to vessel owners with Craig home addresses, or approximately 25 percent of total surveys. Eighty-nine survey responses were from boaters with Craig home addresses, representing 26 percent of total survey responses. Respondents with Craig home addresses were then broken down by vessel type (commercial fishing, charter, subsistence, and other), then by vessel length category, and moorage type preferred. Vessel type and length data are pulled directly as reported from each survey response. The moorage preference indicated on each survey is based on survey question 3, which asks for boaters' current moorage at Craig. The moorage preference for each survey also considers the two questions on the survey which asked if respondents would change their type of moorage if additional space was available at Craig. For example, if a respondent reported they currently use transient moorage at Craig, but would utilize permanent moorage if additional space was available, their moorage preference for purposes of this analysis is permanent.

This data was then compiled based on the survey sample. Table B-22 provides an example of this table for Craig home addressed survey respondents. The data contained in this table was then utilized to create the sample proportions of moorage demand which could be applied to the population. For example, based upon survey sample data, 40.45 percent of vessels with Craig home addresses are commercial fishing vessels (36 / 89 = 40.45%). Then, 91.67 percent of commercial fishing vessels will demand permanent moorage (33 / 36 = 91.67 percent). And finally, 3.03 percent of commercial fishing vessels demanding permanent moorage will be in the 0-20-foot vessel size class (1 / 33 = 3.03%).

Table B-22. Moorage demand for survey respondents with Craig home addresses – survey sample data

Description	0-20	21-27	28-36	37-45	46-60	>60	Total
Commercial Fishing Vessels							
Permanent	1	4	5	13	10	0	33
Transient	0	0	2	1	0	0	3
Boat Launch	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Total Commercial Fishing	1	4	7	14	10	0	**36**
Charter Vessels							
Permanent	0	0	3	1	0	0	4
Transient	0	0	1	0	0	0	1
Boat Launch	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Total Charter Vessels	0	0	4	1	0	0	**5**
Subsistence Vessels							
Permanent	2	3	1	0	0	0	6
Transient	0	1	0	0	0	0	1
Boat Launch	2	0	0	0	0	0	2
Other	0	0	0	0	0	0	0
Total Subsistence Vessels	4	4	1	0	0	0	**9**
Other Vessels							
Permanent	5	11	7	0	2	0	25
Transient	3	5	1	0	1	0	10
Boat Launch	4	0	0	0	0	0	4
Other	0	0	0	0	0	0	0
Total Other Vessels	12	16	8	0	3	0	**39**
Total Vessels	**17**	**24**	**20**	**15**	**13**	**0**	**89**

Source: Craig Small Boat Harbor Survey response data

The same procedure to determine the sample moorage demand categories was conducted for three other categories of survey respondents. The next category was vessel owners who indicated that their vessel was currently homeported in Craig. The third category was vessel owners who did not have Craig home addresses, did not indicate they were currently homeported at Craig, but already utilized Craig for transient moorage or boat launching, or stated a preference for using moorage at Craig in the future. The final category which comprises moorage demand is the other potential users. These are Craig harbor users who do not fit into any of the previous category, but indicated they are currently using Craig facilities in some capacity. These vessels are all transient or boat launch users who are not homeported at Craig and do not have an interest in utilizing permanent slips at Craig if they became available.

The analysis does not include any double-counting between the moorage demand categories. For example, the Craig homeports category was calculated after the Craig home addresses category. To calculate the unique moorage demand for Craig homeported vessels, all Craig home addresses were removed from this category of survey response data. Similar procedures were conducted for the other two categories and the extrapolation from survey sample to population.

The next step is to apply the survey sample proportions to the applicable surveyed population. Surveys mailed to boaters with Craig home addresses comprised approximately 26 percent of the surveyed population, or 359 surveys (after removing surveys which were returned as undeliverable and are not considered part of the population). These 359 surveys represent the population for which moorage demand can be extrapolated for Craig home addresses. However, this analysis takes a conservative approach, and assumes that the population of Craig home addressed surveys is equal to 50 percent of the total, or 180 surveys. This reduction was completed to account for the possibility that some of the unique permit holders surveyed may share a boat. There is no way to account for this practice, so reducing the total population by half was believed an appropriate way to address the issue.

A slightly different approach was used for the other three categories of boaters: Craig homeports, non-Craig homeports, and other potential users. A total of 1,051 surveys were mailed to boaters/permit holders without Craig home addresses. Vessels which reported they were currently homeported at Craig, but did not have a Craig home addresses comprised 7.1 percent of responses. Therefore, the total population of vessels homeported at Craig without Craig home addresses is 75 vessels (1,051 * 7.1 percent).

The third category of vessels are those without Craig home addresses, not currently homeported at Craig, but responded on their survey that they would use moorage at Craig if it were available. These types of boaters comprised 35 percent of survey responses. The expected population of these boaters is equal to 367 (1,051 * 35 percent).

The final category of boaters are those without a Craig home address, who currently utilize some type of moorage a Craig, but did not express an interest in changing their moorage type in the future. These boats represented 10 percent of total survey responses which is equal to an expected population of 109 boaters (1,051 * 10 percent).

These expected population values were then applied to the survey sample proportions for each category to arrive at the expected moorage demand. Table B-23 summarizes the total demand for moorage at Craig utilizing extrapolation of survey results.

Table B-23. Expected Total Craig Moorage Demand

Description	0-20'	21-27'	28-36'	37-45'	46-60'	>60'	Total
Commercial Fishing Vessels							
Permanent	2	14	23	60	45	0	144
Transient	0	0	32	64	152	12	261
Boat Launch	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Total Commercial Fishing	2	14	55	125	197	12	**405**
Charter Vessels							
Permanent	0	3	9	5	0	0	17
Transient	0	0	2	0	6	3	11
Boat Launch	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Total Charter Vessels	0	3	11	5	6	3	**29**
Subsistence Vessels							
Permanent	4	6	2	0	0	0	12
Transient	0	2	0	0	0	0	2
Boat Launch	4	0	0	0	0	0	4
Other	0	0	0	0	0	0	0
Total Subsistence Vessels	8	8	2	0	0	0	**18**
Other Vessels (Recreation & Yachts)							
Permanent	13	38	20	6	4	3	85
Transient	22	16	27	37	49	19	169
Boat Launch	17	6	0	0	0	0	24
Other	0	0	0	0	0	0	0
Total Other Vessels	52	60	47	44	53	22	**278**
Total Vessels	**62**	**86**	**115**	**173**	**256**	**37**	**730**

Table B-24 presents the expected Craig moorage demand, summarized by type of moorage; 35 percent of vessels demand permanent moorage compared to 61 percent transient.

Table B-24. Craig Moorage Demand, by moorage type

Description	0-20'	21-27'	28-36'	37-45'	46-60'	>60'	Total	Percent
Permanent	19	61	54	72	49	3	258	35%
Transient	22	18	61	102	207	34	444	61%
Boat Launch	21	6	0	0	0	0	28	4%
Other	0	0	0	0	0	0	0	0%
Total	**62**	**86**	**115**	**173**	**256**	**37**	**730**	

2. Excess Moorage Demand

The method utilized above to calculate moorage demand includes vessels already utilizing Craig facilities. Put another way, the moorage demand in the table above is the total moorage demand at Craig. In order to determine the needs for new facilities, this analysis considers the excess (or unmet) moorage demand – those vessels which do not already have a place at existing facilities.

Calculating excess moorage demand is an important consideration for formulation of alternatives as it determines the needed basin size. In order to address the uncertainty in calculations, especially those associated with extrapolating survey results, this analysis utilizes two methods for determining excess moorage demand.

The first method utilizes primarily data provided by the City of Craig regarding current harbor usage. The main components of this moorage demand are the vessels on the Craig waiting list, and the vessels using Craig facilities, but in slips too small for their vessel. In addition, this analysis also considers the number of survey respondents who indicated that they would be willing to relocate to Craig if additional moorage was available. Table B-25 summarizes this approach to estimating demand for moorage at new facilities. This is believed to be a "low" approach and only identifies the demand for permanent moorage.

Table B-25. Craig excess moorage demand, Method 1 (low)

Vessel length	0 - 20'	21' - 27'	28' - 36'	37' - 45'	46 - 60'	>60' [1]	Total
Number of vessels on waitlist	6	20	25	15	10	2	**78**
Number of vessels in stalls too small [2]	0	3	17	13	22	0	**55**
Number of new vessels from survey responses[3]	0	0	8	13	16	0	**37**
Sum of vessels by length	**6**	**23**	**50**	**41**	**48**	**2**	**170**
Notes: 1. The vessel on the waitlist that is >60-feet is listed as a 120-foot vessel.							
2. Vessels that are 3-feet or longer than the stall were counted for this evaluation.							
3. Vessels not from Craig which indicated on survey responses that they would use Craig Harbor. This includes extrapolation of survey sample results to the population of vessel owners and permit holders.							
Source: Craig harbormaster records as of July 25, 2013 and Craig Small Boat Harbor Survey results.							

The second method includes information provided by the City of Craig regarding current facility use and incorporates the total moorage demand calculated in the previous section. The first step is to identify the current use of the existing small boat harbors at Craig. Table B-26 summarizes the total number of slips at the North and South Cove Harbors as well as the number of vessels and open slips at both harbors.

Table B-26. Craig North Cove and South Cove Harbors, current usage and open slips

North & South Coves	0-20’	21-27’	28-36’	37-45’	46-60’	>60’	Total
Number of slips	34	55	28	65	35	0	218
Permanent boats	14	28	33	38	26	0	138
Transient boats	15	11	14	9	9	1	59
Open slips	10	9	0	5	2	0	26

Table B-27 summarizes the total moorage demand calculated in the previous section.

Table B-27. Craig Total Moorage Demand Summary

Description	0-20’	21-27’	28-36’	37-45’	46-60’	>60’	Total
Permanent	19	61	54	72	49	3	258
Transient	22	18	61	102	207	34	444
Boat Launch	21	6	0	0	0	0	28
Other	0	0	0	0	0	0	0
Total	**62**	**86**	**115**	**173**	**256**	**37**	**730**

Since the total moorage demand calculations include vessels already using existing facilities, it is necessary to subtract current vessel use and open slips in order to determine the excess moorage demand. Also, the method used to calculate total moorage demand also already includes waitlisted vessels. Vessels on the waitlist should not be subtracted out again as this would lead to double-counting. Subtracting vessels already using Craig facilities and open slips for permanent vessels results in the excess moorage demand presented in Table B-28.

Table B-28. Craig excess moorage demand, method 2 (high)

Vessel Length	0-20'	21-27'	28-36'	37-45'	46-60'	>60'	Total
Permanent	-5	25	21	29	21	3	94
Transient	7	7	47	93	198	33	385
Total	**2**	**32**	**68**	**122**	**219**	**36**	**479**
Note: Negative numbers indicate a surplus of slips in that category.							

E. Current Harbor Conditions

Existing conditions at Craig small boat harbor facilities create inefficiencies for harbor users, including damages, delays, and associated increased costs for operation. These issues were identified in general terms during the planning charette. The discussions at the charette guided development of the Craig Small Boat Harbor survey which questioned users as to the extent they experience these problems.

Based on research and information provided by Craig residents, this analysis assumes that the primary cause of harbor inefficiencies and damages is overcrowding and associated congestion. The excess moorage demand calculated in the previous section is used as a quantitative representation of the overcrowding at Craig in the existing condition.

1. Vessel Damages

Overcrowding in small boat harbors often results in damages to vessels. These damages are due to vessel rafting, hot-berthing, or other operations in a space-constrained harbor. Damages of this type would not be present at a harbor with adequate space to meet demand. Craig residents reported that vessels are damaged as a result of overcrowding and congestion.

To quantify the level of vessel damages, the Craig Small Boat Harbor Survey asked if vessels had sustained damages outside of normal wear and tear as a result of Craig Harbor conditions. Of the 181 respondents to this question, 21 (11.6 percent) reported that their vessel had sustained this type of damage. The proportion of vessels damaged serves as the basis for quantifying the expected level of damages at Craig in the future.

A follow-up question then directed those whose vessels had sustained damage to indicate the kind of damages and costs for repairs for each year from 2008 through 2012. Twenty-two respondents provided this information, and reported a total of 28 vessel damages over that 5-year period. Survey responses showed that there were an average of 5.6 vessel damages per year, with an average repair cost per incident of approximately $1,800 (in 2014 dollars). This data will serve as the basis for quantifying the cost of vessel damages in the future.

Examples of the types of vessel damages reported by Craig harbor users include: hull wear and dents, propeller damage, grounding, and struck by other vessels.

Figure B-17. Example of boats rafting at Craig 2014

2. Vessel Delays

Another frequent issue at overcrowded small boat harbors is vessel delays. Overcrowding often causes vessel delays when vessels are attempting to enter or leave the harbor. In the case of commercial fishing harbors, such as Craig, this can be especially problematic as some vessels may face delays when attempting to access fishing grounds. Delays in accessing fishing grounds may result in reduced time spent fishing and potentially lower commercial fishing earnings. This analysis does not attempt to quantify reduced commercial harvests resulting from these delays. This analysis focuses on quantifying the delay time associated with entering and leaving the harbor only.

A question on the Craig Small Boat Harbor survey asked vessel owners to list the number of delays in 2012 and the average length of delay, for those who encountered delays getting into or out of Craig Harbor. The survey provided five delay explanations (wait for tide change, another boat had to be moved from my stall, harbor staff not available, had to wait for rafted boat owner to return, and launching delays at ramp) and several spaces for respondents to write in their own delay explanations. Table B-29 shows the number of delays by response category as well as the average number of delays per response and the average length of each delay.

Fifty-eight boaters responded to this question. The most popular reasons for delays were another boat had to be moved from my stall, wait for tide change, and had to wait for rafted boat owner to return, with 28 percent, 24 percent, and 21 percent of responses, respectively. Seventeen percent of total survey respondents experienced at least one delay and the average length of delay was approximately 5 hours.

Table B-29. Craig Harbor Delays in 2012

Reason for Delay:	Number of Responses	Average # of Delays per Response	Average Delay Length (hours)
Wait for tide change	20	3.30	3.68
Another boat had to be moved from my stall	24	2.73	10.64
Harbor staff not available	11	2.45	1.54
Had to wait for rafted boat owner to return	18	3.06	3.03
Launching delays at ramp	3	3.67	1.00
Other	8	2.63	10.00

Note: The ‘Other’ responses included the following: Ice (two respondents), getting around town due to vehicles and no dock space, congestion (two respondents), not enough staff, no slips, and crowding/poor use of available space.

3. Subsistence Harvests

According to the results of the Craig Small Boat Harbor survey, approximately 3.4 percent of vessels which use Craig harbors are primarily used for subsistence. In nearly all rural Alaskan communities, all vessels are used for subsistence harvesting to some extent, regardless of vessel owners identifying subsistence as the primary purpose of their vessel. In some cases, portions of commercial catch can be retained by vessel owners as subsistence catch, and “personal use” fisheries, which many consider sport fishing, are actually considered commercial catch for this analysis.

Subsistence vessels and subsistence harvests are discussed here as overcrowded harbor conditions can affect these vessels and harvests. In the case of Craig, overcrowded harbor conditions and congestion cause vessel delays and other issues for vessels getting into and out of existing Craig harbors. As stated in the previous section, vessels delayed leaving the harbor may result in reduced earnings potential for commercial fishermen. Similarly, vessels which are constrained at Craig harbors may see a reduced ability to harvest subsistence resources, resulting in an overall lower level of catch. The value of the potential harvest increase can be quantified using estimates for the replacement values of subsistence resources. These calculations will be explored in more detail in subsequent sections.

4. Travel Costs

Overcrowded conditions at Craig mean that some boaters are not able to use facilities in the manner that they would prefer. In the case of Craig, there are boaters who would like to use permanent moorage, but must homeport elsewhere due to a lack of space. The Craig Small Boat Harbor Survey was used to identify these boaters. First, the survey asked respondents to identify their current moorage at Craig. Table B-30 shows the responses to this question.

Table B-30. Current moorage at Craig

Current Moorage at Craig	Number	Percent
Permanent Slip	67	23.34%
Transient Parking	139	48.43%
Boat Launch User	19	6.62%
Don't use Craig Harbor	62	21.60%
Total	**287**	

Next, the survey asked, “If you indicated transient, boat launch user, or you don’t use Craig Harbor, would you seek permanent moorage if it was available?” Most respondents, 80 percent, indicated they would not utilize permanent moorage.

Table B-31. Those who would seek permanent moorage if it was available

Response	Number	Percent
Yes	40	19.90%
No	161	80.10%
Total	**201**	

Those who stated that they would seek permanent moorage at Craig serve as the basis for vessels which could benefit from additional moorage by relocating to Craig.

This analysis then looks more closely at the vessels that indicated a preference for permanent moorage at Craig, but are not already using it. First, the types of vessels which are appropriate for NED analysis must be considered. This analysis only considers commercial vessels for the travel cost reductions. In this case, policy defines commercial vessels as commercial fishing, subsistence, and existing charter fishing vessels. Survey respondents which indicated that their vessel's primary purpose was recreation are not included. The survey response data shows that there are only five non-commercial fishing vessels interested in permanent moorage at Craig who are not already homeported there. Given this low level of response data, these vessels are not considered in this analysis.

Approximately 22 percent of commercial fishing vessels indicated that they would use permanent moorage at Craig. Some of the respondents reported that their homeport was already Craig. Since these vessels would not benefit in terms of travel costs, this analysis only considers those commercial fishing vessels not already homeported at Craig, or approximately 16 percent of the total commercial fishing vessel respondents. Based on survey response data, the boaters who indicated interest in relocating to Craig are currently homeported at other communities on Prince of Wales Island, in southeast Alaska, and in the Pacific Northwest.

These vessels would benefit from relocating to Craig and boaters would not choose to relocate if it would cost them additional time or money. Since the population surveyed was chosen through permit files for those who fish near Craig, this analysis assumes that survey respondents fish in the vicinity of Craig and would benefit from moorage nearby. In that case, the trips these vessels must take in the existing condition between their current homeport and Craig represent an expense of vessel operating costs and personnel time.

5. Damage to Existing Infrastructure

The City of Craig reports that existing small boat harbor infrastructure is degrading faster than expected due to overcrowded conditions. This is often the case with congested small boat harbors. Overcrowding leads to practices such as vessel rafting, hot-berthing, and berthing vessels in slips which are too small. All of these practices lead to increased wear and tear on moorage facilities, often causing them to require replacement before their expected end of life. In addition, the current North Cove small boat harbor and three docks in the vicinity of the proposed navigation improvements are subject to wave action. These facilities face additional wear and tear through this wave action, which could be reduced or alleviated with navigation improvements at Wards Cove. The proposed navigation improvements will provide additional wave protection to these structures from southwest and northerly waves. Figure B-18 shows these existing docks.

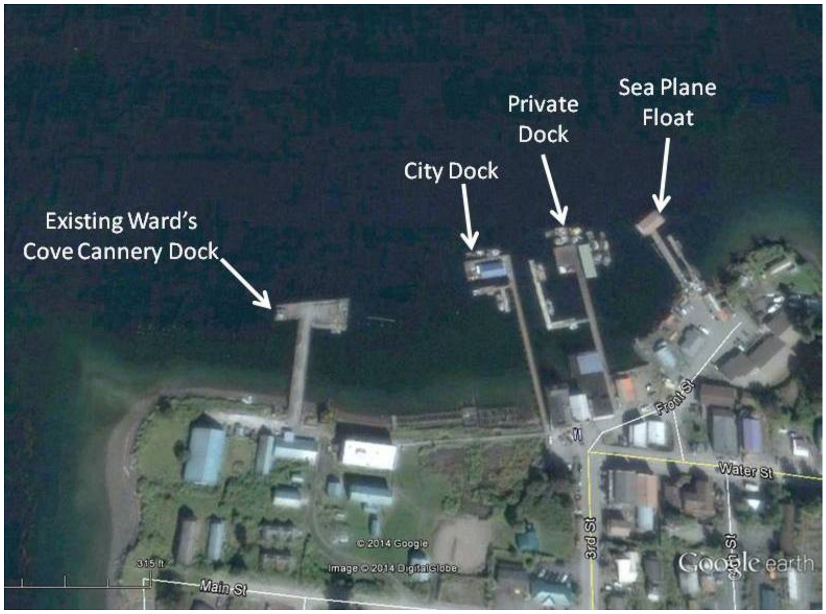

Figure B-18. Existing Docks in the area of proposed navigation improvements

The dock at the existing Wards Cove cannery site is owned by the City of Craig and will be demolished prior to construction of navigation improvements. The existing City Dock, as well as the adjacent private dock and sea plane dock are mentioned here as they may fall behind a future breakwater and may see incidental benefits from increased protection and reduced wave action.

An important note is that harbor maintenance funding is limited for many communities, including Craig. This means that facilities may not actually be replaced or repaired at the required intervals. Regardless of local funding issues, harbor infrastructure faces undue wear and tear from overcrowding and wave action which reduces its useful life. The cost of these damages is most easily represented through the needed interval of replacement. In cases where replacement does not occur on schedule, this method represents an economic or opportunity cost of these replacement activities. It may also represent the cost of interim repair activities which would occur more frequently than replacement at lower costs, but would equal the cost of replacement over the life of the infrastructure. In this case, discounting replacement costs at one point in time may be a conservative approach.

The Craig harbormaster reports that many of the floats in both the North and South Cove harbors were installed in 1985. Some of the floats in the North Cove Harbor were replaced in 1992. According to the harbormaster, all moorage facilities at Craig will be due for major repair or replacement in approximately five years. This means float replacement should occur in 2019. However, replacement of local service facilities (i.e. existing docks and floats) is subject to the availability of local funding and this replacement date is an estimate only.

Figure B-19. Examples of dock damages at Craig's North Cove Harbor

6. Recreational Opportunity – Unit Day Values

Residents of Craig report growth in the tourism industry, specifically recreational and charter vessels, which partially drive the need for additional moorage. A lack of available moorage means that the full growth of sightseeing and charter businesses will not be realized. However, ER 1105-2-100 states that evaluation of benefits to charter fishing and other similar type of craft is based on a change in net income to the owners or operators of all vessels that would be using the harbor facilities in the future without-project condition. Therefore, new charter vessels (and sightseeing or small cruise/excursion vessels) which would utilize Craig as a result of Federal navigation improvements cannot be included in NED benefits.

There are likely other ways in which the recreation fleet at Craig would benefit. Table B-32 lists the primary vessel purpose, as reported by Craig survey respondents. The majority of vessels in Craig are commercial fishing vessels, but the next largest category is recreation.

Table B-32. Craig Vessel Primary Purpose

Vessel Primary Purpose	Number of Responses	Percent of Responses
Recreation Boat	106	32.52%
Subsistence Boat	11	3.37%
Charter/Sightseeing Vessel	12	3.68%
Water taxi Boat	0	0.00%
Commercial Fishing Vessel	164	50.31%
Tender	1	0.31%
Yacht	21	6.44%
Other:	11	3.37%
Total	**326**	

Source: Craig Small Boat Harbor Survey results.

Recreation vessels face the same issues and inefficiencies as commercial vessels resulting from overcrowding and congestion at Craig. However, this analysis only quantifies the costs of these inefficiencies for commercial vessels. There are undoubtedly benefits for the recreation fleet at Craig. These benefits will be calculated utilizing the Corps Unit Day Value (UDV) method and will be described in the following future conditions sections.

7. Recreational Delays – Opportunity Cost of Time

Delay time – including both vessel operating costs and opportunity costs of time – can be quantified for commercial vessels utilizing Craig harbors. Recreational vessels are also subject to delays using Craig facilities. The Unit Day Value method captures the value of the enhanced recreational experience, so this analysis does not attempt to quantify benefits associated with reduced vessel operating costs for recreational vessels. However, the value of time spent delayed at Craig facilities can be quantified for recreational boaters.

As with commercial vessel delay time, this analysis utilizes the responses from the Craig Small Boat Harbor Survey question 7 regarding vessel delays. Approximately 21 percent of respondents to the question of vessel delays were recreational vessels, and another 2 percent were yachts. Table B-33 summarizes the total delay time for recreation boats and yachts.

Table B-33. Craig Harbor Delays, 2012, for Recreation boats and yachts

Vessel Delay Categories	Number of responses	Number of Delays	Total delays (hours)
Wait for tide change	2	11	8
Another boat had to be moved from my stall	9	25.5	31.5
Harbor staff not available	5	16	1.5
Had to wait for rafted boat owner to return	3	10	1.5
Launching delays at ramp	2	7	2.5
Other (ice in harbor)	1	1	1

The value of recreational boaters' time associated with these delays will be calculated in the future conditions sections.

V. FUTURE WITHOUT PROJECT CONDITIONS

This section provides an analysis of future costs of operation for boaters using Craig facilities in the absence of Federal construction. The purpose of this section is to estimate how the issues described in the existing conditions section will affect vessels in the future and to quantify these costs. Wherever possible, these costs have been assigned monetary values and if not possible, are discussed in qualitative terms. The future without-project condition (FWOP) provides a benchmark for comparison of costs under the various alternative navigation improvement scenarios. For the purposes of this analysis, the Federal Fiscal Year 2015 discount rate of 3.375 percent and a 2014 price level is used. The analysis also utilizes a 50-year project period of analysis with a base year of 2017.[40]

This section begins by describing the overall assumptions associated with the future of marine facilities and vessels in Craig in the absence of a Federal project. Then, the next sections provide estimates of the future without-project (FWOP) costs of damages and inefficiencies.

A. Future of the Fleet

The primary vessels for which operational costs are calculated are commercial fishing vessels. This is per USACE policy and because the harbors at Craig serve primarily to support commercial fisheries.[41]

The marine resource assessment section provides a description of the viability of the commercial fisheries near Craig and Prince of Wales Island. The continued sustainability of the commercial fishery is crucial for the vessels which utilize Craig. Available forecasts for commercial fisheries are for the relative near term, in terms of this project's 50-year period of analysis. The assumption of this analysis is that the commercial fisheries utilized by Craig boaters will remain stable. The available data and Alaska's historical management techniques regarding fisheries near Craig support this assumption.

In order to address the uncertainty of forecasting marine resources and their effect on the growth of the vessel fleet, this analysis assumes that the moorage demand for the fleet identified in the existing conditions section is equal to the fleet throughout the 50-year period of analysis. That is, this analysis utilizes a "no-growth" fleet scenario for NED benefits calculation. There is no evidence to suggest the fleet will decrease, and in fact, the land-based processing plant at Craig is expected to attract new vessels to the area.

Utilizing this assumption, the future fleet at Craig is the same as in the existing condition. This fleet is summarized in Table B-34.

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[40] The base year for the period of analysis is based on Alaska District estimates from Cost Engineering and H&H which suggest the date of construction completion, when new facilities could be used and benefits would begin accruing.

[41] Recreation is another key component of harbor use, and operational costs and potential benefits for recreational vessels will be examined in subsequent sections.

Table B-34. Total Craig Moorage Demand, Future Without Project Condition

Description	0-20’	21-27’	28-36’	37-45’	46-60’	>60’	Total
Commercial Fishing Vessels							
Permanent	2	14	23	60	45	0	144
Transient	0	0	32	64	152	12	261
Boat Launch	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Total Commercial Fishing	2	14	55	125	197	12	**405**
Charter Vessels							
Permanent	0	3	9	5	0	0	17
Transient	0	0	2	0	6	3	11
Boat Launch	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0
Total Charter Vessels	0	3	11	5	6	3	**29**
Subsistence Vessels							
Permanent	4	6	2	0	0	0	12
Transient	0	2	0	0	0	0	2
Boat Launch	4	0	0	0	0	0	4
Other	0	0	0	0	0	0	0
Total Subsistence Vessels	8	8	2	0	0	0	**18**
Other Vessels (Recreation & Yachts)							
Permanent	13	38	20	6	4	3	85
Transient	22	16	27	37	49	19	169
Boat Launch	17	6	0	0	0	0	24
Other	0	0	0	0	0	0	0
Total Other Vessels	52	60	47	44	53	22	**278**
Total Vessels	**62**	**86**	**115**	**173**	**256**	**37**	**730**

B. Future of Moorage Facilities

USACE policy states that planned infrastructure improvements over the period of analysis must be supported in writing by the project proponent. At this time, there is no evidence to suggest the City of Craig or another entity has plans to construct marine improvements in the area.

Local entities are assumed to continue maintaining and rehabilitating existing facilities so there will not be a decrease in the availability of moorage. The FWOP condition moorage availability is the same as in the existing condition. The amount of moorage available at these facilities is shown in Table B-35.

Table B-35. Craig Moorage Facilities, Future Without Project Condition

Facility	Number of slips	Feet of transient moorage
North Cove Harbor	102	700
South Cove Harbor	120	125
City Dock		350
False Is. Dock		223
Total	**222**	**1,398**
Source: City of Craig Comprehensive Plan.		

C. Assumptions

Several assumptions are critical to the validity of this analysis. Overarching assumptions are described in this section, while specific assumptions for each category are described in each section.

As described above, sustained commercial fisheries provide the need for moorage of commercial fishing vessels.

Future without project condition operating costs and later project benefits are quantified primarily for commercial activities. For this analysis, commercial activities are related to commercial fishing, subsistence, and charter/sightseeing vessels. Per ER 1105-2-100, “subsistence fishing is considered commercial fishing”. Therefore, benefits to this fleet will be considered commercial. Similarly, “benefits to charter fishing and other similar type craft is based on a change in net income to the owners or operators of all vessels that would be using harbor facilities in the future without-project conditions”. Therefore, charter fishing or similar vessels which would exist in the FWOP condition stand to benefit from Federal navigation improvements and those benefits are also considered commercial.

D. Vessel Damages

The damages reported by Craig harbor users are expected to continue in the future without project condition. In the existing condition, approximately 11.6 percent of survey respondents reported that their vessels sustained damage at Craig beyond normal wear and tear. This represents the annual rate of vessel damages at Craig. Based on the moorage demand estimates, there are 730 vessels which will use Craig small boat harbor facilities. This analysis assumes that this is the pool of vessels which could be subject to damages. Applying the survey sample percent results in 85 vessels damaged per year (730 vessels * 11.6 percent).

To determine how different types of vessels will be affected by navigation improvements, this analysis considers the potential fleet of vessels by the type of moorage they demand. Table B-36 summarizes these calculations.

Table B-36. Vessels Damaged by moorage type

Moorage Types	Percent of moorage demand	Number of vessels damaged
Permanent	35%	30
Transient	61%	52
Boat Launch	4%	3
Total		**85**

According to the results of the Craig Small Boat Harbor survey, the average vessel damage repair cost equals $1,809 (updated to 2014 dollars). Table B-37 summarizes the number of damages and repair costs per year.

Table B-37. Craig Small Boat Harbor Survey results – vessel damages per year and costs

Year	Future Without Project		
	Damage events per year	Avg Cost per damage	Avg Cost (2014 dollars)
2008	6	$4,150	$4,704
2009	4	$1,225	$1,372
2010	6	$288	$316
2011	6	$256	$273
2012	6	$2,280	$2,378
Total	**28**		
Average	**5.6**	**$1,640**	**$1,809**

Average damage costs range widely between years – from a minimum of $273 to a maximum of $4,704. To address some of the uncertainty in these values, this analysis utilizes an @Risk triangular distribution with the minimum, average, and maximum damage cost values as parameters. Figure B-20 shows the distribution of costs per vessel damage.

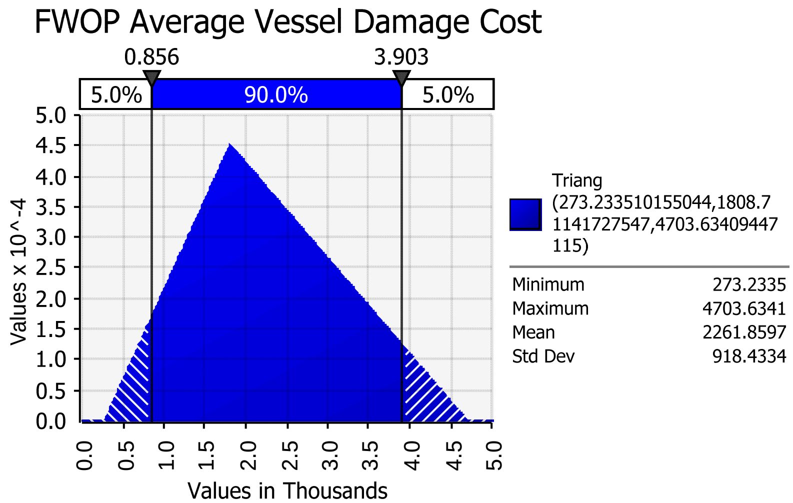


Figure B-20. Future Without Project Condition Average Cost per Vessel Damage, @Risk distribution

The annual cost of vessel damages in the future without project condition is equal to the number of vessels damaged multiplied by the expected cost per damage: 85 vessels multiplied by the damage cost distribution provided above. To utilize the average damage cost distribution in calculations, this analysis utilizes an @Risk simulation with 5,000 iterations. Figure B-21 shows the results of this simulation, with annual vessel damage costs ranging from a minimum of $24,692 to a maximum of $398,039, with a mean of $192,258. This analysis utilizes the mean value for further calculations.

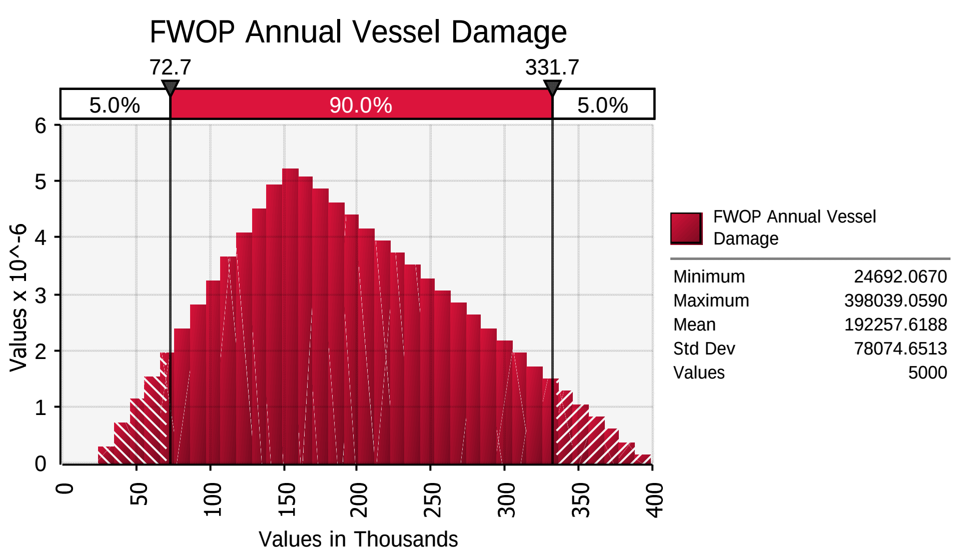


Figure B-21. Future Without Project Annual Vessel Damage Costs, @Risk simulation results

This analysis then again categorizes expected vessel damage costs by moorage type. Table B-38 summarizes these calculations.

Table B-38. Future Without Project Condition Vessel Damages, by moorage type

		Future Without Project Condition	
Moorage Types	**Percent of moorage demand**	**Number of Vessels Damaged**	**Annual damage cost**
Permanent	35%	30	$68,070
Transient	61%	52	$116,905
Boat Launch	4%	3	$7,283
Total		**85**	**$192,258**

The present value of vessel damages over the 50-year project period of analysis is $4.61 million with an average annual value of $192,000.

E. Vessel Delays

The delays faced by vessels entering and exiting Craig harbor facilities in the existing condition are expected to continue in the FWOP condition.

1. Vessel Delay Hours

This category only quantifies delays for commercial fishing, charter, and subsistence vessels. Recreation vessels will be addressed in subsequent sections. The Craig Small Boat Harbor survey provided five vessel delay reasons for which respondents could indicate their delay times in 2012: wait for tide change, another boat had to be moved from my stall, harbor staff not available, had to wait for rafted boat owner to return, and launching delays at ramp. In addition, there were spaces on the survey where respondents could indicate their own delay explanation. All of the “other” delay explanations received can be condensed into two categories: congestion/overcrowding issues, and ice in harbor.

This analysis calculates the percent of vessels experiencing delays for all seven of the delay categories, the average number of delays per boat, and the average delay length (in hours) for each vessel and moorage type. These calculations were conducted first based on the survey sample. The sample data was then applied to the total moorage demand population of vessels which could use Craig harbor. These calculations resulted in a table for each of the vessel delay types which summarized the delay hours by vessel type, moorage type, and vessel length. Table B-39 provides an example of this table for the “Wait for Tide Change” delay.

Table B-39. Delay Hours caused by Waiting for Tide Change, extrapolation of survey sample

Delay Hours, Wait for Tide Change							
Description	**0-20'**	**21-27'**	**28-36'**	**37-45'**	**46-60'**	**>60'**	**Total**
Commercial Fishing Vessels							
Permanent	6.08	43.04	67.86	182.05	135.72	0.00	**434.75**
Transient	0.00	0.00	36.02	72.23	171.41	13.99	**293.66**
Boat Launch	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Other	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Total Comm Fish Vessel Delays	**6.08**	**43.04**	**103.88**	**254.29**	**307.13**	**13.99**	728.41
Charter Vessels							
Permanent	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Transient	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Boat Launch	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Other	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Total Charter Vessel Delays	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	0.00
Subsistence Vessels							
Permanent	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Transient	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Boat Launch	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Other	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Total Subsistence Vessel Delays	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	0.00

All seven of the delay categories were then summed to arrive at the total vessel delay hours in the future without project condition. Table B-40 summarizes the total delay hours by type of vessel, type of moorage, and length category.

Table B-40. Total Delay Hours, Future Without Project Condition

Description	0-20’	21-27’	28-36’	37-45’	46-60’	>60’	Total
Commercial Fishing Vessels							
Permanent	34.04	241.12	380.12	1,019.80	760.24	0.00	2,435.32
Transient	0.00	0.00	139.34	279.41	663.04	54.13	1,135.91
Boat Launch	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Comm Fish Vessel Delays	**34.04**	**241.12**	**519.46**	**1,299.21**	**1,423.28**	**54.13**	**3,571.23**
Charter Vessels							
Permanent	0.00	12.96	38.17	21.36	0.00	0.00	72.48
Transient	0.00	0.00	3.76	0.00	11.59	5.80	21.15
Boat Launch	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Charter Vessel Delays	**0.00**	**12.96**	**41.93**	**21.36**	**11.59**	**5.80**	**93.63**
Subsistence Vessels							
Permanent	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transient	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boat Launch	8.07	0.00	0.00	0.00	0.00	0.00	8.07
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Subsistence Vessel Delays	**8.07**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**8.07**

2. Vessel Operating Costs

Vessel operating costs for the fleet in Craig are used to calculate FWOP delay costs, and later benefits resulting from navigation improvements. Previous Alaska District studies provided the basis for the methodology and assumptions used to develop these vessel operating costs. The methodology described in this section has been used in several recent Alaska District feasibility studies, including Port Lions (feasibility and Limited Reevaluation Report), Valdez, Homer, and Whittier. The basic framework used for those studies is applicable to Craig, with changes to the input data as appropriate.

Vessel costs are comprised of both fixed and variable costs. Fixed costs are induced upon the owner of the vessel regardless of productive use. Variable costs occur while the vessel is in operation, including the costs for vessel repair and maintenance, the cost of fuel and lubricating oil, and other such costs.

Vessel characteristics are used as a starting point to determine operating costs. One key aspect of vessel characteristics is the vessel investment cost. The operating cost methodology calculates certain vessel costs as a portion of vessel investment cost. In this case, vessel investment costs are best represented by the current selling prices of vessels in various size classes. For this analysis, a web search of various boat brokers was conducted. Table B-41 presents the average vessel investment cost by size category and other pertinent characteristics.

Table B-41. Craig vessels, average investment costs and characteristics

	Typical Vessels in the Craig fleet - Characteristics					
Description[1]	**0-20 feet**	**21-27 feet**	**28-36 feet**	**37-45 feet**	**46-60 feet**	**>60 feet**
Investment[2]	$46,000	$45,000	$100,000	$147,000	$409,000	$360,000
Length x Beam (ft)[1]	18 x 6	22 x 9	32 x 13	45 x 17	58 x 19	100 x 28
Draft (ft)[1]	3	3	4	6	8	14
Fish hold (lb)[1]	N/A	N/A	12,000	30,000	60,000	300,000
Main Power Load rate "B"[1]	Volvo penta gas IO	Volvo penta gas IO	Single Cat 3208 Turbo	Twin Cat 3208 turbo	Twin Cat 308 turbo	Twin 8V71 Detroit Diesel

Notes:

1. Vessel Descriptions and Characteristics taken from previous Corps feasibility studies - Port Lions, Valdez, Homer. These vessels are assumed typical of Alaska commercial fishing and charter vessels. Charter vessels have the same characteristics as commercial fishing vessels.

2. Vessel investment costs from online research of current vessel values - Dock Street Brokers and alaskaboat.com, accessed March 19, 2014.

a. Annual Operating Costs

Total annual operating expenditures, both fixed and variable, include all costs that a vessel owner would be expected to spend in a given year. The fixed expenses for any given vessel operating out of Craig will be unchanged with improved navigation. However, the variable expenses for Craig boaters could change as a result of navigation improvements.

Total operating hours are dependent upon assumptions about fishing season length, time spent fishing, and the number of crew. Research into commercial fishing practices in Alaska suggests that the number of open fishing days per season ranges from 60 to 130, depending on vessel size. The total season hours a commercial fishing vessel may be operating is equal to the number of fishing days per season multiplied by 24 hours per day, and ranges from 1,440 to 3,120 hours. This includes time not actively spent fishing, and may include time motoring between ports or fishing locations, awaiting repairs, or time when the vessel is idle, but still expending resources through refrigeration, processing, ventilation, or other systems onboard. Commercial fishing vessels are assumed to spend an average of 14 hours per days actively harvesting during the fishing season. Therefore, the total harvesting hours per commercial vessel range from 840 to 1,820. Commercial fishing vessels have between 2 and 4 persons on board, including captain, depending on the vessel size. The total man hours per commercial fishing vessel ranges from 1,680 hours (840 harvesting hours * 2 crew members) to 7,280 hours (1,820 harvesting hours * 4 crew members). For this analysis, the calculations for subsistence vessels are the same as for commercial fishing vessels.

The total season hours for charter vessels follow a similar methodology, with slightly different assumptions. The number of open fishing days is the same for charter vessels and commercial fishing. Typical fishing charters in Alaska operate for half- or full-day excursions. This averages 12.5 hours of vessel operations per day including time transiting into and out of port. The total annual harvesting hours per charter boat ranges from 750 (60 fishing days * 12.5 hours per day) to 1,625 hours (130 fishing days *12.5 hours per day). The number of crew members aboard charter vessels ranges from 2 to 4, depending on vessel size. So, the man hours per charter vessel ranges from 1,500 (750 harvesting hours * 2 crew) to 6,500 hours (1,625 harvesting hours * 4 crew).

Table B-42 summarizes the assumptions related to the hours in operation per fishing season.

Table B-42. Craig vessels, operating and season length assumptions

	Vessel Operating Data - Craig Fleet					
Description	**0-20 ft**	**21-27 ft**	**28-36 ft**	**37-45 ft**	**46-60 ft**	**>60 ft**
HP[1]	100-200	100-200	255	510	510	925
Fuel Use Rate[1]						
Low (gph @ 25% power)	6	6	5	10	10	13
Medium (gph @ 50% power)	9	9	9.5	19	19	28
High (gph @ 85% power)	12	12	14	28	28	43
Crew, Charter boats[1]	2	2	3	3	4	4
Crew, Commercial Fishing & Subistence[1]	2	2	3	4	4	4
Potential number open fishing days, per season[2]	60	60	120	130	130	130
Charterboat harvesting hours (12.5 hour days)[3]	750	750	1,500	1,625	1,625	1,625
Man hours per charter vessel[4]	1,500	1,500	4,500	4,875	6,500	6,500
Commercial vessels, total season hours (assumes 24-hrs in operation)[5]	1,440	1,440	2,880	3,120	3,120	3,120
Commercial vessels, total harvesting hours (14-hr days)[6]	840	840	1,680	1,820	1,820	1,820
Commercial vessels, total man hours[4]	1,680	1,680	5,040	7,280	7,280	7,280

Notes:

1. Vessel characteristics and number of crew members are assumptions from previous Corps feasibility reports (Port Lions, Valdez, and Homer) and are representative of Alaskan commercial fishing vessels.

2. Previous Corps feasibility reports assumed an average commercial fishing length season of 130 days for larger vessels. Smaller fishing vessels fish fewer days. This is based on the typical commercial fishing season length, based on searches of records from the State of Alaska Department of Fish and Game.

3. Typical fishing charters in Alaska operate for half- or full-day excursions. This averages 12.5 hours of vessel operations per day including time transiting into and out of port. This row is equal to the number of active days per season multiplied by the number of hours per day.
4. Equal to the number of fishing hours per season multiplied by the number of crew per boat.
5. Total season hours for commercial vessels, equal to the number of fishing days per season multiplied by 24 hours per day. This includes time not actively spent fishing, but may include time motoring between ports, awaiting repairs, or time when the vessel is idle, but still expending resources through refrigeration, processing, ventilation, or other systems onboard.
6. Commercial vessels spend an average of 14-hours per day actively harvesting during the fishing season. This row is equal to the number of days per season multiplied by 14 hours per day in operation.

Fixed Costs. Most fixed costs are calculated as a percentage of vessel investment cost. Hull insurance is equal to 5 percent of investment cost, protection and indemnity (P&I) insurance is 2 percent, and miscellaneous business expenses related to commercial fishing are estimated at 2 percent. Other fixed costs include license and permit fees and association dues, which range from $2,000 to $24,000, depending on the size of the vessel, based on assumptions from previous Corps feasibility studies.

Another fixed cost is food for the fishing crew, estimated at $28 per person, per fishing day. Return on investment is the debt payment for an investment in business assets and is estimated using the Federal interest rate of 3.375 percent for fiscal year 2015 and an average vessel life of 30 years under ideal conditions.

In the case of commercial fishing vessels, the captain and crew are paid through crew shares, which vary based on the skill of the crew, the fishery, and the gross harvest value. For this analysis, crew shares are assumed equal to 50 percent of gross harvest value, assuming a break-even harvest for the year. Under this assumption, crew shares are equal to half of the total annual operating costs. Charter fishing workers are paid hourly so wages are a variable cost. Table B-43 summarizes the annual fixed costs for the Craig fleet, by vessel size category.

Table B-43. Annual Fixed Operating Costs for the Craig Fleet

	Annual Operating Data - Fixed Costs					
Description	**0-20 ft**	**21-27 ft**	**28-36 ft**	**37-45 ft**	**46-60 ft**	**>60 ft**
Fixed Costs[1]						
Hull Insurance @ 5% of investment[2]	$2,300	$2,250	$5,000	$7,350	$20,450	$18,000
P&I Insurance @2%[2]	$920	$900	$2,000	$2,940	$8,180	$7,200
License/permit fees[3]	$991	$991	$5,943	$9,905	$20,141	$24,213
Association dues[3]	$220	$220	$330	$550	$1,101	$1,101
Business Expenses @ 2%[2]	$920	$900	$2,000	$2,940	$8,180	$7,200
Return on Capital @ 3.50 % over 30 years[4]	$2,462	$2,409	$5,352	$7,868	$21,891	$19,268
Food @ ($28 x #fishing days x # crew), Comm Fishing[5]	$3,416	$3,416	$10,248	$14,802	$14,802	$14,802
Food, Charter[5]	$3,416	$3,416	$10,248	$11,102	$14,802	$14,802
Commercial fishing Crew share (1/2 total costs)[6]	$66,905	$66,651	$151,098	$299,178	$376,387	$483,477

Notes:

1. Fixed costs are incurred upon the vessel owner regardless of if the vessel is put to productive use. These operating costs will not be affected by navigation improvements.

2. Research conducted for the Port Lions feasibility study found that some fixed vessel costs are best represented as a percent of the investment cost of the vessel. Hull insurance is estimated at 5% of vessel investment, Protection and Indemnity Insurance at 2%, and Business Expenses at 2%. Since vessel investment costs are up-to-date, these percentages represent current estimates of these items.

3. License and permit fees and Association dues values are derived from the Valdez Feasibility economics appendix, June 2010. Values updated to current dollars using the Consumer Price Index.

4. The average annual value of return on capital of vessel investment is estimated using the current Federal discount rate (3.375 percent), and an average vessel life of 30 years.

5. The Port Lions feasibility report found that food for crew is equal to $20 per person, per day. These values were based on a USACE cost estimate for False Pass from 2000. Using the CPI to update this value to current dollars results in a per person food cost of $28 per day. This is multiplied by the number of days per fishing season.

6. Crew shares for commercial captain and crew are based on 50 percent of gross harvest value, assuming a break-even harvest value. Under this assumption, crew shares would equal half of total annual costs.

Variable Costs. Variable costs are costs which can be foregone when the vessel is not in operation and include: fuel, vessel repairs and maintenance, lube oil and hydraulic fluid, and wages for charter vessel captain and crew.

The expense of fuel depends on the vessel characteristics and the vessel operator's strategic and tactical fishing decisions. The fuel consumption rates vary by vessel type and range from 6 to 12 gallons per hour for 0 to 20-foot vessels to 10 to 28 gallons per hour for 46 to 60-foot vessels. For commercial fishing vessels, this analysis assumes that each vessel operates for 8 hours per day at the high fuel use rate, 12 hours at the medium (or average) fuel use, and 4 hours per day at low fuel use (or idle but utilizing on-board systems). In this case, fuel use per vessel per year ranges from nearly 14,000 gallons to 95,000 gallons. Charter fishing vessels are assumed to operate half time at high fuel use and a quarter of their operations at low fuel use and medium fuel use. Total fuel use per season for charter vessels then ranges from over 7,000 gallons to 52,000 gallons.

Quantifying the cost of this fuel use is dependent upon the price of fuel. The analysis utilizes the average price of #2 marine diesel as reported in Juneau, Ketchikan, Petersburg, Sitka, and Wrangell. These are all of the southeast Alaska ports which report fuel prices to the Pacific States Marine Fisheries Commission monthly fuel price survey, and are believed representative of southeast Alaska fuel prices. The 12-month average (September 2013 through August 2014) fuel price at these ports is equal to $3.70. Fuel costs range from $51,000 to $352,000 for commercial fishing vessels and $27,000 to $191,000 for charter vessels.

An estimate for vessel repair and maintenance expenses is 11 percent of vessel value. This category includes the costs of preparing the vessel to fish at the beginning of the season, preparation for winter storage at the end of the season, in-season maintenances, and other repairs.

Charter fishing vessel wages are a variable cost because wages are only earned when charter outfits are operating. Charter wages are equal to the hourly wages for captain and crew, multiplied by the number of crew members per vessel and the number of fishing days per year. According to the State of Alaska Department of Labor and Workforce Development (ADOL&WD), the hourly wage for a charter vessel captain and crew member is $50.67 and $26.45, respectively (updated to 2014 dollars).

Table B-44 summarizes the annual variable operating costs by vessel size category.

Table B-44. Annual Variable Costs, Craig Fleet

	Annual Operating Data - Variable Costs					
Description	**0-20 ft**	**21-27 ft**	**28-36 ft**	**37-45 ft**	**46-60 ft**	**>60 ft**
Variable Costs[1]						
Charter Wages[2]	$57,841	$57,841	$155,353	$168,299	$211,275	$211,275
Fuel[3]						
Commercial/Subsistence	$50,616	$50,616	$109,224	$236,652	$236,652	$352,092
Charter Vessels	$27,056	$27,056	$58,969	$127,766	$127,766	$190,897
Repair/Maintenance @ 11%[4]	$5,060	$4,950	$11,000	$16,170	$44,990	$39,600
Notes: 1. Variable costs are those incurred when the vessel is in operation.						
2. Charter wages are a variable cost because wages are only earned when charter outfits are operating. Charter wages are equal to the hourly wages for captain and crew members, multiplied by the number of crew members per vessel, multiplied by the number of fishing days per year.						
3. These are the same annual fuel costs calculated in the "Fuel Calculations" section above.						
4. An USACE Alaska District Cost Engineering report for False Pass estimated repair and maintenance expenses at 11 percent of vessel value.						

b. Hourly Operating Costs

Hourly variable operating costs are calculated as a range to address some of the uncertainty associated with vessel operating practices and their effects on these calculations. The high range for vessel fuel costs are based on fuel consumption for the hours spent actively fishing. It is calculated by dividing the total fuel cost per season by the total number of vessel hours spent fishing during the season. The low range for fuel costs is based on the fuel consumption for all vessel activities – assuming the vessel is in operation in some capacity for 24 hours per day during the fishing season. The total hourly variable cost is equal to fuel costs plus repair and maintenance and charter wages, as applicable. The mid-range hourly variable cost is an average of the high and low estimates and is used throughout this analysis as the representative vessel operating cost.

Table B-45 and Table B-46 show the hourly variable costs for commercial and charter vessels.

Table B-45. Hourly Variable Cost Summary for Craig Commercial Fishing Vessels

Hourly Cost Summary - Commercial Fishing						
Description	**0-20 ft**	**21-27 ft**	**28-36 ft**	**37-45 ft**	**46-60 ft**	**>60 ft**
Fuel Cost Averaged per hour harvesting	$60.26	$60.26	$65.01	$130.03	$130.03	$193.46
Fuel Cost Averaged per hour for all activities	$35.15	$35.15	$37.93	$75.85	$75.85	$112.85
Variable repair and maintenance	$6.02	$5.89	$6.55	$8.88	$24.72	$21.76
Hourly Variable Costs (Comm Fishing)						
High	$66.28	$66.15	$71.56	$138.91	$154.75	$215.22
Low	$41.17	$41.04	$44.47	$84.73	$100.57	$134.61
Mid Range	$53.73	$53.60	$58.02	$111.82	$127.66	$174.91

Table B-46. Hourly Variable Cost Summary for Craig Charter Fishing Vessels

Hourly Cost Summary - Charter Vessels						
Description	**0-20 ft**	**21-27 ft**	**28-36 ft**	**37-45 ft**	**46-60 ft**	**>60 ft**
Fuel Cost Averaged per hour harvesting	$36.08	$36.08	$39.31	$78.63	$78.63	$117.48
Fuel Cost Averaged per hour for all activities	$18.79	$18.79	$20.48	$40.95	$40.95	$61.18
Variable repair and maintenance	$6.75	$6.60	$7.33	$9.95	$27.69	$24.37
Charter wages	$77.12	$77.12	$103.57	$103.57	$130.02	$130.02
Hourly Variable Costs (Charter)						
High	$119.94	$119.80	$150.21	$192.14	$236.33	$271.86
Low	$102.66	$102.51	$131.38	$154.47	$198.65	$215.57
Mid Range	$111.30	$111.15	$140.80	$173.31	$217.49	$243.71

3. Opportunity Cost of Time

In addition to the operating costs of the vessel, captain and crew members incur an opportunity cost of time (OCT) during unplanned delay time. OCT is the value of time which could otherwise be spent pursuing additional leisure or work activities. This analysis assumes that the captain and crew members of fishing vessels would engage in additional leisure activities if not delayed at Craig. For commercial fishing crew, OCT rates are taken from the report *Value of Time Commercial Fishermen in Alaska Could Save with Improved Harbor Facilities*, conducted by the Cornell University Human Dimensions Research Unit for USACE in September 2006. According to that report, 70 percent of Alaska salmon fishers would use that added time to conduct more fishing activity while 30 percent said they would use that time for leisure activity. Even though the fishing activity at Craig appears to be growing in some sectors, this analysis takes a conservative approach and assumes that time saved by captains and crews in Craig would elect to use these saved hours as leisure time. According to the Cornell report, the value of a fisherman's leisure time is equal to $75.23 per hour, updated to 2014 dollars.

For charter captain and crew, wage rates from the ADOL&WD are utilized. Economic theory states that OCT or "leisure" rates are equal to 1/3 of wage rates for paid activities. Table B-47 presents these calculations.

Table B-47. Charter Vessel Wage and Opportunity Cost of Time Rates

	Hourly Wage (May 2012)[1]	Hourly Wage (June 2014)[4]	Hourly Leisure Rate[5]
Captain[2]	$48.88	$50.67	$16.89
Crew[3]	$25.51	$26.45	$8.82
Notes & Data Sources:			
1. State of Alaska Department of Labor and Workforce Development, May 2012 Wages in Alaska, Statewide. Captains, Mates, and Pilots of Water Vessels. http://live.laborstats.alaska.gov/wage/index.cfm?at=01&a=000000			
2. Captains wages equal to 90th percentile wage level, as they are experienced vessel operators.			
3. Crew wages equal to average of 10th percentile and median wage level. Bottom third assumed representative of Craig charter crew members.			
4. Wages updated to current using US BLS Employment Cost Index.			
5. Leisure rates are equal to one-third of labor rates.			

4. Total Vessel Delay Costs

Quantifying the costs of vessel delays involves combining the total FWOP delay hours with vessel operating costs and OCT rates. Table B-48 summarizes the total annual delay costs in the FWOP at Craig.

Table B-48. Future Without Project Condition Vessel Delay Costs

Cost of Delays (Vessel Operating Costs and Opportunity Cost of Time), Future Without Project Condition							
Total Delay Costs	**0-20 ft**	**21-27 ft**	**28-36 ft**	**37-45 ft**	**46-60 ft**	**>60 ft**	**Total**
Permanent	$6,951	$50,977	$114,537	$425,367	$325,831	$0	**$923,663**
Transient	$0	$0	$40,191	$115,326	$287,197	$27,419	**$470,134**
Boat Launch	$1,647	$0	$0	$0	$0	$0	**$1,647**
Other	$0	$0	$0	$0	$0	$0	**$0**
Total	**$8,598**	**$50,977**	**$154,728**	**$540,693**	**$613,029**	**$27,419**	**$1,395,444**

The present value of vessel delays over the 50-year project period of analysis is $33.48 million with an average annual value of $1.395 million.

F. Subsistence Harvests

Congestion and overcrowding at Craig means that some residents cannot access their vessels as frequently as they would like and face reduced ability to harvest subsistence resources. This reduced harvest level is expected to continue in the FWOP condition. In general, this analysis compares subsistence harvests in the study community (in this case, Craig) to those of nearby communities. This serves as an estimate for the potential expected increase in subsistence harvest levels in the study community. In this case, the amount of harbor infrastructure on Prince of Wales Island is limited. So there is no clear community against which to compare Craig. This analysis examined the subsistence harvest levels of all communities on Prince of Wales Island and estimated future harvest rates for Craig based on that data.

In the future without navigation improvements, Craig residents will continue to see similar levels of subsistence harvests. Calculations regarding the potential for future harvests will be presented in the future with project conditions section.

According to data from the State of Alaska Department of Fish and Game (ADF&G), Community Subsistence Information System, Craig residents harvested 230.66 pounds of subsistence resources per capita in 1997. This is the most recent year for which complete subsistence harvest information is available. Subsistence harvest data is often limited, so this data is assumed representative of current conditions. There have not been significant changes in the subsistence harvest patterns of Craig residents in the intervening years which would suggest utilizing a different harvest amount.

As the levels of subsistence harvests in the future are based upon the population, this analysis considers the expected rates of change for the population. The State of Alaska Department of Labor and Workforce Development prepares population projections at the borough[42] level. Table B-49 presents the population projections for Prince of Wales Island. These rates of change are used in this analysis to estimate the future population of Craig.

Table B-49. Prince of Wales Island, Alaska Population Projections, 2012-2042

Year	Average Annual Percent Change
2012	
2017	-0.13%
2022	-0.24%
2027	-0.27%
2032	-0.27%
2037	-0.20%
2042	-0.24%

Source: State of Alaska Department of Labor and Workforce Development

[42] A borough is similar to a county.

Table B-50 presents the total Craig subsistence harvest for selected project years. The harvest amounts are calculated based on the Craig population for each year multiplied by the expected future without project subsistence harvest of 230.66 pounds per capita.

Table B-50. Craig population and estimated future without project subsistence harvest, for selected project years

Year	Craig Population	Total Harvest, lbs
2017	1,189	274,263
2027	1,166	268,956
2037	1,136	262,056
2047	1,111	256,312
2057	1,085	250,337
2066	1,063	245,078

Based on the results of the Craig Small Boat Harbor Survey, of boaters who marked subsistence as the primary purpose of their vessel, 51.13 percent demanded permanent moorage, 38.35 percent demanded transient, and 10.51 percent boat launch. Utilizing these assumptions, Table B-51 presents the estimated subsistence harvest by moorage type.

Table B-51. Craig future without project subsistence harvest, by moorage type

Year	FWOP Harvest (lbs), by moorage type		
	Permanent	Transient	Boat Launch
2017	140,242	105,183	28,838
2027	137,528	103,148	28,279
2037	134,000	100,502	27,554
2047	131,063	98,299	26,950
2057	128,007	96,007	26,322
2066	125,319	93,991	25,769

The valuation of subsistence harvests is dependent upon the assumed replacement value of these resources. A study conducted by ADF&G found that the replacement value of subsistence resources ranged from $4.00 to $8.00 per pound in 2012, or $4.17 to $8.34 in 2014 dollars.[43] A recent study conducted for the Alaska District regarding subsistence harvest values on Little Diomede found maximum harvest values of $24.40 per pound, updated to 2014 dollars.[44] The values from the Little Diomede study are higher than the values reported by ADF&G as they represent the total production costs of subsistence resources, rather than a

[43] Subsistence in Alaska, A Year 2010 Update. State of Alaska Department of Fish and Game. Updated to current dollars using the Anchorage Consumer Price Index from the State of Alaska Department of Labor and Workforce Development.

[44] Economic Value of Subsistence Activity, Little Diomede, Alaska, 2011. Survey by Tetra Tech, Inc. Updated to current dollars using the Anchorage CPI.

replacement value. Replacement values are the typical method used to value subsistence resources and consider only the cost of purchasing proteins. The production cost method used for Little Diomede considers all of the resources utilized to harvest subsistence.

The values calculated for Little Diomede are specific to that community and do not necessarily represent the costs to harvest subsistence in Craig. However, including this cost on the distribution of possible subsistence valuations is appropriate for this analysis to address the large range of methodologies for valuing subsistence.

To consider a more local approach, the Alaska District gathered replacement values for various proteins at three grocery stores in Craig in September 2014, as shown in Table B-52.

Table B-52. Protein replacement values from Craig grocery stores

	Price per Pound			
Protein	**Store 1**	**Store 2**	**Store 3**	**Average**
Bacon	$10.69		$6.84	$8.77
Hot Dogs	$2.69		$2.69	$2.69
Ham	$7.99		$6.99	$7.49
Sausage	$5.99		$7.39	$6.69
Slice ham	$8.49			$8.49
Chicken thigh	$1.98		$1.98	$1.98
Pork shoulder	$4.79			$4.79
Eye Round	$6.99			$6.99
Pork ribs	$3.98		$6.99	$5.49
Chuck Steaks	$11.78			$11.78
Beef stew meat	$5.98		$7.29	$6.64
Ground beef	$4.28		$5.79	$5.04
Beef chuck roast	$5.98	$5.10		$5.54
Pork sausage	$4.99			$4.99
NY steaks	$8.99	$10.95	$11.98	$10.64
Rib eye	$9.59			$9.59
Bottom round			$7.79	$7.79
T-Bone			$13.79	$13.79
Flank steak		$8.95		$8.95
Average	**$6.57**	**$8.33**	**$7.23**	**$7.27**

Source:
Data collected at three Craig grocery stores (names concealed here for confidentiality) 19 September 2014.

The subsistence replacement values for this analysis are: $4.17, $8.34, $24.40, and $7.27 per pound. To address the variation associated with these values, this analysis utilizes an @Risk triangle distribution with the parameters: $4.17 (minimum), $11.05 (most likely equal to the average of the four values), and $24.40 (maximum).

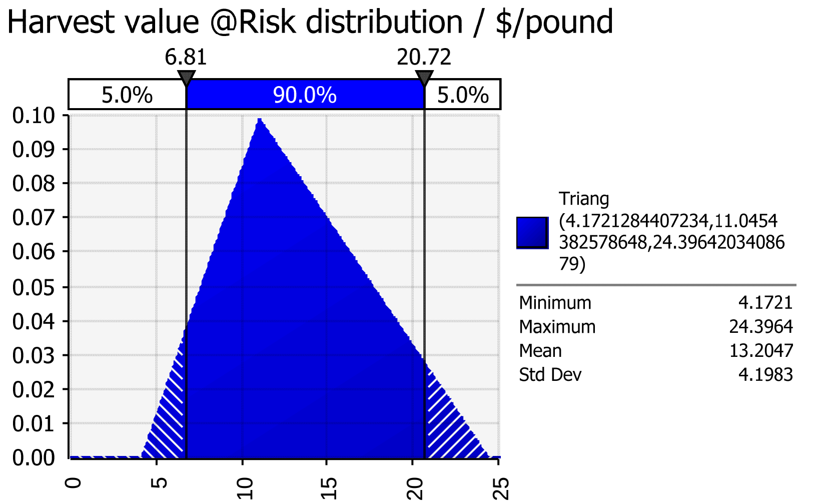


Figure B-22. Subsistence harvest value @Risk distribution

An @Risk simulation with 1,000 iterations was conducted to utilize this distribution of subsistence replacement values in this analysis, with results shown in Figure B-23. This analysis utilizes the mean value of $13.20 per pound for future calculations.

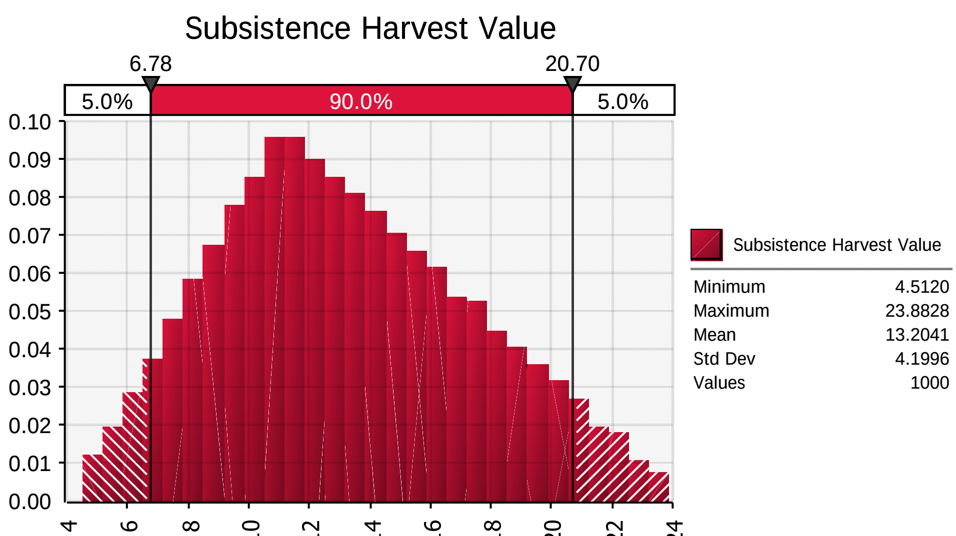


Figure B-23. Subsistence harvest value, @Risk simulation results

The total value of subsistence harvests is equal to the total expected harvest (see Table B-50) multiplied by the mean value per pound of $13.20. Table B-53 summarizes these calculations for selected project years.

Table B-53. Future Without Project Subsistence Harvest Values, for selected project years

Year	FWOP Harvest Value			
	Permanent	Transient	Boat Launch	Total
2017	$1,851,765	$1,388,849	$380,773	$3,621,386
2027	$1,815,931	$1,361,973	$373,404	$3,551,308
2037	$1,769,347	$1,327,034	$363,825	$3,460,206
2047	$1,730,563	$1,297,946	$355,850	$3,384,359
2057	$1,690,219	$1,267,687	$347,555	$3,305,461
2066	$1,654,715	$1,241,059	$340,254	$3,236,027

The present value of subsistence harvests over the 50-year project period of analysis is $83.59 million with an average annual value of $3.48 million.

G. Travel Costs

In the existing condition, there are vessels which would utilize permanent moorage at Craig, but cannot due to space limitations. This analysis assumes that these boaters would prefer to be located in Craig due to its relatively closer proximity to fishing grounds. The surveyed population included only boaters and permit holders near Craig, which supports this assumption. Utilization of permanent moorage at Craig would represent a reduction in these boaters' transportation costs.

In the future without project condition, vessels will continue to transit between their current homeport and Craig. As reported in the existing conditions section, only commercial fishing vessels are considered in this analysis as other vessel types had low response rates. Response data from the Craig Small Boat Harbor survey found that approximately 16 percent of commercial fishing vessels surveyed would utilize permanent moorage at Craig and are not already homeported there. Applying this surveyed proportion to the appropriate surveyed population provides the expected number of vessels which must make additional transits to Craig in the FWOP condition.

Based on survey response data, the commercial fishing vessels which reported they would relocate to Craig primarily use transient moorage at Craig under existing conditions. Therefore, the potential population of vessels is the total transient commercial fleet determined in the moorage demand calculations, equal to 264 vessels. There are approximately 41 vessels (264 vessels * 16 percent) which are not already homeported at Craig but would use permanent moorage there. According to survey results, 87.5 percent of these vessels (or approximately 36 vessels) did not have Craig home addresses. Vessels without Craig home addresses are those which must transit to Craig in the FWOP condition.

Survey respondents provided their vessel's current homeport. This homeport data was grouped into three regions: Pacific Northwest, Prince of Wales Island, and Other Southeast Alaska. The average distances between Craig and each of these regions will be used to determine vessel travel in the FWOP condition. Table B-54 shows the survey proportions of each region and the expected number of vessels from each region when applying the survey proportion to the population.

Table B-54. Commercial fishing vessels without Craig home addresses, by region of origin, survey proportion and expected population

Commercial vessels going to:	Percent	Number
Pacific Northwest	14%	5
Prince of Wales Island	14%	5
Other SE AK	71%	26
Total		**36**

Table B-55 shows the average distance between each region and Craig.

Table B-55. Average Distance between Craig and selected regions

Region	Average one-way distance from Craig (nm)
Pacific Northwest	716
Prince of Wales Island	80
Other SE AK	122

Source: NOAA's Distances Between United States Ports and estimates using Google Earth.

The next step is to determine the expected size of the vessels which indicated a preference for permanent moorage at Craig. Once again, the sample proportions of vessel size categories were applied to the expected surveyed population of 36 commercial fishing vessels. Table B-56 summarizes the results of these calculations.

Table B-56. Number of commercial fishing vessels which could relocate to Craig, by region of origin and vessel size class

Commercial fishing vessels going to:	Number of Vessels
Pacific Northwest	
0-20 ft	0
21-27 ft	0
28-36 ft	0
37-45 ft	0
46-60 ft	5
>60 ft	0
Prince of Wales Island	
0-20 ft	0
21-27 ft	0
28-36 ft	5
37-45 ft	0
46-60 ft	0
>60 ft	0
Other SE AK	
0-20 ft	0
21-27 ft	0
28-36 ft	3
37-45 ft	13
46-60 ft	10
>60 ft	0
TOTAL	**36**

Information on vessel speeds is necessary to determine the amount of time vessels spend transiting between Craig and their respective homeport regions. The Craig Small Boat Harbor Survey asked for vessel speeds while cruising, fishing, and in port. The vessels in this category are assumed be cruising between their current homeport location and Craig, so vessel cruising speeds are utilized. Table B-57 shows vessel speeds by length category.

Table B-57. Average Vessel Cruising Speed, in knots, Commercial Fishing Vessels, by vessel length

Vessel Size Classes:	0-20’	21-27’	28-36’	37-45’	46-60’	>60’
Commercial fishing vessels only						
Average Cruising speed (knots)	20.00	20.78	8.47	7.82	7.99	8.42

Source: Craig Small Boat Harbor Survey results

Table B-58 summarizes the total travel costs per round-trip for vessels without Craig home addresses.

Table B-58. Round Trip Travel Costs – Vessels not homeported at Craig, and without Craig home address

Commercial fishing vessels, by current homeport region	Number of Vessels	Nautical Miles (RT)	Hours	Vessel Operating Hourly Rate	Hourly Leisure Rate	Number of Crew	Roundtrip Cost
Pacific Northwest							
0-20 ft	0	1,432	72	$53.73	$75.23	2	$0
21-27 ft	0	1,432	69	$53.60	$75.23	2	$0
28-36 ft	0	1,432	169	$58.02	$75.23	3	$0
37-45 ft	0	1,432	183	$111.82	$75.23	4	$0
46-60 ft	5	1,432	179	$127.66	$75.23	4	$397,656
>60 ft	0	1,432	170	$174.91	$75.23	4	$0
Prince of Wales Island							
0-20 ft	0	160	8	$53.73	$75.23	2	$0
21-27 ft	0	160	8	$53.60	$75.23	2	$0
28-36 ft	5	160	19	$58.02	$75.23	3	$27,736
37-45 ft	0	160	20	$111.82	$75.23	4	$0
46-60 ft	0	160	20	$127.66	$75.23	4	$0
>60 ft	0	160	19	$174.91	$75.23	4	$0
Other SE AK							
0-20 ft	0	245	12	$53.73	$75.23	2	$0
21-27 ft	0	245	12	$53.60	$75.23	2	$0
28-36 ft	3	245	29	$58.02	$75.23	3	$21,192
37-45 ft	13	245	31	$111.82	$75.23	4	$166,956
46-60 ft	10	245	31	$127.66	$75.23	4	$135,792
>60 ft	0	245	29	$174.91	$75.23	4	$0
TOTAL	36						**$749,333**

This analysis assumes that each of these vessels would make one round trip between Craig and their current homeport every two years. Since these boaters are already fishing near Craig, it is likely that they keep their vessels at Craig, utilizing transient moorage or boat launching, for the majority of the time. However, periodic trips to their current homeport are necessary. Therefore, this roundtrip travel cost will accrue every other year through the period of analysis.

The vessel operating costs, leisure rates, and number of crew are the same data utilized in the vessel delays section.

According to survey results, there are also commercial fishermen with Craig home addresses who do not use existing Craig harbors as a homeport, but indicated a preference to do so. In the FWOP condition, these boaters must also make trips between their current homeports and Craig.

Approximately 15 percent of survey respondents with Craig home addresses reported being homeported elsewhere. Applying this percentage to the population of Craig home addressed surveys, and the portion of commercial fishing vessels results in 29 commercial fishing vessels with Craig home addresses that are not homeported at Craig. Applying sample proportions regarding the region of origin and vessel length provides more detail regarding these vessels.

Table B-59 summarizes the total travel costs per round-trip for vessels with Craig home addresses, not currently homeported there, but indicating a preference for permanent moorage at Craig. This analysis assumes that these vessels would make one trip per year between Craig and their current homeport location. This increased frequency represents the fact that these vessel owners live in Craig and would likely access the community more frequently.

Table B-59. Future Without Project Travel Costs – Vessels not homeported at Craig, with Craig home addresses

Commercial fishing vessels, by current homeport region	Number of Vessels	Nautical Miles (RT)	Hours	Vessel Operating Hourly Rate	Hourly Leisure Rate	Number of Crew	Roundtrip Cost
Pacific Northwest							
0-20 ft	1	1432	72	$53.73	$75.23	2	$13,052
21-27 ft	2	1432	69	$53.60	$75.23	2	$25,110
28-36 ft	1	1432	169	$58.02	$75.23	3	$64,216
37-45 ft	0	1432	183	$111.82	$75.23	4	$0
46-60 ft	0	1432	179	$127.66	$75.23	4	$0
>60 ft	0	1432	170	$174.91	$75.23	4	$0
Prince of Wales Island							
0-20 ft	4	160	8	$53.73	$75.23	2	$5,833
21-27 ft	7	160	8	$53.60	$75.23	2	$11,222
28-36 ft	5	160	19	$58.02	$75.23	3	$28,700
37-45 ft	0	160	20	$111.82	$75.23	4	$0
46-60 ft	4	160	20	$127.66	$75.23	4	$30,650
>60 ft	0	160	19	$174.91	$75.23	4	$0
Other SE AK							
0-20 ft	1	245	12	$53.73	$75.23	2	$2,228
21-27 ft	2	245	12	$53.60	$75.23	2	$4,287
28-36 ft	1	245	29	$58.02	$75.23	3	$10,964
37-45 ft	0	245	31	$111.82	$75.23	4	$0
46-60 ft	1	245	31	$127.66	$75.23	4	$11,709
>60 ft	0	245	29	$174.91	$75.23	4	$0
TOTAL	29						**$207,972**

The total FWOP travel costs for vessels which could relocate to Craig are the sum of those with and without Craig home addresses.

The present value of vessel travel costs over the 50-year project period of analysis is $14.129 million with an average annual value of $589,000.

H. Infrastructure Damage

In the future without project condition no new infrastructure at Craig is expected. And, the level of harbor use is assumed to remain at its current level. This means that the issues associated with overcrowding and congestion will continue in the future. This includes the degradation and reduced life of existing small boat harbor infrastructure due to both overcrowding and wave action.

As described in the existing conditions section, damage to existing infrastructure is often calculated as a reduced life of facilities. In this case, the benefit of navigation improvements will be the reduced frequency of replacement of floats. This method serves to estimate the effects of overcrowding and wave action on existing facilities and may not represent actual repair or replacement activities.

Based on input from the Craig harbormaster, this analysis assumes that the floats in the North and South Cove harbors need to be replaced every 20 years in the FWOP condition. The cost for float repairs is based on a recent Alaska District cost estimate for float replacement at Seldovia, Alaska. Table B-60 presents information on the small boat harbor infrastructure at Seldovia, and the alternative plans for replacement identified in a 2011 technical report.

Table B-60. Seldovia Small Boat Harbor Infrastructure characteristics

Plan #	Description	Main Float Length	# Finger Floats	Length of finger floats (ft)	Number of slips	Total length of floats (feet)
1	Replace N. Main Float, Floatplane dock	712			0	712
2	Replace A float & finger floats	225	9	42	18	603
3	Replace B float and finger floats	250	18	32	36	826
4	Replace C float and finger floats	287	20	32	40	927
5	Replace D float and finger floats	287	10	32	20	607
6	Replace E float and S. Main Float	437	14	32	30	885

Source: Seldovia Small Boat Harbor Improvements Technical Reports, February 2011. USACE for the Denali Commission.

The North Cove harbor at Craig has 102 slips and 700 feet of transient moorage. The North main float, A, B, D, and E floats at Seldovia total 712 feet of dock plus 104 slips. The replacement costs for these facilities are assumed representative for the North Cove.

The South Cove harbor has 120 slips and 125 feet of transient moorage. The equivalent docks at Seldovia are the South main float, B, C, D and E floats, which total 126 slips. Table B-61 shows the estimated float replacement costs for Craig infrastructure utilizing equivalent Seldovia facilities. The costs are updated to 2014 dollars.

Table B-61. Existing Craig small boat harbor infrastructure and estimated replacement costs

Description of Existing Craig infrastructure[1]:	# slips	Transient moorage (ft)	Float Replacement Cost estimate (2014 $)
North Cove[2]	102	700	$6,566,000
South Cove[3]	120	125	$5,232,000
Notes:			
1. Craig Harbor characteristics provided by the Craig harbormaster.			
2. Replacement costs for North Cove based on Seldovia costs for: North Main float, A, B, D, and E floats (totals 712 feet dock plus 104 slips)			
3. Replacement costs for South Cove based on Seldovia costs for: South Main float, B, C, D, and E floats (126 slips)			

Utilizing this cost information, the total replacement cost for Craig floats is approximately $12 million, at each replacement interval of 20 years, assuming first replacement occurs in 2019.

The present value of infrastructure replacement over the 50-year project period of analysis is $19.01 million with an average annual value of $792,000.

I. Recreational Opportunity

This analysis uses the unit day value (UDV) method as described in Corps Economic Guidance Memorandum (EGM 15-03) for fiscal year 2015 to estimate the value of recreational use of Craig Harbor. The EGM provides guidelines for assigning point values to recreation activities and provides a table showing the range of daily values that correspond to point value scores. Points are awarded based on five criteria that address the quality of the site, the number and types of activities enjoyed at the site, and the availability of substitutes for the site. The UDV method then uses this point system to determine day values for recreation.

A focus group of recreational boaters from Craig was convened in September 2014 to assign point values to each of the five criteria for the recreation experience analysis. Each member of the focus group was familiar with Craig small boat harbors based on both personal use and familiarity with issues related to the harbor. Each harbor user received the selection criteria for review and was requested to complete their responses by assigning values to each of the five criteria on an individual basis. This process was completed based on future without and future with project conditions. For the with-project condition, the focus group was instructed to consider additional small boat harbor facilities at Wards Cove. Responses were accepted as-is, and were averaged to obtain point scores for the future without- and with-project conditions.

1. General or Specialized Recreational Activity

According to the Economic Guidance Memorandum, outdoor recreation activities can be classified as either "general" or "specialized". General refers to a recreation day that primarily involves activities attractive to outdoor users and that generally require the development and maintenance of convenient and adequate facilities. In contrast, specialized refers to a recreation day that involves activities where opportunities are more limited, intensity of use is low, and a high degree of skill is required. Alaska District analysis concluded that based on the above criteria, the remote location of Craig facilities, and the specialized characteristics of the sport fishery in Craig, that harbor-related recreation activities should be categorized as "specialized".

Craig has two categories of recreational users – those who engage in specialized fishing and those who come from the specialized recreational experience of sightseeing tours, whale watching, wildlife viewing, and other non-fishing recreational boating (such as yachts sailing through the area).

2. Craig Unit Day Value Results

Table B-62 presents the assigned point values for Craig in both the future without and with project conditions along with the rationale for each rating. These ratings are the average values as reported by focus group participants.

Table B-62. Unit Day Values Without and With-Project Conditions, Craig

Criteria	Point Range	Points Without Project	Points With Project	Rationale
Recreation Experience	0-30	8.2	15.3	Harbor weekend and holiday use is crowded with close proximity to fishing grounds and commercial fish processor in town. Moderate use during weekdays. Decision based on numerous factors such as high quality of the fishing experience and willingness of charter clients to pay from $190 to $275 for the opportunity to fish along with plane fare for out of town recreation users. Non-fishing recreation customers pay between $145 to $200 for the sightseeing and water taxi opportunities. Recreation destination will be enhanced with project.
Availability of Opportunity	0-18	11.7	9.2	No comparable opportunities within two-hours travel time, although recreational opportunities abound in Alaska.
Carrying Capacity	0-14	7.3	10.3	Adequate facility that currently accommodates multiple users. Prince of Wales Island and surrounding area fisheries are well managed but not overcrowded. Only limitations on carrying capacity might be in the form of reaching maximum commercial and sport fishing quotas.
Accessibility	0-18	9.2	15.3	Remote access, good roads on island within site although parking is an expressed concern. Assume with-project conditions will relieve overcrowded parking condition.
Environmental	0-20	12.2	15.2	Above average aesthetic quality; any limiting factors can be reasonably rectified. Limiting factor for aesthetic quality concerns the crowded conditions at the harbor and launch ramp. Additional aesthetic concerns are the visions of the clearcut areas on the island from the timber industry activity. Overcrowded conditions are significantly improved with project. Clearcut areas of the surrounding mountains will not be changed under with project conditions.
Total Points	**100**	**48.5**	**65.3**	

Source: USACE Economic Guidance Memorandum 15-03, Unit Day Values for Recreation for Fiscal Year 2015 and average of responses from Craig focus group, September 2014.

3. Conversion of Points into Dollars

One of the advantages of the UDV methodology is that EGM 15-03 provides an accepted, reliable, and valid way to translate points into dollar values. Table B-63 shows the conversion of assigned points to representative unit day values.

Table B-63. Points and Unit Day Values for Craig Harbor, Future Without and With Project Conditions

	Future Without Project		Future With Project	
Type of Recreation	**Points**	**UDV**	**Points**	**UDV**
Specialized Fishing & Hunting	49	$32.67	65	$36.99
Specialized Recreation other than Fishing & Hunting	49	$23.17	65	$28.57

Source: Points from Craig focus group responses, September 2014. UDVs from USACE EGM 15-03.

4. Harbor Use – Baseline Recreation Information

Recreational boaters using Craig small boat harbor facilities are comprised of three categories: sport/recreational fishing, charter boat passengers (both fishing and sightseeing), and independent travelers.

Information about recreational fishing use of Craig facilities was obtained from the State of Alaska Department of Fish and Game Alaska Sport Fishing Survey for Prince of Wales Island. Table B-64 presents the saltwater recreation angler days for Prince of Wales Island from 2003 through 2012. This analysis utilizes the most recent three-year average to represent the baseline level of recreational fishing activity at Craig. Values for Prince of Wales Island are utilized as representative given that Craig has the largest population and small boat harbor infrastructure on Prince of Wales Island and a large portion of recreational fishing occurs in the vicinity of Craig. In addition, navigation improvements at Craig will likely improve the recreational experience of all sport fishermen in the region.

Table B-64. Recreation Angler Days, Prince of Wales Island, Saltwater

Year	Recreation Angler Days
2003	53,818
2004	57,628
2005	68,468
2006	58,206
2007	63,110
2008	64,944
2009	49,075
2010	51,566
2011	59,834
2012	66,100
Avg (2010-2012)	59,167

Source: State of Alaska Department of Fish and Game, Alaska Sport Fishing Survey, Prince of Wales Island Sport Fish Harvest and Effort (2003-2012).

The second group of recreational users of Craig harbor is customers who engage in charter fishing and sightseeing trips. According to the moorage demand estimates determined in conjunction with Craig small boat harbor survey results, there are 29 charter vessels which utilize Craig. Interviews with Craig charter operators were conducted to determine the number of passengers per trip, trips per season, and the amount of trips (or passengers) related to fishing versus sightseeing or other non-fishing activities. Table B-65 summarizes the results of interviews with charter operators. In general, charter operators at Craig operate between 50 and 100 trips per year, with 3 to 4 passengers on board. Trips are almost exclusively for fishing; interviews found an average of 97.5 percent of trips for fishing and only 2.5 percent of trips were for sightseeing, wildlife viewing, or other similar non-fishing activities.

Table B-65. Craig Charter vessels and passengers

Charter Fleet	Number
Permanent Vessels	17
Transient Vessels	11
Total Vessels	**29**
Average customers per trip	3.75
Average trips per season	66.4
Total Annual Charter Customers	**7,218**

The third group of recreational users of Craig small boat harbor facilities are independent travelers, or boaters (such as yachts or sailboats) who use Craig small boat harbor facilities for activities other than sport or charter fishing. For this analysis, these are boaters who marked their primary vessel purpose as "yacht" on the Craig small boat harbor survey. Combining these responses with the expected population values of Craig boaters results in 48 yachts demanding moorage at Craig. To determine the estimated use of Craig facilities by these independent travelers, an estimate of the number of passengers per vessel is needed. This analysis assumes that there are approximately 4.7 passengers per vessel, based on the average group size of Alaska tourism activities, as presented in the most recent Alaska Visitor Statistics program.[45] Combining the expected passengers per vessel with the number of vessels results in 227 independent travelers per year using Craig.

Based on Craig survey results, the majority of independent travelers use transient moorage at Craig. Lacking data on the number of days per trip to Craig, this analysis assumes that each vessel represents a one-day stop in Craig. This is a conservative assumption, but its basis is that most of these independent boaters will only be passing through Craig.

5. Expected Change in Recreational Use

The values of recreational use presented in the previous section represent the baseline or existing condition use. Recreational use of Craig harbors facilities is expected to change in future conditions. This analysis utilizes population projections for Prince of Wales Island as a proxy for this expected change. Table B-66 presents these values as reported by the State of

[45] Source: Alaska Visitor Statistics Program VI: Summer 2011. McDowell Group, Inc. for the State of Alaska Department of Commerce, Community, and Economic Development.

Alaska Department of Labor and Workforce Development. Population change estimates are only available at the borough level, so these rates are used as representative for Craig.

Table B-66. Average Annual Population Change, Prince of Wales Island

Year	Average Annual Percent Change
2012	
2017	-0.13%
2022	-0.24%
2027	-0.27%
2032	-0.27%
2037	-0.20%
2042	-0.24%

Source: State of Alaska Department of Labor and Workforce Development

Table B-67 presents the expected number of recreational visits to Craig, by type of recreational user, for selected years.

Table B-67. Craig Recreational Visitation for selected project years

Year	Number of Visitor Days					
	Recreational Fishing		Charter Boats		Independent Travelers	
	Specialized Fishing	Specialized Sightseeing	Specialized Fishing	Specialized Sightseeing	Specialized Fishing	Specialized Sightseeing
2012	59,167	0	7,038	180	0	227
2017	59,093	0	7,029	180	0	227
2027	57,949	0	6,893	177	0	222
2037	56,463	0	6,716	172	0	217
2047	55,225	0	6,569	168	0	212
2057	53,938	0	6,416	165	0	207
2066	52,805	0	6,281	161	0	203

6. Future Without Project Unit Day Values

Table B-68 shows the future without project condition Unit Day Values for Craig for selected project years. These values are based on the input data as described in the previous sections.

Table B-68. Unit Day Values for Craig Small Boat Harbor Future Without-Project Condition

Year	Future Without-Project Condition Unit Day Values					
	Recreational Fishing		Charter Boats		Independent Travelers	
	Specialized Fishing	Specialized Sightseeing	Specialized Fishing	Specialized Sightseeing	Specialized Fishing	Specialized Sightseeing
2012	$1,932.798	$0	$229,905	$4,181	$0	$5,260
2017	$1,930,381	$0	$229,617	$4,176	$0	$5,253
2027	$1,893,026	$0	$225,174	$4,095	$0	$5,152
2037	$1,844,464	$0	$219,397	$3,990	$0	$5,019
2047	$1,804,034	$0	$214,588	$3,903	$0	$4,909
2057	$1,761,977	$0	$209,586	$3,812	$0	$4,795
2066	$1,724,965	$0	$205,183	$3,732	$0	$4,694

The present value of the recreational experience in Craig over the 50-year project period of analysis is $50.08 million with an average annual value of $2.09 million.

J. Recreational Delays – Opportunity Cost of Time

This category quantifies the opportunity cost of time for recreational boaters which experience delays using Craig small boat harbors. Vessel operating costs for recreational boats are captured through Unit Day Value method estimates, but this analysis assumes that the equivalent value of delay time should be quantified separately and is not explicitly captured using the UDV method.

Table B-69 presents the number of responses to the vessel delays question from recreation, yacht, and “other” vessel types. These are the vessel types which are not considered as commercial in this analysis and have not been quantified in the previous vessel delays category. The low level of response data for most delay categories means that these responses do not comprise a representative sample of boaters and are not appropriate for extrapolation to the surveyed population. For this analysis, only “Another boat had to be moved from my stall” will be extrapolated: response data from all other categories will be used as-is.

Table B-69. Number of responses, by delay category, for recreation, yachts, and “other” vessels

Vessel Delay Categories	Number of responses
Wait for tide change	2
Another boat had to be moved from my stall	9
Harbor staff not available	5
Had to wait for rafted boat owner to return	3
Launching delays at ramp	2
Other (ice in harbor)	1

Source: Craig Small Boat Harbor Survey results

Table B-70 presents the delay hours per year for delay categories which will not be extrapolated to the population. These delay hours are assumed representative of the future without project recreational vessel delays for these categories.

Table B-70. Delay hours for categories not extrapolated

Vessel Delay Categories	Number of boats delayed	Number of delays	Total delay hours reported
Wait for tide change	2	11	8
Harbor staff not available	5	16	1.5
Had to wait for rafted boat owner to return	3	10	1.5
Launching delays at ramp	2	7	2.5
Other (ice in harbor)	1	1	1
Total	**13**	**45**	**14.5**

Source: Craig Small Boat Harbor Survey results

Table B-71 presents the delay hours for “Another boat had to be moved from my stall”, including extrapolation to the surveyed population.

Table B-71. Extrapolated delay hours for “Another boat moved from my stall”

Another boat moved from my stall	
Number of waits	34.5
Number of boats experiencing delay	10
Percent of boats experiencing delay	6.62%
Avg. number of waits per boat	3.45
Avg. delay length (hours)	4.5
Total delay hours	**285.48**

The future without project delay hours for all categories total approximately 300 hours.

This analysis assumes that recreational boaters would choose to engage in additional leisure activities if not delayed at Craig. The value of leisure time is equal to one-third of wage rates. This analysis utilizes the average hourly wage rate for Prince of Wales Island workers, as reported by the State of Alaska Department of Labor and Workforce Development.[46] The 2009-2013 average wage rate for Prince of Wales Island is $13.45 (updated to 2014 dollars), which is equivalent to a leisure rate of $4.48 per hour.

Combining the expected delay hours for recreational vessels with the value of their leisure time results in $1,000 annually of recreational opportunity cost of time.

The present value of recreational opportunity cost of time in Craig over the 50-year project period of analysis is $32,000 with an average annual value of $1,000.

[46] State of Alaska Department of Labor and Workforce Development, Research and Analysis Section, Alaska Local and Regional Information. http://live.laborstats.alaska.gov/alari/

K. Summary of Future Without-Project Conditions

Table B-72 summarizes the future without-project condition at Craig and forms the basis for comparison for the future with-project alternatives.

Table B-72. Summary of Future Without-Project Conditions

Category:	Net Present Value	Average Annual
Vessel damages	$4,613,000	$192,000
Vessel delays	$33,482,000	$1,395,000
Subsistence	$83,590,000	$3,484,000
Travel Cost	$14,129,000	$589,000
Infrastructure Damage	$19,009,000	$792,000
Recreation UDV	$50,076,000	$2,087,000
Recreation OCT	$32,000	$1,000
Total	**$204,931,000**	**$8,540,000**

Note: Values have been rounded to the nearest thousand.

The present value of the future without project condition costs over the 50-year project period of analysis is $204.93 million with an average annual value of $8.54 million.

VI. ALTERNATIVES CONSIDERED

The planning charette held in Craig in November 2012 resulted in the selection of a site and development of preliminary alternatives. After design of the initial array of alternatives, the project delivery team held a follow-up meeting in Craig in February 2014. Community representatives suggested further changes to the alternatives, which led to refining the harbor designs.

A. Alternative Formulation

Once the Wards Cove Cannery site was chosen, several alternatives were formulated that would provide protection for vessels. The varying basin sizes for the alternatives are based upon the estimated future fleet utilizing Craig Small Boat Harbor survey results and harbor use information from the City of Craig. The smaller alternatives were initially formulated to serve primarily the fleet of vessels demanding permanent moorage, while larger alternatives consider moorage for varying levels of transient vessels.

1. Additional Design Considerations

Craig residents raised concerns about a 2-foot swell that enters Klawock Inlet from the southwest. Based on this information, breakwater designs with a western opening should not be considered as they would not offer protection to this southwesterly swell and so were incomplete. Alternative 2 was eliminated from consideration and two modified alternatives based on the basin size of Alternative 2 were developed. These are discussed below as Alternatives 2a and 2b.

The medium and large basin sizes (Alternatives 3 and 4) were also eliminated from consideration based on the information regarding swell. In addition, Craig residents reported that the basin sizing for Alternatives 3 and 4 was problematic as it could interfere with local float plane traffic. Residents preferred the smaller basin sizes of Alternatives 1 and 2 which is why these general configurations were carried forward for detailed analysis.

The cost information for Alternatives 3 and 4 was still carried forward for the economic analysis. The purpose of analyzing these alternatives is to illustrate the justification of the NED plan – that is, to show the net benefits of a basin size larger than Alternative 2. The costs of alternatives with basin sizes similar to Alternatives 3 and 4 which are designed to consider the swell would be higher than the costs of the existing alternatives.

B. Alternatives Considered

The following sections describe each alternative and the costs. Costs are at 2014 price levels. Construction cost estimates include mob and demob, local service facilities (both upland facilities and harbor floats), general navigation features, navigation aids, and anodes. Costs for Operations, Maintenance, Repair, Replacement, and Rehabilitation are included and described for each alternative. Annual costs are based on the Federal Fiscal Year 2015 discount rate of 3.375 percent and a 50-year project period of analysis.

1. Alternative 1

Alternative 1 provides a protected basin for 105 slips for vessels if configured as currently designed. Alternative 1 includes design features to accommodate fish passage near shore. The approximate costs for fish passage are included in the construction cost.

The estimated construction cost including interest during construction, preliminary engineering and design, real estate, construction supervision and administration, and contingency is $33.93 million. OMRR&R for this alternative includes 5 percent of armor stone at 25 year intervals, complete anode replacement at 15 year intervals, and float replacement at 40 year intervals. OMRR&R costs for Alternative 1 are estimated at a present value of $1.4 million, or $60,000 annually. The average annual cost for Alternative 1 is $1.47 million.

2. Alternative 2

Alternative 2 would consist of a 10.1-acre basin protected by a 650-foot long western breakwater in a north-south alignment and an 850-foot long northern breakwater in an east-west alignment. There would be an opening to the west allowing for vessel ingress and egress to both the east and west. This alternative would provide 145 slips for vessels if configured as designed.

The estimated construction cost including interest during construction, preliminary engineering and design, real estate costs, construction supervision and administration, and contingency is $31.8 million. Operations, maintenance, repair, replacement, and rehabilitation (OMRR&R) for this alternative includes 5 percent of armor stone at 25 year intervals, complete anode replacement at 15 year intervals, and float replacement at 40 year intervals. OMRR&R costs for Alternative 2 are estimated at a present value of $1.762 million, or $73,000 annually. The average annual cost for Alternative 2 is $1.40 million.

3. Alternative 2a

Alternative 2a would consist of a 10.1-acre basin protected by a 960-foot long western breakwater in a general north-south alignment and a 960-foot long northern breakwater in a general east-west alignment. The western breakwater was modified to allow for vessel ingress and egress from the northwest while simultaneously addressing concerns about a southwesterly swell entering the harbor. This alternative would provide 145 slips for vessels if configured as currently designed. Additional design features were added to accommodate fish passage near shore. The approximate costs for fish passage are included in the construction cost.

The estimated construction cost including interest during construction, preliminary engineering and design, real estate costs, construction supervision and administration, and contingency is $42.51 million. Operations, maintenance, repair, replacement, and rehabilitation (OMRR&R) for this alternative includes 5 percent of armor stone at 25 year intervals, complete anode replacement at 15 year intervals, and float replacement at 40 year intervals. OMRR&R costs for Alternative 2a are estimated at a present value of $2.3 million, or $95,000 annually. The average annual cost for Alternative 2a is $1.87 million.

4. Alternative 2b

This alternative would consist of a 10.1-acre basin protected by a 1,933-foot long breakwater configured in an L-shape. This design eliminates the western opening completely, providing protection against waves from all westerly and northerly directions. This basin would provide 145 slips for vessels if configured as currently designed. Additional design features were added to accommodate fish passage near shore. The approximate costs for fish passage are included in the construction cost.

The estimated construction cost including interest during construction, preliminary engineering and design, real estate costs, construction supervision and administration, and contingency is $36.47 million. Operations, maintenance, repair, replacement, and rehabilitation (OMRR&R) for this alternative includes 5 percent of armor stone at 25 year intervals, complete anode replacement at 15 year intervals, and float replacement at 40 year intervals. OMRR&R costs for Alternative 2b are estimated at a present value of $1.4 million, or $60,000 annually. The average annual cost for Alternative 2b is $1.58 million.

5. Alternative 3

Alternative 3 would consist of a 25.1-acre basin protected by a 650-foot long western breakwater in a north-south alignment and a 1,450-foot long breakwater in an east-west alignment. This basin would provide 303 slips for vessels if configured as designed.

The estimated construction cost including interest during construction, preliminary engineering and design, real estate costs, construction supervision and administration, and contingency is $50.1 million. Operations, maintenance, repair, replacement, and rehabilitation (OMRR&R) for this alternative includes 5 percent of armor stone at 25 year intervals, complete anode replacement at 15 year intervals, and float replacement at 40 year intervals. OMRR&R costs for Alternative 3 are estimated at a present value of $2.44 million, or $101,700 annually. The average annual cost for Alternative 3 is $2.26 million.

6. Alternative 4

This alternative would consist of a 42.5-acre basin protected by a 650-foot long western breakwater in a north-south alignment and a 1,600-foot long breakwater in an east-west alignment. This basin would provide 530 slips for vessels if configured as currently designed.

The estimated construction cost including interest during construction, preliminary engineering and design, real estate costs, construction supervision and administration, and contingency is $56.14 million. Operations, maintenance, repair, replacement, and rehabilitation (OMRR&R) for this alternative includes 5 percent of armor stone at 25 year intervals, complete anode replacement at 15 year intervals, and float replacement at 40 year intervals. OMRR&R costs for Alternative 4 are estimated at a present value of $3.63 million, or $151,000 annually. The average annual cost for Alternative 4 is $2.57 million.

C. Total Project Costs

Table B-73 presents a summary of the costs for each alternative.

Table B-73. Total Project Costs, by Alternative

Alternative	First Cost	Interest During Construction	PV OMRR&R	Total PV Project Costs	Average Annual Cost
1	$32,822,000	$1,113,000	$1,444,000	$35,379,000	$1,474,000
2*	$30,804,000	$1,045,000	$1,762,000	$33,612,000	$1,401,000
2a	$41,118,000	$1,395,000	$2,280,000	$44,792,000	$1,867,000
2b	$35,270,000	$1,196,000	$1,447,000	$37,913,000	$1,580,000
3*	$50,121,000	$1,701,000	$2,441,000	$54,263,000	$2,262,000
4*	$56,141,000	$1,905,000	$3,625,000	$61,672,000	$2,570,000

Notes:

- All costs rounded to the nearest thousand.
- Project costs assume a 2-year (24-month) construction window with construction beginning in 2015 and completed in 2017.
- Present value and average annual costs are calculated utilizing a 50-year project period of analysis and a Federal fiscal year 2015 discount rate of 3.375 percent.
- Operations, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) costs include armor rock (5% of initial quantity) at 25 year intervals, complete anode replacement at 15 year intervals, and float replacement at 40 year intervals.
- Alternative 2 has been eliminated from further consideration due to issues associated with swell at the proposed harbor site.
- Alternatives 3 and 4 as presented in this table have been eliminated from further consideration due to issues associated with swell, basin size, and interference with sea plane operations. However, these alternatives are carried forward for comparison purposes only to serve to identify the NED plan.

VII. FUTURE WITH PROJECT CONDITIONS

This section provides an analysis of the costs incurred by harbor users in the various future with-project (FWP) conditions. These are the costs which accrue over the 50-year period of analysis with the various Federal projects in place. The same categories for which costs were quantified in the FWOP are utilized in this section.

A. Assumptions

In general, the same assumptions utilized in the FWOP condition section still apply here. Key assumptions and any differences will be noted in the appropriate sections.

There is no change in the vessel fleet expected to call upon Craig in the FWP conditions.

1. Future With Project Excess Moorage Demand and Costs by Alternative

In the FWOP condition, the level of costs and damages to boaters is calculated based on applying survey results to the expected population of Craig Harbor users. This analysis assumes that the inefficiencies in the FWOP are based upon the current level of overcrowding and congestion at Craig small boat harbor facilities. In this case, the overcrowding and congestion at Craig which cause these issues are represented quantitatively as excess moorage demand. Therefore, a relationship exists between the excess moorage demand and the level of expected damages in the FWOP. This analysis assumes that FWP costs for each alternative will be based on the level to which moorage demand is addressed.

a. Future Without Project Excess Moorage Demand

The excess moorage demand in the FWOP condition was calculated as a low and high scenario. The low scenario utilized primarily data from the City of Craig and estimated only the demand for permanent slips. This demand is summarized in Table B-74.

Table B-74. Craig Harbor FWOP excess moorage demand, Low scenario

Vessel Length	0-20'	21-27'	28-36'	37-45'	46-60'	>60'	Total
Number vessels on waitlist[1]	6	20	25	15	10	2	**78**
Vessels in stalls too small for their vessel[2]	0	3	17	13	22	0	**55**
Number of new vessels from survey responses[3]	0	0	8	13	16	0	**37**
Total	**6**	**23**	**50**	**41**	**48**	**2**	**170**
Notes:							
1. Source: Craig harbor waitlist as of July 25, 2013.							
2. Source: Craig harbor slip list as of July 25, 2013. Vessels greater than 3-feet longer than current stall length.							
3. Vessels not from Craig which indicated on survey responses that they would use Craig Harbor. This includes extrapolation of survey sample results to the population vessel owners and permit holders.							

The high scenario excess moorage demand considered both permanent and transient usage, and was based on the expected moorage demand from survey results minus current harbor use. Table B-75 summarizes this moorage demand.

Table B-75. Craig Harbor FWOP excess moorage demand, High scenario

Vessel Length	0-20'	21-27'	28-36'	37-45'	46-60'	>60'	Total
Permanent moorage	-5	24	21	29	21	3	**93**
Transient moorage	7	7	47	93	198	33	**385**
Total	**2**	**31**	**68**	**122**	**219**	**36**	**478**
Note: Negative numbers indicate a surplus of moorage (supply greater than demand).							
Permanent moorage is the estimated moorage demand from Craig survey results, minus the number of permanent boats already using the harbor, minus the number of open slips.							
Transient moorage is the estimated transient demand from Craig survey results and harbormaster data, minus the number of transient slips reported by the harbormaster.							

The nature of transient harbor use suggests that these boaters will come and go as needed for their operations, and their durations of stay at Craig will be varied. It is unlikely that all 385 transient vessels will utilize harbor facilities at the same time. There is no data available regarding the exact harbor entrances and exits for transient boaters. In order to address the uncertainty for these transient vessels, this analysis assumes that the largest fleet of transient vessels which will ever need to be at Craig harbors at any one time is equal to the commercial fishing vessel fleet. This revised transient fleet estimate is shown in Table B-76.

Table B-76. Revised Craig Harbor FWOP excess moorage demand, High scenario, transient vessels only

Vessel Length	0-20'	21-27'	28-36'	37-45'	46-60'	>60'	Total
Transient moorage	4	4	28	55	116	19	**226**

b. Future With Project Conditions Slip Availability

Costs to vessel owners in the future with project condition are based upon the level to which excess moorage demand is addressed. This is dependent upon the slips provided in each harbor configuration. Slip configurations are a local service facility, so the local sponsor has ultimate control over slip sizes and placement in new harbor facilities. However, the alternative plans are designed as complete projects including slip configurations and costs. The slip configurations were designed to optimize the number of vessels accommodated at Craig.

Table B-77 shows the expected slip configurations by alternative.

Table B-77. Slip Configurations, by Alternative (moorage supply)

Slip Length	20'	28'	36'	46'	60'	75'	120'	Total
Alternative 1	12	20	30	18	24		1	**105**
Alternative 2	12	28	38	30	36		1	**145**
Alternative 2a	12	28	38	30	36		1	**145**
Alternative 2b	12	28	38	30	36		1	**145**
Alternative 3	8	0	72	73	142	7	1	**303**
Alternative 4	10	29	101	132	245	12	1	**530**
Source: USACE Alaska District H&H Section.								

The low estimate of excess moorage demand includes vessels which use existing facilities at Craig, but are in slips which are too small for their vessels. In the low scenario, this analysis assumes that these vessels will be accommodated at new facilities first, which will result in available slips at old facilities as they are vacated by the larger vessels. Table B-78 presents the revised slip availability at the new Craig small boat harbor when considering the shift of vessels from existing harbors.

Table B-78. Revised slip availability at Craig

Slip Length	20'	28'	36'	46'	60'	75'	120'	Total
Alternative 1	13	28	25	24	14	0	1	**105**
Alternative 2	13	36	33	36	26	0	1	**145**
Alternative 2a	13	36	33	36	26	0	1	**145**
Alternative 2b	13	36	33	36	26	0	1	**145**
Alternative 3	9	8	67	79	132	7	1	**303**
Alternative 4	11	37	96	138	235	12	1	**530**

c. Total Moorage at Craig

The total amount of moorage available at Craig in the future with project condition is equal to the number of slips already available at North and South Cove, plus the new slips which will be added for each alternative plan. Table B-79 summarizes these calculations.

Table B-79. Total Moorage Availability at Craig

Slip Length	20'	28'	36'	46'	60'	75'	120'	Total
Alternative 1	47	82	53	88	49	0	4	**323**
Alternative 2	47	90	61	100	61	0	4	**363**
Alternative 2a	47	90	61	100	61	0	4	**363**
Alternative 2b	47	90	61	100	61	0	4	**363**
Alternative 3	43	62	95	143	167	7	4	**521**
Alternative 4	45	91	124	202	270	12	4	**748**

d. Moorage Demand met by alternative

Future without and future with project moorage demand at Craig is based upon extrapolating results of the Craig Small Boat Harbor survey. Table B-80 summarizes Craig moorage demand by moorage type.

Table B-80. Craig moorage demand by moorage type

Description	0-20	21-27	28-36	37-45	46-60	>60	Total
Permanent	19	61	54	72	49	3	258
Transient	22	18	61	102	207	34	444
Boat Launch	21	6	0	0	0	0	28
Total	**62**	**86**	**115**	**173**	**256**	**37**	**730**

Considering this moorage demand with the number of slips provided in each alternative plan allows a determination to be made regarding how each alternative addresses moorage demand. Then, future with project operating costs can be determined for each alternative.

This analysis assumes that vessels demanding permanent moorage will fill available slips first. Table B-81 shows the remaining available slips after accommodating vessels demanding permanent moorage. Since there are remaining available slips for all alternatives, permanent moorage demand has been met for all alternatives.

Table B-81. Available slips after accommodating permanent moorage

Alternative	Number of slips remaining after accommodating permanent vessels
Alternative 1	65
Alternative 2	105
Alternative 2a	105
Alternative 2b	105
Alternative 3	263
Alternative 4	490

The values in Table B-81 represent the slips available to meet transient moorage demand. Vessels demanding transient moorage do not need a full-time permanent slip. So this analysis assumes that each available slip can accommodate two transient vessels. The 105 remaining slips in Alternatives 2, 2a, and 2b can accommodate 210 transient vessels. This assumption addresses the limited information available regarding how often transient vessels need to utilize moorage at Craig.

Table B-82 presents the level of transient moorage demand met, considering these assumptions.

Table B-82. Transient moorage demand met, by alternative

Alternative	Percent of transient demand met
Alternative 1	29%
Alternative 2	47%
Alternative 2a	47%
Alternative 2b	47%
Alternative 3	100%
Alternative 4	100%

According to moorage demand estimates, there are 28 vessels which demand only use of the boat launch at Craig. There are boat launch ramp facilities at the existing small boat harbors, but a boat launch is not part of the harbor plans for the Wards Cove site. Given the low level of moorage demand for boat launch users, this analysis assumes that the demand for boat launch facilities is met for all alternatives. The basis for this assumption is that alleviating overcrowding at existing harbors will alleviate any issues currently experienced by boat launch users.

B. Vessel Damages

Some of the vessel damages reported by Craig survey respondents will not be alleviated with Federal navigation improvements. Examples of these types of damages as reported on surveys include: seat stolen, missing buoys, electrolysis, broken glass, missing mooring lines, and frozen water lines. There is an average of 1.8 of these types of vessel damages per year with an average repair cost of $146 each (updated to 2014 dollars).

The method to quantify these vessel damages is essentially the same as used to estimate FWOP damages. First the population of vessels which could be damaged is the total vessel fleet which would use moorage at Craig: 730 vessels. In the FWOP condition, this analysis assumed that an average of 5.6 vessel damages per year was equivalent to 11.6 percent of vessels subject to damage. Using that same proportional assumption, an average of 1.8 vessel damages per year equates to an annual damage rate of 3.73 percent. Applying this percent to the population of vessels subject to damages means that there will be an average of 27 vessels damaged per year (730 vessels * 3.73 percent). These vessel damages are split by vessel moorage type, as shown in Table B-83.

Table B-83. Future With Project, Vessels experiencing unavoidable damages

Moorage Types	Percent of moorage demand	Number of vessels damaged
Permanent	35%	10
Transient	61%	16
Boat Launch	4%	1
Total		**27**

According to the results of the Craig Small Boat Harbor survey, the average repair cost for these unavoidable damages is $146 (updated to 2014 dollars). Costs per damage range from $104 to $224. To maintain consistency with the future without project vessel damage calculations, and to address uncertainty in vessel damage costs, this analysis utilizes an @Risk triangular distribution with the minimum, average, and maximum damage costs as parameters. Figure B-24 shows the distribution of costs per vessel damage.

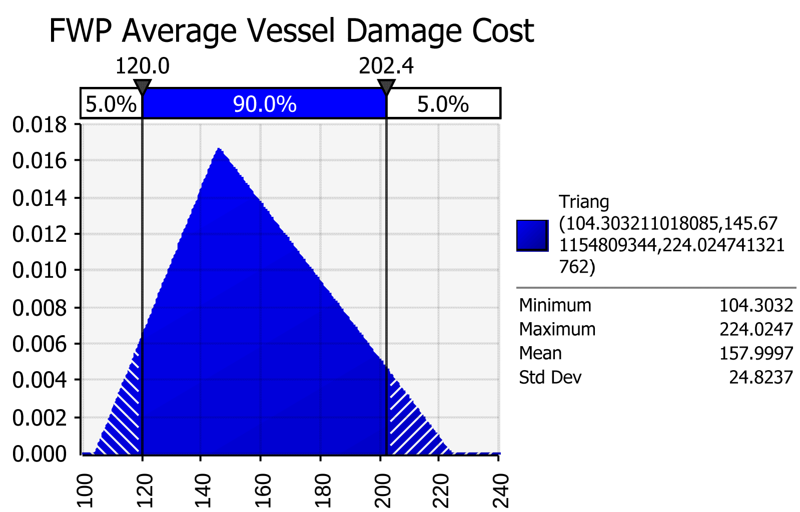


Figure B-24. Future With Project Condition Average Cost per unavoidable vessel damage, @Risk distribution

The annual cost of these unavoidable vessel damages in the future with project condition is equal to the number of vessels damages multiplied by the expected cost per damage, or 27 vessels multiplied by the damage cost distribution provided above. To utilize the average damage cost distribution in calculations, this analysis uses and @Risk simulation with 1,000 iterations. Figure B-25 shows the results of this simulation with annual vessel damage costs ranging from a minimum of $2,871 to a maximum of $6,014 with a mean of $4,266. This analysis utilizes the mean value for further calculations.

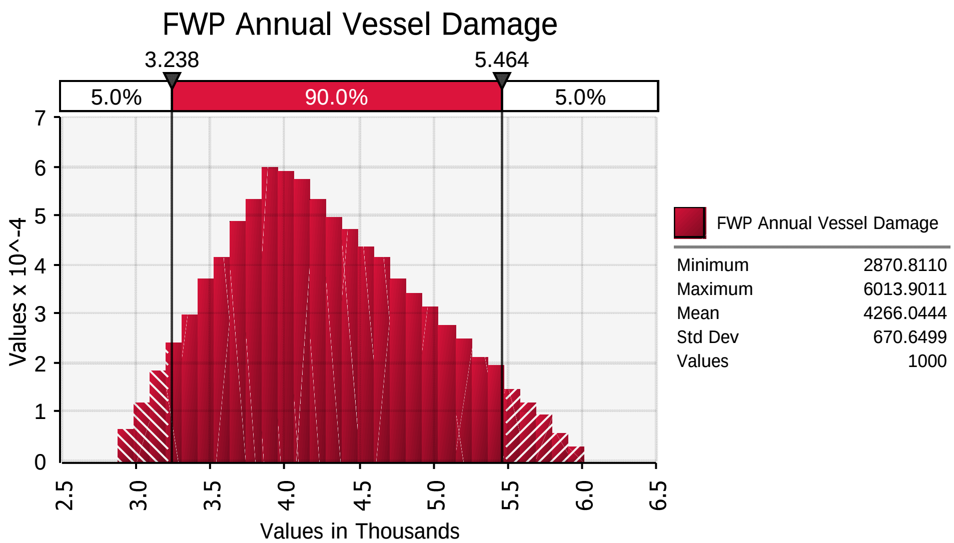


Figure B-25. Future With Project Annual Unavoidable Vessel Damage Costs, @Risk simulation results

These vessel damage costs are then calculated by moorage type, see Table B-84.

Table B-84. Future With Project Unavoidable vessel damages, by moorage type

		Future With Project (unavoidable)	
Moorage Types	**Percent of moorage demand**	**Number of vessels damaged**	**Annual damage cost**
Permanent	35%	10	$1,510
Transient	61%	16	$2,594
Boat Launch	4%	1	$162
Total		**27**	**$4,266**

In addition, this analysis utilizes the assumptions described in the preceding sections to determine how much of the FWOP damages will still accrue with a project. The amount of moorage demand met is related to the amount of damages alleviated. As previously described, all of the alternatives meet the demand for permanent moorage, so the only remaining vessel damage costs are those that are unavoidable with navigation improvements, as shown in Table B-85.

Table B-85. Permanent moorage demand met and remaining vessel damage costs

Scenario	Permanent moorage	
	Demand Met	FWP Damage Costs
Alt. 1	100%	$1,510
Alt. 2	100%	$1,510
Alt. 2a	100%	$1,510
Alt. 2b	100%	$1,510
Alt. 3	100%	$1,510
Alt. 4	100%	$1,510

Similarly, the amount of remaining transient moorage demand (equal to one minus the amount of demand met) is equal to the remaining vessel damage costs, as shown in Table B-86.

Table B-86. Transient moorage demand met and remaining damage costs

Scenario	Transient moorage	
	Demand Met	FWP Damage Costs
Alt. 1	29%	$85,474
Alt. 2	47%	$64,402
Alt. 2a	47%	$64,402
Alt. 2b	47%	$64,402
Alt. 3	100%	$2,594
Alt. 4	100%	$2,594

And finally, this analysis assumes that all boat launch moorage demand is met, so the remaining vessel damage costs are equal to those that are unavoidable. See Table B-87.

Table B-87. Boat Launch moorage demand met and remaining damage costs

Scenario	Boat Launch	
	Demand Met	FWP Damage Costs
Alt. 1	100%	$162
Alt. 2	100%	$162
Alt. 2a	100%	$162
Alt. 2b	100%	$162
Alt. 3	100%	$162
Alt. 4	100%	$162

Total annual future with project vessel damages are equal to the sum of permanent, transient, and boat launch, as show in Table B-88.

Table B-88. Total Annual Future With-Project Vessel Damage Costs, by alternative

Alternative	Total Annual FWP Damage Cost
Alt. 1	$87,146
Alt. 2	$66,074
Alt. 2a	$66,074
Alt. 2b	$66,074
Alt. 3	$4,266
Alt. 4	$4,266

Table B-89 presents the net present value and average annual future with-project vessel damage costs for each alternative.

Table B-89. Future With-Project Vessel Damage Costs, by Alternative

Category:	Future With Project Costs	
Vessel Damages	Net Present Value	Average Annual
Alt. 1	$2,091,000	$87,000
Alt. 2	$1,585,000	$66,000
Alt. 2a	$1,585,000	$66,000
Alt. 2b	$1,585,000	$66,000
Alt. 3	$102,000	$4,000
Alt. 4	$102,000	$4,000

Note: Values are rounded to the nearest thousand.

C. Vessel Delays

Similar to vessel damages, there are some vessel delays reported on survey results which will not be affected by navigation improvements. Table B-90 summarizes the expected effects of navigation improvements on each of the vessel delay categories.

Table B-90. Vessel Delay categories and expected effect of navigation improvements

Vessel Delay Categories (from survey)	Delay alleviated with navigation improvements?	Remaining Delay cost in FWP condition
Wait for tide change	Somewhat	50%
Another boat had to be moved from my stall	Yes	0%
Harbor staff not available	No	100%
Had to wait for rafted boat owner to return	Yes	0%
Launching delays at ramp	No	100%
Other (congestion & overcrowding)	Yes	0%
Other (ice in harbor)	No	100%

Note: The total remaining delay cost for each alternative will be dependent upon the level of overcrowding alleviated. This table shows the best case scenario for reducing vessel delays.

The assumptions related to each of the delay categories are as follows:

- Wait for tide change – some vessels at Craig have to wait for tide changes when entering or leaving existing small boat harbor facilities due to draft restrictions. The new harbor site is naturally deep and vessels will not face these issues. This analysis conservatively assumes that half of the delays associated with tidal issues will be alleviated as some vessels which are depth-constrained will utilize new harbor facilities, while some will continue current practices.
- Another boat had to be moved from my stall – these delays are directly related to current overcrowding issues and can be alleviated with navigation improvements.
- Harbor staff not available – Federal navigation improvements will have no effect on the level of local harbor staffing. These delays will not be alleviated with navigation improvements.
- Had to wait for rafted boat owner to return – these delays are directly related to current overcrowding. With navigation improvements, rafting activities will be reduced and these delays can be eliminated.
- Launching delays at ramp – the current harbor designs do not include boat launch ramp facilities; therefore, these delays will not be affected by new navigation improvements.
- Other (congestion and overcrowding) – these responses were written in by survey respondents and were all related to congestion and overcrowding issues. These are the types of issues which are expected to be resolved by navigation improvements.
- Other (ice in harbor) – Federal navigation improvements will not address issues with ice in current harbor facilities. Delays associated with ice in the harbor will not be changed in the future with project condition scenarios.

Table B-91 summarizes the total delay hours which will not be alleviated by navigation improvements.

Table B-91. Total Future With-Project Delay Hours, only delays which will occur regardless of navigation improvements

Description	0-20’	21-27’	28-36’	37-45’	46-60’	>60’	Total
Commercial Fishing Vessels							
Permanent	10.70	75.80	119.49	320.57	238.98	0.00	765.54
Transient	0.00	0.00	19.05	38.21	90.67	7.40	155.34
Boat Launch	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Comm Fish Vessel Delays	10.70	75.80	138.55	358.78	329.65	7.40	920.88
Charter Vessels							
Permanent	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transient	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boat Launch	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Charter Vessel Delays	0.00	0.00	0.00	0.00	0.00	0.00	-
Subsistence Vessels							
Permanent	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transient	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boat Launch	8.07	0.00	0.00	0.00	0.00	0.00	8.07
Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Subsistence Vessel Delays	8.07	0.00	0.00	0.00	0.00	0.00	8.07

The cost of these delays is calculated in the same manner as in the FWOP condition: utilizing a combination of vessel operating costs and opportunity cost of time. Table B-92 summarizes these calculations.

Table B-92. Cost of Future With-Project Vessel Delays, only delays which will occur regardless of navigation improvements

Cost of Delays (Vessel Operating Costs and OCT), Future With-Project Condition							
Total Delay Costs	**0-20 ft**	**21-27 ft**	**28-36 ft**	**37-45 ft**	**46-60 ft**	**>60 ft**	**Total**
Permanent	$2,185	$15,467	$33,901	$132,319	$102,425	$0	$286,297
Transient	$0	$0	$5,406	$15,771	$38,862	$3,522	$63,561
Boat Launch	$1,647	$0	$0	$0	$0	$0	$1,647
Other	$0	$0	$0	$0	$0	$0	$0
Total	**$3,832**	**$15,467**	**$39,307**	**$148,090**	**$141,287**	**$3,522**	**$351,505**

The total cost of vessel delays in the FWP condition is dependent upon the level of remaining excess moorage demand in each scenario. The same methodology as used in vessel damages is used here to calculate remaining vessel delay costs. First, all alternatives meet the demand for permanent moorage, so the only remaining delay costs are those that would not be alleviated. See Table B-93.

Table B-93. Permanent Moorage Demand met and Future With-Project delay costs

Scenario	Permanent Moorage	
	Demand Met	FWP Delay Cost
Alt. 1	100%	$286,297
Alt. 2	100%	$286,297
Alt. 2a	100%	$286,297
Alt. 2b	100%	$286,297
Alt. 3	100%	$286,297
Alt. 4	100%	$286,297

The amount of remaining transient moorage demand is related to the level of remaining vessel delay costs. See Table B-94.

Table B-94. Transient Moorage Demand met and Future With-Project delay costs

Scenario	Transient Moorage	
	Demand Met	FWP Delay Cost
Alt. 1	29%	$396,865
Alt. 2	47%	$312,120
Alt. 2a	47%	$312,120
Alt. 2b	47%	$312,120
Alt. 3	100%	$63,561
Alt. 4	100%	$63,561

Finally, all alternatives meet the demand for boat launch use at Craig, so only unavoidable delays remain for these vessels in the future with project condition. See Table B-95.

Table B-95. Boat Launch Moorage Demand met and Future With-Project delay costs

Scenario	Boat launch	
	Demand Met	FWP Delay Cost
Alt. 1	100%	$1,647
Alt. 2	100%	$1,647
Alt. 2a	100%	$1,647
Alt. 2b	100%	$1,647
Alt. 3	100%	$1,647
Alt. 4	100%	$1,647

The total future with project vessel delay costs are equal to the sum of permanent, transient, and boat launch delay costs, as shown in Table B-96.

Table B-96. Total Future With-Project Vessel Delay Costs

Scenario	Total FWP Cost
Alt. 1	$684,809
Alt. 2	$600,064
Alt. 2a	$600,064
Alt. 2b	$600,064
Alt. 3	$351,505
Alt. 4	$351,505

Table B-97 presents the net present value and average annual future with project vessel damage costs for each alternative.

Table B-97. Future With-Project Vessel Delay Costs, by Alternative

Category:	Future With Project Costs	
Vessel Delays	Net Present Value	Average Annual
Alt. 1	$16,431,000	$685,000
Alt. 2	$14,398,000	$600,000
Alt. 2a	$14,398,000	$600,000
Alt. 2b	$14,398,000	$600,000
Alt. 3	$8,434,000	$352,000
Alt. 4	$8,434,000	$352,000

Note: Values are rounded to the nearest thousand.

D. Subsistence

In the future with project condition, Craig residents are expected to harvest additional subsistence resources, resulting in an increase in the equivalent value of those harvests. These harvest increases are based upon increased access to vessels and reduced overcrowding and congestion at harbor facilities.

To estimate the possible harvest levels in the FWP condition, this analysis examines subsistence harvests of nearby communities. In order to determine which communities are appropriate for comparison, this analysis examines the demographic characteristics and marine facilities of other communities on Prince of Wales Island, as shown in Table B-98.

Table B-98. Population and Marine Facilities of Prince of Wales Island Communities

Communities on Prince of Wales Island:[1]	Population, 2000[2]	Population, 2010[3]	Rank by 2010 population	Marine Facilities[4]
Craig	1,397	1,201	1	SBH - North Cove and South Cove, Dock
Coffman Cove	199	176	5	Float
Edna Bay	49	42	10	Refuge Float
Hollis	139	112	7	Float
Hydaburg	382	376	4	SBH
Kasaan	39	49	8	Float & Floating breakwater
Klawock	854	755	2	SBH & Dock
Naukati Bay	135	113	6	None
Point Baker	35	15	12	Float
Port Protection	63	48	9	Refuge Float
Thorne Bay	557	471	3	SBH
Whale Pass	58	31	11	Seaplane float

Notes & Data Sources:

1. Per 2010 Census data, these are all of the cities and Census Designated Places on Prince of Wales Island.
2. 2000 US Census population data, accessed through demographic profiles at the State of Alaska Department of Labor and Workforce Development.
3. 2010 US Census population data, accessed through demographic profiles at the State of Alaska Department of Labor and Workforce Development.
4. Source: "Public Port & Harbors in Alaska" map. January 2011, State of Alaska Department of Transportation and Public Facilities.

Craig is by far the largest community on Prince of Wales Island and has the most marine infrastructure. The demographic and infrastructure data for Prince of Wales Island do not immediately indicate a community against which to compare Craig. Prince of Wales Island communities are believed to be the most representative, rather than other communities in Southeast Alaska. This is due to their relatively isolated location, and that communities near Craig will all be harvesting the same subsistence resources (animal and plant species). The comparison of subsistence harvest data of these communities is shown in Table B-99.

Table B-99. Comparison of Subsistence Harvest Data, Prince of Wales Island Communities

Communities on Prince of Wales Island:	Year of Subsistence Harvest Data	Estimated Pounds Harvested, per year	Average Lbs Harvested per Household	Per Capita Lbs Harvested	Percent difference vs. Craig, per capita harvest
Craig	1997	406,934	669.30	230.66	
Coffman Cove	1997	58,818	784.24	276.14	19.72%
Edna Bay	1998	20,089	1,181.68	383.25	66.15%
Hollis	1998	26,271	445.27	169.28	-26.61%
Hydaburg	1997	154,874	1,182.25	384.11	66.53%
Kasaan	1998	19,758	1,097.67	451.98	95.95%
Klawock	1997	271,071	894.62	320.36	38.89%
Naukati Bay	1998	35,388	536.18	241.52	4.71%
Point Baker	1996	13,707	721.41	288.56	25.10%
Port Protection	1996	44,004	1,100.09	450.86	95.47%
Thorne Bay	1998	92,840	455.10	179.22	-22.30%
Whale Pass	1998	10,111	505.56	184.96	-19.81%

Notes & Data Sources:
All subsistence harvest information gathered from the State of Alaska Department of Fish and Game, Community Subsistence Information System. This most recent data available is presented here.

Given the lack of a single community against which to compare Craig, this analysis examines the harvest levels of all other Prince of Wales Island communities. The average per capita subsistence harvest for Prince of Wales Island, not including Craig, is 302.75 pounds, or a 31.25 percent increase compared to Craig. This analysis expects that the level of subsistence harvest increase related to navigation improvements will be less than or equal to 31.25 percent. To address the uncertainty associated with selecting this value, this analysis utilizes an @Risk uniform distribution using 0 and 31.25 percent as parameters, as shown in Figure B-26.

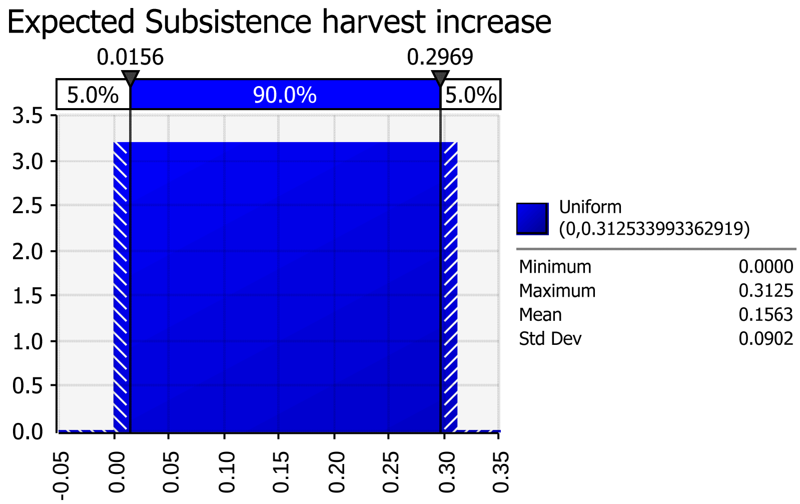


Figure B-26. Subsistence harvest increase, @Risk distribution

An @Risk simulation with 1,000 iterations was conducted to utilize this distribution of expected subsistence harvest increase, with results shown in Figure B-27. This analysis uses the mean value of 15.6 percent increase. This represents the maximum expected subsistence harvest increase, assuming all overcrowding at Craig is alleviated. The harvest increase will be evaluated for each alternative based on the level of moorage demand met.

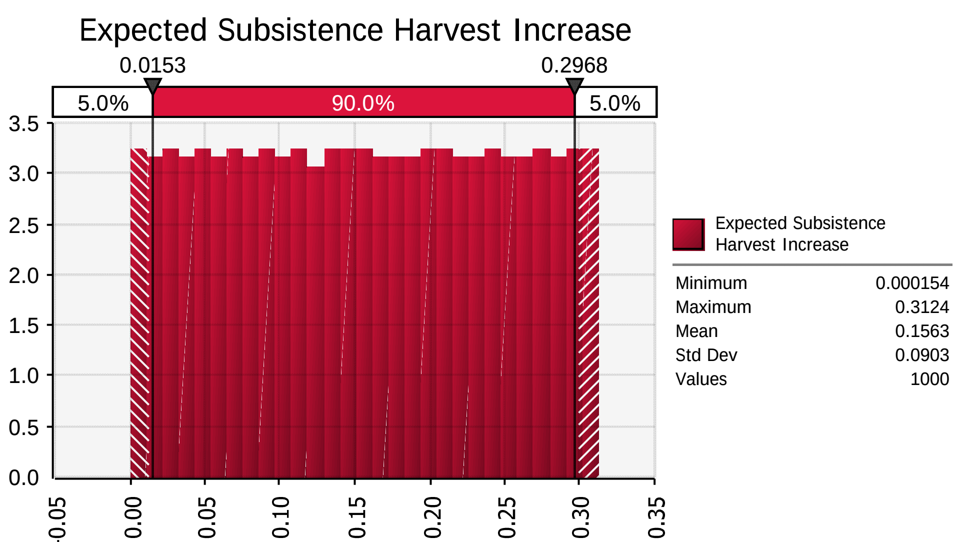


Figure B-27. Subsistence harvest increase, @Risk simulation results

The level of the expected harvest increase for each alternative is dependent upon the amount of moorage demand met. The Craig Small Boat Harbor survey found that all of the subsistence vessels demanding moorage at Craig were in the 36-feet or smaller size classes. This analysis utilizes the amount of moorage demand met for these classes of vessels to determine the expected increase in harvest. Table B-100 summarizes the moorage demand met for these vessels.

Table B-100. Moorage Demand met by alternative, vessels 36 feet and less

Alternative	Amount of moorage demand met - vessels 36' and less		
	Permanent	Transient	Boat Launch
Alternative 1	100%	94%	100%
Alternative 2	100%	100%	100%
Alternative 2a	100%	100%	100%
Alternative 2b	100%	100%	100%
Alternative 3	100%	100%	100%
Alternative 4	100%	100%	100%

The future with project subsistence harvest amounts are equal to the expected future without project harvests multiplied by the expected harvest increase for each alternative. The population and distribution of moorage demand by type is expected to remain the same between the future without and future with project conditions. A summary of future with project harvest levels is presented in Table B-101.

Table B-101. Craig estimated future with-project subsistence harvest, by alternative, for selected harvest years

Year	Total FWP Harvest, lbs, All Moorage Types					
	Alt. 1	Alt. 2	Alt. 2a	Alt. 2b	Alt. 3	Alt. 4
2017	310,169	317,121	317,121	317,121	317,121	317,121
2027	304,167	310,985	310,985	310,985	310,985	310,985
2037	296,364	303,007	303,007	303,007	303,007	303,007
2047	289,867	296,365	296,365	296,365	296,365	296,365
2057	283,110	289,456	289,456	289,456	289,456	289,456
2066	277,163	283,376	283,376	283,376	283,376	283,376

Valuation of the future with project subsistence harvest utilizes the same replacement value as described in the future without project condition: $13.20 per pound. The total value of the subsistence harvest each year is equal to the total expected harvest multiplied by the replacement value per pound. Table B-102 summarizes these calculations for selected project years.

Table B-102. Future With-Project Subsistence Harvest Values, by alternative for selected project years

Year	FWP Harvest value					
	Alt. 1	Alt. 2	Alt. 2a	Alt. 2b	Alt. 3	Alt. 4
2017	$4,095,489	$4,187,291	$4,187,291	$4,187,291	$4,187,291	$4,187,291
2027	$4,016,236	$4,106,262	$4,106,262	$4,106,262	$4,106,262	$4,106,262
2037	$3,913,208	$4,000,924	$4,000,924	$4,000,924	$4,000,924	$4,000,924
2047	$3,827,431	$3,913,224	$3,913,224	$3,913,224	$3,913,224	$3,913,224
2057	$3,738,204	$3,821,998	$3,821,998	$3,821,998	$3,821,998	$3,821,998
2066	$3,659,680	$3,741,713	$3,741,713	$3,741,713	$3,741,713	$3,741,713

Table B-103 presents the net present value and average annual future with project subsistence harvest values for each alternative.

Table B-103. Future With-Project Value of Craig Subsistence Harvests, by alternative

Category:	Future With Project Costs	
Subsistence	Net Present Value	Average Annual
Alt. 1	$94,534,000	$3,940,000
Alt. 2	$96,653,000	$4,028,000
Alt. 2a	$96,653,000	$4,028,000
Alt. 2b	$96,653,000	$4,028,000
Alt. 3	$96,653,000	$4,028,000
Alt. 4	$96,653,000	$4,028,000

Note: Values are rounded to the nearest thousand.

E. Travel Costs

In the future with-project condition, the vessels which indicated that they would relocate to Craig would see reduced travel costs. For the FWOP condition, this analysis only quantified the vessel travel costs related to traveling to and from Craig each year. For commercial vessels (commercial fishing, subsistence, and charter), these trips likely occur at the beginning and end of each fishing season. Only these pre- and post-season trips were quantified due to lack of data regarding in-season vessel movements. It is likely that these vessels make more frequent trips between their current homeport and Craig.

The FWOP condition analysis split boaters which could relocate to Craig into two parts: part 1 are boaters without Craig home addresses, not currently homeported at Craig who indicated they would homeport there, and part 2 are boaters with Craig home addresses who reported that they are not currently homeported there. The FWOP condition analysis assumed that Part 1 boaters make a minimum of one trip every two years between Craig and their current homeport. Part 2 boaters are assumed to make 1 trip per year.

The FWOP condition only quantified the travel costs of vessel trips which will be affected by navigation improvements. Therefore, in the best case scenario FWP condition, in which all excess moorage demand is met, all of these trips will be eliminated and vessel travel costs will be zero.

The boaters who indicated they will relocate to Craig all demand permanent moorage there. Since all of the alternatives meet the demand for permanent moorage, there will be no remaining vessel travel costs in the future with project condition. Table B-104 summarizes these calculations.

Table B-104. Annual FWP Vessel Travel Costs, by alternative

Scenario	Permanent moorage met	FWP Travel Costs
Alt. 1	100%	$0
Alt. 2	100%	$0
Alt. 2a	100%	$0
Alt. 2b	100%	$0
Alt. 3	100%	$0
Alt. 4	100%	$0

Table B-105 presents the net present value and average annual future with project vessel travel costs for each alternative.

Table B-105. Future With-Project Vessel Travel Costs, by alternative

Category:	Future With Project Costs	
Travel Cost	Net Present Value	Average Annual
Alt. 1	$0	$0
Alt. 2	$0	$0
Alt. 2a	$0	$0
Alt. 2b	$0	$0
Alt. 3	$0	$0
Alt. 4	$0	$0

F. Infrastructure Damage

Calculations of infrastructure damage costs for the FWP condition are the same as the FWOP condition. The primary difference in calculation is that this analysis assumes that FWP infrastructure repairs must be conducted at 40-year intervals. This is in comparison to 20-years in the FWOP condition. This assumption is based on input from the Craig harbormaster and Alaska District Engineering staff.

This analysis assumes that existing float infrastructure at both North Cove and South Cove will need to be replaced less frequently in the future with project condition. The basis for this assumption is that new moorage facilities at the new Wards Cove site will reduce the overcrowding currently faced at both North Cove and South Cove. Since overcrowding and congestion is causing increased wear-and-tear to existing facilities, reducing this overcrowding will alleviate these types of damages. Also, some of the reduced life of floats at North Cove is due to the wave climate. The existing docks adjacent to the Wards Cove site are also subject to damages from wave action. The new breakwater proposed at the Wards Cove site is expected to reduce the wave climate for North Cove and for the existing docks adjacent to Wards Cove. This reduction in wave climate is also expected to alleviate damage to infrastructure and contribute to the decreased frequency of replacement.

The costs from Seldovia Harbor are again utilized as representative float replacement costs. The total float replacement costs for existing Craig facilities is approximately $12 million at each interval.

Table B-106 presents the net present value and average annual future with project infrastructure damage costs for each alternative.

Table B-106. Future With-Project Infrastructure Damage Costs, by alternative

Category:	Future With Project Costs	
Infrastructure Damage	**Net Present Value**	**Average Annual**
Alt. 1	$13,511,000	$563,000
Alt. 2	$13,511,000	$563,000
Alt. 2a	$13,511,000	$563,000
Alt. 2b	$13,511,000	$563,000
Alt. 3	$13,511,000	$563,000
Alt. 4	$13,511,000	$563,000

Note: Values are rounded to the nearest thousand.

This analysis assumes that infrastructure damage costs will be alleviated regardless of the selected alternative. The basis for this assumption is that infrastructure damage is due to both overcrowding issues and wave conditions. The new Wards Cove Harbor will address both of these issues, but not necessarily in a manner proportional to the amount of moorage demand met.

G. Recreational Opportunity – Unit Day Values

The future with project recreation experience is quantified using the same Unit Day Value (UDV) method as described in the future without project condition section. The difference is that the calculations in this section are based upon the expected with project UDV points assignment, as based on a focus group of Craig recreational boaters. Table B-107 presents the assigned point values for Craig in the future without- and future with-project condition.

Table B-107. Unit Day Values Without- and With-Project Conditions, Craig

Criteria	Point Range	Points Without Project	Points With Project	Rationale
Recreation Experience	0-30	8.2	15.3	Harbor weekend and holiday use is crowded with close proximity to fishing grounds and commercial fish processor in town. Moderate use during weekdays. Decision based on numerous factors such as high quality of the fishing experience and willingness of charter clients to pay from $190 to $275 for the opportunity to fish along with plane fare for out of town recreation users. Non-fishing recreation customers pay between $145 to $200 for the sightseeing and water taxi opportunities. Recreation destination will be enhanced with project.
Availability of Opportunity	0-18	11.7	9.2	No comparable opportunities within two-hours travel time, although recreational opportunities abound in Alaska.
Carrying Capacity	0-14	7.3	10.3	Adequate facility that currently accommodates multiple users. Prince of Wales Island and surrounding area fisheries are well managed but not overcrowded. Only limitations on carrying capacity might be in the form of reaching maximum commercial and sport fishing quotas.
Accessibility	0-18	9.2	15.3	Remote access, good roads on island within site although parking is an expressed concern. Assume with-project conditions will relieve overcrowded parking condition.
Environmental	0-20	12.2	15.2	Above average aesthetic quality; any limiting factors can be reasonably rectified. Limiting factor for aesthetic quality concerns the crowded conditions at the harbor and launch ramp. Additional aesthetic concerns are the visions of the clearcut areas on the island from the timber industry activity. Overcrowded conditions are significantly improved with project . Clearcut areas of the surrounding mountains will not be changed under with project conditions.
Total Points	**100**	**48.5**	**65.3**	

Source: USACE EGM 15-03, Unit Day Values for Recreation for Fiscal year 2015, and average of responses for Craig focus group, September 2014.

Table B-108 shows the conversion of assigned points to unit day values.

Table B-108. Points and Unit Day Values for Craig Harbor, Future Without- and Future With-Project Conditions

	Future Without Project		Future With Project	
Type of Recreation	**Points**	**UDV**	**Points**	**UDV**
Specialized Fishing & Hunting	49	$32.67	65	$36.99
Specialized Recreation other than Fishing & Hunting	49	$23.17	65	$28.57

Source: Points from Craig focus group responses, September 2014. UDVs from USACE EGM 15-03.

This analysis assumes that the recreational use of Craig small boat harbors does not change between the future without- and with-project conditions. The recreation days for sport fishermen, charter fishermen, and independent travelers as reported in the future without-project condition also apply here. This analysis assumes that there will be no new recreational boaters (those who did not participate in any recreation activity in the without-project condition) as a result of navigation improvements. This analysis only quantifies the expected increase in the recreational experience as a result of enhanced marine infrastructure. Table B-109 summarizes the expected recreational use at Craig.

Table B-109. Craig Recreational Visitation for selected project years

Year	Number of Visitor Days					
	Recreational Fishing		Charter Boats		Independent Travelers	
	Specialized Fishing	Specialized Sightseeing	Specialized Fishing	Specialized Sightseeing	Specialized Fishing	Specialized Sightseeing
2012	59,167	0	7,038	180	0	227
2017	59,093	0	7,029	180	0	227
2027	57,949	0	6,893	177	0	222
2037	56,463	0	6,716	172	0	217
2047	55,225	0	6,569	168	0	212
2057	53,938	0	6,416	165	0	207
2066	52,805	0	6,281	161	0	203

Table B-110 shows the future with project condition Unit Day Values for Craig for selected project years. These values are based on the input data as described in the previous sections.

Table B-110. Unit Day Values for Craig Small Boat Harbor Future With-Project Condition

Year	Future With-Project Condition Unit Day Values					
	Recreational Fishing		Charter Boats		Independent Travelers	
	Specialized Fishing	Specialized Sightseeing	Specialized Fishing	Specialized Sightseeing	Specialized Fishing	Specialized Sightseeing
2012	$2,188,279	$0	$260,294	$5,155	$0	$6,484
2017	$2,185,543	$0	$259,969	$5,148	$0	$6,476
2027	$2,143,250	$0	$254,938	$5,049	$0	$6,341
2037	$2,088,270	$0	$248,398	$4,919	$0	$6,188
2047	$2,042,495	$0	$242,953	$4,811	$0	$6,052
2057	$1,994,879	$0	$237,289	$4,699	$0	$5,911
2066	$1,952,975	$0	$232,305	$4,600	$0	$5,787

Unit Day Values for the future with project condition are only presented for one project scenario – rather than separate values for each alternative plan. Recreation benefits are based upon the overall expected change in the recreational experience and are also based on the expected population of recreational boaters at Craig. This analysis assumes that future with project recreation values (and benefits) will accrue at the same level regardless of the selected alternative.

Table B-111 presents the net present value and average annual future with-project recreation unit day values for each alternative.

Table B-111. Future With-Project Recreation Unit Day Values for each alternative

Category:	Future With Project Costs	
Recreation UDV	Net Present Value	Average Annual
Alt. 1	$56,717,000	$2,364,000
Alt. 2	$56,717,000	$2,364,000
Alt. 2a	$56,717,000	$2,364,000
Alt. 2b	$56,717,000	$2,364,000
Alt. 3	$56,717,000	$2,364,000
Alt. 4	$56,717,000	$2,364,000

Note: Values are rounded to the nearest thousand.

H. Recreational Delays – Opportunity Cost of Time

As with delays for commercial vessels, there are types of delays for recreational boats that will not be affected by navigation improvements. Table B-112 summarizes the expected effects of navigation improvements on vessel delays. These are the same assumptions used for commercial vessel delays.

Table B-112. Vessel Delay categories and expected effect of navigation improvements

Vessel Delay Categories (from survey)	Delay alleviated with navigation improvements?	Remaining Delays in FWP condition
Wait for tide change	Somewhat	50%
Another boat had to be moved from my stall	Yes	0%
Harbor staff not available	No	100%
Had to wait for rafted boat owner to return	Yes	0%
Launching delays at ramp	No	100%
Other (congestion & overcrowding)	Yes	0%
Other (ice in harbor)	No	100%

Utilizing these assumptions, Table B-113 presents the remaining delay hours in the future with-project condition.

Table B-113. Recreation Vessel Delay Hours, Future Without- and Future With-Project Condition

Vessel Delay Categories	FWOP delay hours	Remaining Delay hours in FWP condition
Wait for tide change	8	4
Another boat had to be moved from my stall	285.48	0
Harbor staff not available	1.5	2
Had to wait for rafted boat owner to return	1.5	0
Launching delays at ramp	2.5	3
Other (congestion & overcrowding)	0	0
Other (ice in harbor)	1	1
Total	**300**	**9**

The annual opportunity cost of time for these remaining recreation delays is equal to the delay hours multiplied by the hourly leisure rate of $4.48 per hour: equal to $40.

Table B-114 presents the net present value and average annual future with project recreation unit day values for each alternative. As this category is related to the recreational experience at Craig, this analysis assumes that future with project delays accrue at the same level for each alternative plan.

Table B-114. Future With-Project Recreation Delay Opportunity Cost of Time for each alternative

Category:	Future With Project Costs	
Recreation OCT	Net Present Value	Average Annual
Alt. 1	$1,000	$40
Alt. 2	$1,000	$40
Alt. 2a	$1,000	$40
Alt. 2b	$1,000	$40
Alt. 3	$1,000	$40
Alt. 4	$1,000	$40

Note: Net Present Values are rounded to the nearest thousand.

I. Summary of Future With-Project Conditions

Table B-115 summarizes the future with-project conditions at Craig.

Table B-115. Summary of Future With-Project Costs

Alternative Number	Net Present Value	Average Annual Value
1	$183,285,000	$7,639,000
2*	$182,865,000	$7,621,000
2a	$182,865,000	$7,621,000
2b	$182,865,000	$7,621,000
3*	$175,418,000	$7,311,000
4*	$175,418,000	$7,311,000

Notes:

- Values are rounded to the nearest thousand and may not sum from the previous tables due to rounding.
- Alternative 2 has been eliminated from consideration due to concerns regarding swell. Alternatives 3 and 4 as presented here have also been eliminated from consideration due to swell and local concerns regarding the basin size interfering with float plane operations. Alternatives 3 and 4 were retained for economic analysis to show that a smaller basin size represents the NED plan.

VIII. ANNUAL BENEFITS

This section serves to summarize the annual benefits, by category and by alternative. Annual benefits determined by comparing costs to harbor users in the future without and future with project conditions.

An important note is that all values presented in this section have been rounded to the nearest thousand and therefore may not exactly equal to values presented in the previous sections.

A. Benefits by category

This section summarizes the average annual future without project condition costs, future with project condition costs, and benefits by benefit category.

1. Vessel Damages

Table B-116. Vessel Damages, Average Annual Values

Scenario	Average Annual Values		
	FWOP	FWP	Benefit
FWOP	$192,000		
Alt. 1		$87,000	$105,000
Alt. 2		$66,000	$126,000
Alt. 2a		$66,000	$126,000
Alt. 2b		$66,000	$126,000
Alt. 3		$4,000	$188,000
Alt. 4		$4,000	$188,000

2. Vessel Delays

Table B-117. Vessel Delays, Average Annual Values

Scenario	Average Annual Values		
	FWOP	FWP	Benefit
FWOP	$1,395,000		
Alt. 1		$685,000	$711,000
Alt. 2		$600,000	$795,000
Alt. 2a		$600,000	$795,000
Alt. 2b		$600,000	$795,000
Alt. 3		$352,000	$1,044,000
Alt. 4		$352,000	$1,044,000

3. Subsistence

Table B-118. Subsistence, Average Annual Values

Scenario	Average Annual Values		
	FWOP	FWP	Benefit
FWOP	$3,484,000		
Alt. 1		$3,940,000	$456,000
Alt. 2		$4,028,000	$544,000
Alt. 2a		$4,028,000	$544,000
Alt. 2b		$4,028,000	$544,000
Alt. 3		$4,028,000	$544,000
Alt. 4		$4,028,000	$544,000

4. Travel Costs

Table B-119. Travel Costs, Average Annual Values

Scenario	Average Annual Values		
	FWOP	FWP	Benefit
FWOP	$589,000		
Alt. 1		$0	$589,000
Alt. 2		$0	$589,000
Alt. 2a		$0	$589,000
Alt. 2b		$0	$589,000
Alt. 3		$0	$589,000
Alt. 4		$0	$589,000

5. Infrastructure Damage

Table B-120. Infrastructure Damage, Average Annual Values

Scenario	Average Annual Values		
	FWOP	FWP	Benefit
FWOP	$792,000		
Alt. 1		$563,000	$229,000
Alt. 2		$563,000	$229,000
Alt. 2a		$563,000	$229,000
Alt. 2b		$563,000	$229,000
Alt. 3		$563,000	$229,000
Alt. 4		$563,000	$229,000

6. Recreation – Unit Day Values

Table B-121. Recreation UDV, Average Annual Values

Scenario	Average Annual Values		
	FWOP	FWP	Benefit
FWOP	$2,087,000		
Alt. 1		$2,364,000	$277,000
Alt. 2		$2,364,000	$277,000
Alt. 2a		$2,364,000	$277,000
Alt. 2b		$2,364,000	$277,000
Alt. 3		$2,364,000	$277,000
Alt. 4		$2,364,000	$277,000

7. Recreation – Opportunity Cost of Time

Table B-122. Recreation OCT, Average Annual Values

Scenario	Average Annual Values		
	FWOP	FWP	Benefit
FWOP	$1,000		
Alt. 1		$0	$1,000
Alt. 2		$0	$1,000
Alt. 2a		$0	$1,000
Alt. 2b		$0	$1,000
Alt. 3		$0	$1,000
Alt. 4		$0	$1,000

B. Benefits by Alternative

This section summarizes the future without project costs, future with project costs, and benefits, by alternative and benefit category. Calculations utilize a 50-year project period of analysis and a Fiscal Year 2015 discount rate of 3.375 percent.

Table B-123. Alternative 1 Benefits Summary

Alternative 1	Future Without Project		Future With Project		Benefits	
Category:	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**
Vessel damages	$4,613,000	$192,000	$2,091,000	$87,000	$2,522,000	$105,000
Vessel delays	$33,482,000	$1,395,000	$16,431,000	$685,000	$17,051,000	$711,000
Subsistence	$83,590,000	$3,484,000	$94,534,000	$3,940,000	$10,943,000	$456,000
Travel Cost	$14,129,000	$589,000	$0	$0	$14,129,000	$589,000
Infrastructure Damage	$19,009,000	$792,000	$13,511,000	$563,000	$5,499,000	$229,000
Recreation UDV	$50,076,000	$2,087,000	$56,717,000	$2,364,000	$6,641,000	$277,000
Recreation OCT	$32,000	$1,000	$1,000	$0	$31,000	$1,000
Total	**$204,931,000**	**$8,540,000**	**$183,285,000**	**$7,639,000**	**$56,816,000**	**$2,368,000**

Table B-124. Alternative 2 Benefits Summary

Alternative 2	Future Without Project		Future With Project		Benefits	
Category:	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**
Vessel damages	$4,613,000	$192,000	$1,585,000	$66,000	$3,028,000	$126,000
Vessel delays	$33,482,000	$1,395,000	$14,398,000	$600,000	$19,084,000	$795,000
Subsistence	$83,590,000	$3,484,000	$96,653,000	$4,028,000	$13,062,000	$544,000
Travel Cost	$14,129,000	$589,000	$0	$0	$14,129,000	$589,000
Infrastructure Damage	$19,009,000	$792,000	$13,511,000	$563,000	$5,499,000	$229,000
Recreation UDV	$50,076,000	$2,087,000	$56,717,000	$2,364,000	$6,641,000	$277,000
Recreation OCT	$32,000	$1,000	$1,000	$0	$31,000	$1,000
Total	**$204,931,000**	**$8,540,000**	**$182,865,000**	**$7,621,000**	**$61,474,000**	**$2,561,000**

Table B-125. Alternative 2a Benefits Summary

Alternative 2a	Future Without Project		Future With Project		Benefits	
Category:	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**
Vessel damages	$4,613,000	$192,000	$1,585,000	$66,000	$3,028,000	$126,000
Vessel delays	$33,482,000	$1,395,000	$14,398,000	$600,000	$19,084,000	$795,000
Subsistence	$83,590,000	$3,484,000	$96,653,000	$4,028,000	$13,062,000	$544,000
Travel Cost	$14,129,000	$589,000	$0	$0	$14,129,000	$589,000
Infrastructure Damage	$19,009,000	$792,000	$13,511,000	$563,000	$5,499,000	$229,000
Recreation UDV	$50,076,000	$2,087,000	$56,717,000	$2,364,000	$6,641,000	$277,000
Recreation OCT	$32,000	$1,000	$1,000	$0	$31,000	$1,000
Total	**$204,931,000**	**$8,540,000**	**$182,865,000**	**$7,621,000**	**$61,474,000**	**$2,561,000**

Table B-126. Alternative 2b Benefits Summary

Alternative 2b	Future Without Project		Future With Project		Benefits	
Category:	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**
Vessel damages	$4,613,000	$192,000	$1,585,000	$66,000	$3,028,000	$126,000
Vessel delays	$33,482,000	$1,395,000	$14,398,000	$600,000	$19,084,000	$795,000
Subsistence	$83,590,000	$3,484,000	$96,653,000	$4,028,000	$13,062,000	$544,000
Travel Cost	$14,129,000	$589,000	$0	$0	$14,129,000	$589,000
Infrastructure Damage	$19,009,000	$792,000	$13,511,000	$563,000	$5,499,000	$229,000
Recreation UDV	$50,076,000	$2,087,000	$56,717,000	$2,364,000	$6,641,000	$277,000
Recreation OCT	$32,000	$1,000	$1,000	$0	$31,000	$1,000
Total	**$204,931,000**	**$8,540,000**	**$182,865,000**	**$7,621,000**	**$61,474,000**	**$2,561,000**

Table B-127. Alternative 3 Benefits Summary

Alternative 3	Future Without Project		Future With Project		Benefits	
Category:	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**
Vessel damages	$4,613,000	$192,000	$102,000	$4,000	$4,511,000	$188,000
Vessel delays	$33,482,000	$1,395,000	$8,434,000	$352,000	$25,048,000	$1,044,000
Subsistence	$83,590,000	$3,484,000	$96,653,000	$4,028,000	$13,062,000	$544,000
Travel Cost	$14,129,000	$589,000	$0	$0	$14,129,000	$589,000
Infrastructure Damage	$19,009,000	$792,000	$13,511,000	$563,000	$5,499,000	$229,000
Recreation UDV	$50,076,000	$2,087,000	$56,717,000	$2,364,000	$6,641,000	$277,000
Recreation OCT	$32,000	$1,000	$1,000	$0	$31,000	$1,000
Total	**$204,931,000**	**$8,540,000**	**$175,418,000**	**$7,311,000**	**$68,921,000**	**$2,872,000**

Table B-128. Alternative 4 Benefits Summary

Alternative 4	Future Without Project		Future With Project		Benefits	
Category:	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**	**NPV**	**Avg Annual**
Vessel damages	$4,613,000	$192,000	$102,000	$4,000	$4,511,000	$188,000
Vessel delays	$33,482,000	$1,395,000	$8,434,000	$352,000	$25,048,000	$1,044,000
Subsistence	$83,590,000	$3,484,000	$96,653,000	$4,028,000	$13,062,000	$544,000
Travel Cost	$14,129,000	$589,000	$0	$0	$14,129,000	$589,000
Infrastructure Damage	$19,009,000	$792,000	$13,511,000	$563,000	$5,499,000	$229,000
Recreation UDV	$50,076,000	$2,087,000	$56,717,000	$2,364,000	$6,641,000	$277,000
Recreation OCT	$32,000	$1,000	$1,000	$0	$31,000	$1,000
Total	**$204,931,000**	**$8,540,000**	**$175,418,000**	**$7,311,000**	**$68,921,000**	**$2,872,000**

IX. SUMMARY OF BENEFITS AND COSTS

The summary of total present value of future without project costs, with project costs, benefits, residual damages, and the average annual estimated benefits for the project is summarized in Table B-129.

Table B-129. Summary of Benefits by alternative

Alternative Number	Total Present Value Future Without Project Costs	Total Present Value Future With Project Costs	Total Present Value Benefits	Residual Damages	Average Annual Benefits
1	$204,931,000	$183,285,000	$56,816,000	$148,115,000	$2,368,000
2	$204,931,000	$182,865,000	$61,474,000	$143,457,000	$2,561,000
2a	$204,931,000	$182,865,000	$61,474,000	$143,457,000	$2,561,000
2b	$204,931,000	$182,865,000	$61,474,000	$143,457,000	$2,561,000
3	$204,931,000	$175,418,000	$68,921,000	$136,010,000	$2,872,000
4	$204,931,000	$175,418,000	$68,921,000	$136,010,000	$2,872,000

Table B-130 summarizes project first costs, interest during construction, operations, maintenance and repair along with the present value of costs and the average annual equivalents.

Table B-130. Summary of Costs by alternative

Alternative	First Cost[1]	Interest During Construction[2]	PV OMRR&R[3]	Total PV Project Costs	Average Annual Cost
1	$32,822,000	$1,113,000	$1,444,000	$35,379,000	$1,474,000
2*	$30,804,000	$1,045,000	$1,762,000	$33,612,000	$1,401,000
2a	$41,118,000	$1,395,000	$2,280,000	$44,792,000	$1,867,000
2b	$35,270,000	$1,196,000	$1,447,000	$37,913,000	$1,580,000
3*	$50,121,000	$1,701,000	$2,441,000	$54,263,000	$2,262,000
4*	$56,141,000	$1,905,000	$3,625,000	$61,672,000	$2,570,000

Notes to table:

1. First costs estimates as of April 29, 2014.
2. Interest During Construction assumes 2-year construction window.
3. Operations, Maintenance, Repair, Rehabilitation and Replacement assumes 5% of armor rock every 25 years, anode replacement every 15 years, and float replacement every 40 years.

The economic benefits for each plan are the future without project costs minus the future with project costs. The National Economic Development (NED) plan is defined as the plan which maximizes the net annual benefits. The benefit to cost ratio is the average annual benefits divided by the average annual construction costs. Table B-131 summarizes the benefits and costs for each alternative. The NED plan is highlighted in yellow.

Table B-131. Summary of Benefits and Costs, by alternative

Alternative Number	Present Value Benefits	Average Annual Benefits	Present Value Costs	Average Annual Costs	Benefit to Cost Ratio	Net Annual NED Benefits	Rank by Net NED benefits
1	$56,816,000	$2,368,000	$35,379,000	$1,474,000	1.61	$894,000	2
2	$61,474,000	$2,561,000	$33,612,000	$1,401,000			
2a	$61,474,000	$2,561,000	$44,792,000	$1,867,000	1.37	$694,000	3
2b	$61,474,000	$2,561,000	$37,913,000	$1,580,000	1.62	$981,000	1
3	$68,921,000	$2,872,000	$54,263,000	$2,262,000	1.27	$610,000	4
4	$68,921,000	$2,872,000	$61,672,000	$2,570,000	1.12	$302,000	5

Note: Alternative 2 has been eliminated from consideration due to concerns regarding swell. Alternatives 3 and 4 as presented here have also been eliminated from consideration due to swell and local concerns regarding the basin size interfering with float plane operations. Alternatives 3 and 4 were retained for economic analysis to show that a smaller basin size is incrementally justified and represents the NED plan.

Evaluation of benefits and costs for the given alternatives reveal that Alternative 2b has the greatest net annual NED benefits. The benefit-cost ratio associated with Alternative 2b is 1.62 with net annual NED benefits of $981,000.

X. SENSITIVITY ANALYSIS

(To be completed during future editions of this report)

-Test of the sensitivity of major benefit categories and total benefits along with major cost categories and total cost – to be completed for final economics appendix

XI. REGIONAL ECONOMY

(To be completed during future editions of this report)

Brief description of regional benefits to the Craig area

-Focus on income and employment changes in the region

XII. **OTHER SOCIAL EFFECTS**

(To be completed during future editions of this report)

The categories of effects in the Other Social Effects (OSE) account include: urban and community effects; life, health, and safety factors; displacement; long-term productivity; and energy requirements and energy conservation. OSE can be either beneficial or adverse (positive/negative) depending on the standard being measured. Potential social effects from navigation improvements at Craig include…

XIII. **FOUR ACCOUNTS SUMMARY**

(To be completed during future editions of this report)

Summary table showing NED, EQ, RED, OSE

XIV. ATTACHMENT – CRAIG SMALL BOAT HARBOR SURVEY INSTRUMENT AND SURVEY RESULTS ANALYSIS

Appendix E

Geotechnical Evaluation

Appendix F

Cost Engineering

US Army Corps of Engineers ® Pacific Ocean Division	**COST ENGINEERING REPORT** **APPENDIX**	**Alaska District**

NAVIGATIONAL IMPROVEMENTS

CRAIG, ALASKA

Cost Engineering Division
Alaska District
U.S. Army Corps of Engineers

NAVIGATION IMPROVEMENTS

CRAIG, ALASKA

Cost Narrative

Project Description:

The purpose of this project is to evaluate the feasibility of constructing a small boat harbor for the port of Craig. The estimate is based on concept designs that have rubble mound breakwater configurations and a natural harbor. The breakwaters will provide protection from the prevailing southwesterly waves. Dredging of the basin is not required. Alternatives 2, 3 and 4 were rejected are not being estimated as there are technical issues that make these alternatives undesirable. The alternatives being considered are 2a, 2b and 1. Alternatives 2a & 2b share the same basin size at 10.1 acres while alternative 1 has a smaller basin area of 8.5 acres.

Alternative 2a would have two breakwaters. The land-attached breakwater would be placed on the west side and is 956 feet long with a north-south alignment. The second breakwater would be on the north side and is 957 feet long with an east-west alignment.

Alternative 2b will have a small land-attached stub breakwater on the west side which would be 318 feet long with a small fish pass (at least 3' wide available 95% of the time). The larger main breakwater would be a dog leg with a small overlap to prevent swell within the harbor. The breakwater would be 1606 feet long.

Alternative 1 is similar to the breakwaters in alternative 2b with the dog leg breakwater measuring in at only 1462 feet long.

There is approximately 3,000 square feet of old dock and piers, 7,650 VLF of pilings and other miscellaneous debris to be removed from the job site. The assumption for the purposes of the cost estimate is for the debris to be disposed of at the local landfill which is approximately 3 miles from the job site.

Development of Costs and the Estimate:

Design Documents: The designs used for this estimate were provided by POA Hydraulics and Hydrology Section, and summarized in the rest of the report. They were concept level in nature and included a plan and section drawing. H&H provided the quantities for each material type and these were used for the current working estimates. Similar projects within POA were referred to for typical general condition requirements (contractor oversight, permits, plans).

Cost Estimate: All of the alternatives were initially developed using excel using historical pricing from similar projects.

The current working cost estimate for Alt 2b was developed using MCACES 2nd Generation estimating software. All estimates were done in accordance with guidance contained in ER 1110-2-1302, Civil Works Cost Engineering. The Mii estimate was prepared using MII version 4.2, the 2012-b English Cost Library, 2014 Davis Bacon South 63rd wages from General Decision AK140001 AK1 Construction Type Labor Library dated 04/25/2014The equipment library used if the Mii Equipment 2014 Region 09.

Labor and Equipment Productivity: The assumed work schedule would be 6 days a week, 12 hours a day. The estimate assumes overtime hours and has been implemented in the MCACES estimate to account for additional labor and equipment adjustments. The estimate assumes an overall production index of 100% as the location is in a temperate climate zone, the methodology of the construction is well understood by marine contractors, is not extremely complex, and there will be few if any anticipated weather or other types of delays. Vessel traffic thru the site or others using the docks should have little impact on the construction.

The estimate has been updated with the following fuel prices with an average for the area from the *Alaska Fuel Price Report: Current Community Conditions, January 2014*: $4.15/gal for off-road diesel, $4.75/gal for on-road diesel, and $4.25/gal for gasoline. Marine diesel fuel in Ketchikan was $3.70/Gal in July 2014.

Escalation has been estimated to a mid-point construction of July 2017 using EM 1110-2-1304, March 2014.

Contingency: Contingency was developed in the abbreviated risk register. H&H and Geotechnical departments were involved with the impacts discussion. The highest factors in the risk register were based upon the demolition work. The dock and pilings are known factors but other possible debris quantity was noted during the site visit and may have unknown impacts. There may also be archeological impacts that are not known. Eel grass in the area has been studied and the impacts are considered negligible. There is also a slight risk of migratory whales in area but this would be an uncommon occurrence in the area.

The breakwater construction is a moderate/high risk. The assumption is rock is readily available in close proximity of the proposed construction site. However, if there was a need to bring in rock from another source, this would have significant cost impacts. There is a good indication that the quarry at Klawock should be able to meet specs for the project as they have met specs for the local DOT.

Contractor Markups: JOOH and HOOH were assumed at 8% for JOOH, 4% for HOOH and prime profit is based upon the Profit Weighted Guidelines which came up with 8.05% profit.

Assumptions and Factors impacting the Cost Estimates:

Mob/demob is assumed out of Anchorage, AK which is approximately 970 miles from Craig. Equipment may be found locally but may not be readily available during the construction phase of the project.

A site visit was conducted in April 2014. Several quarries were observed in various conditions for potential to provide rock to the project within a 10 mile radius including an island that is approximately 4 miles from the proposed site. See the table below for additional information.

	Viable	Rock Available			Distance	Delivery Method	Active
		Core Rock	B Rock	A Rock			
Shaan Seet Quarries							
Lower 62 Pit	Yes	Yes	Yes	Yes	3 Miles	Barge	Yes
Upper 62 Pit	No	N/A	N/A	N/A	N/A	N/A	N/A
4.5 Mile	Yes	Yes	No	No	4.5 Miles	Land/Barge	Unknown*
5 Mile	Unknown**	N/A	N/A	N/A	N/A	N/A	N/A
Wolf Lake	No	N/A	N/A	N/A	9 Miles	N/A	N/A
St. Johns quarry	Yes	Yes	Yes	Yes	4 Miles	Barge	No
Southeast Road Builders							
Klawock	Yes	Yes	Yes	Yes	7 Miles	Land	Yes
Black Rock quarry	Yes	Yes	Yes	No	8 Miles	Land	Yes

*No equipment on site

**Unable to do a visual inspection

The estimate assumes that Klawock quarry will be used. Klawock's quarry appears to have enough rock and equipment to provide all three types of rock for the rubble-mound breakers. It is an active quarry mining rock providing sand and gravel to the community along with a busy asphalt division. It is located about seven miles from the job site. Rock would be transported by trucks to a staging area at the job site.

The estimate has been updated with historically quoted material prices, production rates and equipment costs.

Construction of the breakwater is assumed to be built from the land out, building a road for the equipment to place the rock for the breakwater similar to the breakwater built in Nome Alaska. There is also an equipment working barge included in the estimate as some work (especially around the toe area) including placing rock might be best accomplished from an in-water platform.

The majority of the preliminary design associated with this project is the rock for the breakwater construction. There is space within 500 hundred feet of the construction site for stockpiling. Rock can be trucked in and placed in the open areas between the existing buildings while construction takes place. Include all costs for handling and re-handling stockpiled/stored materials

Description	Quantity	UOM	ContractCost	Contingency	SIOH	ProjectCost
Project Cost Summary Report			**26,738,637**	**0**	**0**	**26,738,637**
Mobilization-Demobilization	**1.00**	**EA**	*901,402.21* **901,402**	**0**	**0**	*901,402.21* **901,402**
Shutdown and Closeout Work	**1.00**	**EA**	*21,551.56* **21,552**	**0**	**0**	*21,551.56* **21,552**
Preliminary and Startup Work	**1.00**	**EA**	*62,703.83* **62,704**	**0**	**0**	*62,703.83* **62,704**
Personnel Mob/Demob	**10.00**	**EA**	*1,854.77* **18,548**	**0**	**0**	*1,854.77* **18,548**
Road Mob/Demob	**1.00**	**EA**	*1,711.35* **1,711**	**0**	**0**	*1,711.35* **1,711**
Barge Mobilization & Demobilization	**1.00**	**EA**	*796,887.80* **796,888**	**0**	**0**	*796,887.80* **796,888**
Surveys	**1.00**	**EA**	*181,020.29* **181,020**	**0**	**0**	*181,020.29* **181,020**
Hydrographic surveys	**2.00**	**EA**	*90,510.14* **181,020**	**0**	**0**	*90,510.14* **181,020**
Demolition	**1.00**	**EA**	*302,181.97* **302,182**	**0**	**0**	*302,181.97* **302,182**
Demo of existing facilities and drydock	**1.00**	**LS**	**302,182**	**0**	**0**	**302,182**
Breakwater Construction	**1.00**	**EA**	*18,586,887.66* **18,586,888**	**0**	**0**	*18,586,887.66* **18,586,888**
CONSTRUCT BREAKWATER	**2,025.00**	**LF**	*9,169.66* **18,568,572**	**0**	**0**	*9,169.66* **18,568,572**
Navigation Markers	**3.00**	**EA**	*6,105.37* **18,316**	**0**	**0**	*6,105.37* **18,316**
Inner Harbor Development	**1.00**	**EA**	*6,767,144.76* **6,767,145**	**0**	**0**	*6,767,144.76* **6,767,145**
Piles, Caps & Anodes	**1.00**	**EA**	*2,454,531.90* **2,454,532**	**0**	**0**	*2,454,531.90* **2,454,532**
Mooring Floats/Gangways	**1.00**	**EA**	*4,312,612.86* **4,312,613**	**0**	**0**	*4,312,612.86* **4,312,613**

**** TOTAL PROJECT COST SUMMARY ****

PROJECT: CRAIG NAVIGATION IMPROVEMENTS Alt 2b, TSP
PROJECT NO: P2 102831
LOCATION: Craig, Alaska

DISTRICT: POA Alaska District PREPARED: 12/5/2014
POC: CHIEF, COST ENGINEERING, K. Harvey

This Estimate reflects the scope and schedule in report; Craig Harbor Integrated Feasibility Report and EA

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 7-Jul-1905; Effective Price Level Date: 1 OCT 14				Spent Thru: 10/1/2013					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	**TOTAL ($K)**	($K)	**FIRST COST ($K)**	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*				*M*	*N*	*O*
10	BREAKWATER & SEAWALLS	$901	$156	17%	$1,057	0.0%	$901	$156	$1,057	$0	$1,057	4.9%	$946	$164	$1,109
10	BREAKWATER & SEAWALLS	$302	$86	28%	$388	0.0%	$302	$86	$388	$0	$388	4.9%	$317	$90	$407
10	BREAKWATER & SEAWALLS	$18,768	$4,604	25%	$23,372	0.0%	$18,768	$4,604	$23,372	$0	$23,372	4.9%	$19,690	$4,830	$24,520
12	NAVIGATION PORTS & HARBORS	$4,313	$481	11%	$4,793	0.0%	$4,313	$481	$4,793	$0	$4,793	4.9%	$4,525	$504	$5,029
12	NAVIGATION PORTS & HARBORS	$2,455	$323	13%	$2,778	0.0%	$2,455	$323	$2,778	$0	$2,778	4.9%	$2,575	$339	$2,914
12	NAVIGATION PORTS & HARBORS	$0	$0	-	$0	-	$0	$0	$0	$0	$0	-	$0	$0	$0
12	NAVIGATION PORTS & HARBORS	$0	$0	-	$0	-	$0	$0	$0	$0	$0	-	$0	$0	$0
12	NAVIGATION PORTS & HARBORS	$0	$0	-	$0	-	$0	$0	$0	$0	$0	-	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$26,739	$5,649		$32,388	0.0%	$26,739	$5,649	$32,388	$0	$32,388	4.9%	$28,052	$5,927	$33,979
01	LANDS AND DAMAGES	$23	$2	10%	$25	0.0%	$23	$2	$25	$0	$25	1.9%	$23	$2	$26
30	PLANNING, ENGINEERING & DESIGN	$4,008	$256	6%	$4,264	0.0%	$4,008	$256	$4,264	$0	$4,264	4.2%	$4,175	$267	$4,441
31	CONSTRUCTION MANAGEMENT	$2,139	$137	6%	$2,276	0.0%	$2,139	$137	$2,276	$0	$2,276	9.5%	$2,343	$150	$2,493
	PROJECT COST TOTALS:	$32,909	$6,045	18%	$38,954		$32,909	$6,045	**$38,954**	$0	**$38,954**	5.1%	$34,593	$6,346	$40,939

CHIEF, COST ENGINEERING, K. Harvey

PROJECT MANAGER, L. Cordova

CHIEF, REAL ESTATE, M. Coy

CHIEF, PLANNING,B. Sexauer

CHIEF, ENGINEERING, D. Frenier

CHIEF, OPERATIONS, A. Churchill

CHIEF, CONSTRUCTION, P. Coullahan

CHIEF, CONTRACTING, C. Tew

CHIEF, PM-PB, K. Farmer

CHIEF, DPM, M. Coburn

ESTIMATED FEDERAL COST:	**80%**	**$32,751**
ESTIMATED NON-FEDERAL COST:	**20%**	**$8,188**
ESTIMATED TOTAL PROJECT COST:		**$40,939**

**** TOTAL PROJECT COST SUMMARY ****

**** CONTRACT COST SUMMARY ****

PROJECT: CRAIG NAVIGATION IMPROVEMENTS Alt 2b, TSP
LOCATION: Craig, Alaska
This Estimate reflects the scope and schedule in report; Craig Harbor Integrated Feasibility Report and EA

DISTRICT: POA Alaska District
POC: CHIEF, COST ENGINEERING, K. Harvey
PREPARED: 12/5/2014

Civil Works Work Breakdown Structure		**ESTIMATED COST**				**PROJECT FIRST COST (Constant Dollar Basis)**				**TOTAL PROJECT COST (FULLY FUNDED)**				
		Estimate Prepared:			**15-Mar-14**	Program Year (Budget EC):			2015					
		Effective Price Level:			01-Oct-14	Effective Price Level Date:			1 OCT 14					
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	RISK BASED CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Mid-Point Date	ESC (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***	***J***	***P***	***L***	***M***	***N***	***O***
	Contract 1													
10	BREAKWATER & SEAWALLS	$901	$156	17%	$1,057	0.0%	$901	$156	$1,057	2017Q3	4.9%	$946	$164	$1,109
10	BREAKWATER & SEAWALLS	$302	$86	28%	$388	0.0%	$302	$86	$388	2017Q3	4.9%	$317	$90	$407
10	BREAKWATER & SEAWALLS	$18,768	$4,604	25%	$23,372	0.0%	$18,768	$4,604	$23,372	2017Q3	4.9%	$19,690	$4,830	$24,520
12	NAVIGATION PORTS & HARBORS	$4,313	$481	11%	$4,793	0.0%	$4,313	$481	$4,793	2017Q3	4.9%	$4,525	$504	$5,029
12	NAVIGATION PORTS & HARBORS	$2,455	$323	13%	$2,778	0.0%	$2,455	$323	$2,778	2017Q3	4.9%	$2,575	$339	$2,914
12	NAVIGATION PORTS & HARBORS	$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
12	NAVIGATION PORTS & HARBORS	$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
12	NAVIGATION PORTS & HARBORS	$0	$0	0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$26,739	$5,649	21%	**$32,388**		$26,739	$5,649	$32,388			$28,052	$5,927	$33,979
01	LANDS AND DAMAGES	$23	$2	10%	$25	0.0%	$23	$2	$25	2016Q1	1.9%	$23	$2	$26
30	PLANNING, ENGINEERING & DESIGN													
2.5%	Project Management	$668	$43	6%	$711	0.0%	$668	$43	$711	2015Q3	1.5%	$678	$43	$721
1.0%	Planning & Environmental Compliance	$267	$17	6%	$284	0.0%	$267	$17	$284	2015Q3	1.5%	$271	$17	$288
2.5%	Engineering & Design	$668	$43	6%	$711	0.0%	$668	$43	$711	2015Q3	1.5%	$678	$43	$721
1.0%	Reviews, ATRs, IEPRs, VE	$267	$17	6%	$284	0.0%	$267	$17	$284	2015Q3	1.5%	$271	$17	$288
1.0%	Life Cycle Updates (cost, schedule, risks)	$267	$17	6%	$284	0.0%	$267	$17	$284	2015Q3	1.5%	$271	$17	$288
1.0%	Contracting & Reprographics	$267	$17	6%	$284	0.0%	$267	$17	$284	2015Q3	1.5%	$271	$17	$288
3.0%	Engineering During Construction	$802	$51	6%	$853	0.0%	$802	$51	$853	2017Q3	9.5%	$878	$56	$935
2.0%	Planning During Construction	$535	$34	6%	$569	0.0%	$535	$34	$569	2017Q3	9.5%	$586	$37	$623
1.0%	Project Operations	$267	$17	6%	$284	0.0%	$267	$17	$284	2015Q3	1.5%	$271	$17	$288
31	CONSTRUCTION MANAGEMENT													
3.5%	Construction Management	$936	$60	6%	$996	0.0%	$936	$60	$996	2017Q3	9.5%	$1,025	$66	$1,091
2.0%	Project Operation:	$535	$34	6%	$569	0.0%	$535	$34	$569	2017Q3	9.5%	$586	$37	$623
2.5%	Project Management	$668	$43	6%	$711	0.0%	$668	$43	$711	2017Q3	9.5%	$732	$47	$778
	CONTRACT COST TOTALS:	$32,909	$6,045		$38,954		$32,909	$6,045	$38,954			$34,593	$6,346	$40,939

Abbreviated Risk Analysis

Project Name & Location: **Craig SBH, Alaska**
Project Development Stage/Alternative: **Feasibility (Alternatives)**
Risk Category: **Moderate Risk: Typical Project Construction Type**

District: **Alaska District**
Alternative: **Alt 2b, TSP**
Meeting Date: **8/15/2014**

Total Estimated Construction Contract Cost = **$26,738,702**

	CWWBS	Feature of Work	Contract Cost		% Contingency	$ Contingency	Total
	01 LANDS AND DAMAGES	Real Estate	$ 23,000		20.00%	$ 4,600	$ 27,600
1	10 BREAKWATERS AND SEAWALLS	Mob/Demob	$901,400		17.30%	$ 155,968	$ 1,057,368
2	10 BREAKWATERS AND SEAWALLS	Demolition	$302,170		28.47%	$ 86,036	$ 388,206
3	10 BREAKWATERS AND SEAWALLS	Breakwater	$18,767,927		24.53%	$ 4,603,510	$ 23,371,437
4	12 02 HARBORS	Mooring Floats & Gangways	$4,312,920		11.15%	$ 480,717	$ 4,793,637
5	12 02 HARBORS	Piles, Caps & Anodes	$2,454,285		13.17%	$ 323,131	$ 2,777,416
6					0.00%	$ -	$ -
7					0.00%	$ -	$ -
8			$ -		0.00%	$ -	$ -
9			$ -		0.00%	$ -	$ -
10			$ -		0.00%	$ -	$ -
11			$ -		0.00%	$ -	$ -
12	All Other (less than 10% of construction costs)	**Remaining Construction Items**	$ -	*0.0%*	0.00%	$ -	$ -
13	30 PLANNING, ENGINEERING, AND DESIGN	**Planning, Engineering, & Design**	$ 4,008,000		6.40%	$ 256,327	$ 4,264,327
14	31 CONSTRUCTION MANAGEMENT	**Construction Management**	$ 2,139,000		6.40%	$ 136,797	$ 2,275,797
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)					$ -	

Totals	Contract Cost	% Contingency	$ Contingency	Total
Real Estate	$ 23,000	20.00%	$ 4,600	$ 27,600.00
Total Construction Estimate	$ 26,738,702	21.13%	$ 5,649,363	$ 32,388,065
Total Planning, Engineering & Design	$ 4,008,000	6.40%	$ 256,327	$ 4,264,327
Total Construction Management	$ 2,139,000	6.40%	$ 136,797	$ 2,275,797
Total	**$ 32,908,702**	**18%**	**$ 6,047,087**	**$ 38,955,789**

	Base	50%	80%
Range Estimate ($000's)	$32,909k	$36,537k	$38,956k

* 50% based on base is at 50% CL.

Fixed Dollar Risk Add: (Allows for additional risk to be added to the risk analsyis. Must include justification. Does not allocate to Real Estate.	

CRAIG SBH

TASK DESCRIPTION	Alternative One						
	UNIT PRICE	UNIT MEAS.	NO. OF UNITS	EXTENDED COST		GNF	LS
MOB/DEMOB	$901,400.00	LS	1	$901,400		$901,400	
Hydro/Topo Surveys	$162,175.24	LS	1	$162,175		$162,175	
Demolition	$302,180.00	LS	1	$302,180		$302,180	
LOCAL SERVICE FACILITIES							
Upland Fill	$20.00	CY	6,782	$135,640			$135,640
Upland Slope Protection	$20.00	CY	1,600	$32,000			$32,000
Aggregate Base Course	$25.00	CY	600	$15,000			$15,000
NORTH/WEST BREAKWATER							
A ROCK	$149.94	CY	31,400	$4,708,116		$4,708,116	
B ROCK	$67.59	CY	37,600	$2,541,384		$2,541,384	
C ROCK	$53.68	CY	181,000	$9,716,080		$9,716,080	
NAVIGATION AIDS							
MARKER SIGNS	$6,105.00	EA	3	$18,315		$18,315	
HARBOR							
PEDESTRIAN GANGWAY	$19,875.00	EA	1	$19,875			$19,875
MOORING FLOATS	$120.00	SF	35,776	$4,293,120			$4,293,120
PILES	$308.33	VLF	7,490	$2,309,392			$2,309,392
PILE CAPS	$95.00	EA	107	$10,165			$10,165
ANODE COUNT							
PILES	$645.80	EA	204	$131,743			$131,743
Current Contract Cost				**$25,296,585**		**$18,349,650**	**$6,946,935**
Contingency-Risk based	21.13%			$5,344,672		$3,876,921	$1,467,751
SIOH				$2,153,211		$1,561,897	$591,314
PED				$4,034,627		$2,926,640	$1,107,987
Real Estate				$27,600	0	$9,600	$18,000
Current Project Cost				$36,856,695		$26,724,708	$10,131,987
Escalation - assume FY17	4.91%			$1,810,944		$1,313,111	$497,832
TOTAL PROJECT COST				**$38,667,639**		**$28,037,820**	**$10,629,819**
						72.5%	27.5%
							$38,668,000.00

TASK DESCRIPTION	Alternative Alt 2a						
	UNIT PRICE	UNIT MEAS.	NO. OF UNITS	EXTENDED COST		GNF	LS
MOB/DEMOB	$901,400.00	LS	1	$901,400		$901,400	
Hydro/Topo Surveys	$195,972.56	LS	1	$195,973		$195,973	
Demolition	$302,180.00	LS	1	$302,180		$302,180	
LOCAL SERVICE FACILITIES							
Upland Fill	$20.00	CY	6,782	$135,640			$135,640
Upland Slope Protection	$20.00	CY	1,600	$32,000			$32,000
Aggregate Base Course	$25.00	CY	600	$15,000			$15,000
WEST BREAKWATER							
A ROCK	$149.94	CY	14,000	$2,099,160		$2,099,160	
B ROCK	$67.59	CY	11,800	$797,562		$797,562	
C ROCK	$53.68	CY	44,000	$2,361,920		$2,361,920	
NORTH BREAKWATER							
A ROCK	$149.94	CY	21,000	$3,148,740		$3,148,740	
B ROCK	$67.59	CY	35,300	$2,385,927		$2,385,927	
C ROCK	$53.68	CY	176,000	$9,447,680		$9,447,680	
NAVIGATION AIDS							
MARKER SIGNS	$6,105.00	EA	3	$18,315		$18,315	
HARBOR							
PEDESTRIAN GANGWAY	$19,875.00	EA	1	$19,875			$19,875
MOORING FLOATS	$120.00	SF	61,524	$7,382,880			$7,382,880
PILES	$308.33	VLF	7,490	$2,309,392			$2,309,392
PILE CAPS	$95.00	EA	107	$10,165			$10,165
ANODE COUNT							
PILES	$645.80	EA	204	$131,743			$131,743
Current Contract Cost				**$31,695,551**		**$21,658,857**	**$10,036,695**
Contingency-Risk based	21.13%			$6,696,648		$4,576,091	$2,120,557
SIOH				$2,697,882		$1,843,572	$854,310
PED				$5,055,217		$3,454,435	$1,600,782
Real Estate				$27,600	0	$9,600	$18,000
Current Project Cost				$46,172,899		$31,542,555	$14,630,343
Escalation - assume FY17	4.91%			$2,268,693		$1,549,835	$718,858
TOTAL PROJECT COST				**$48,441,592**		**$33,092,390**	**$15,349,201**
						68.3%	31.7%
							$48,442,000.00

Appendix G

Real Estate

US Army Corps of Engineers® Pacific Ocean Division	REAL ESTATE PLAN APPENDIX G	Alaska District

NAVIGATIONAL IMPROVEMENTS

CRAIG, ALASKA

Real Estate Division
Alaska District
U.S. Army Corps of Engineers

TABLE OF CONTENTS

NAVIGATION IMPROVEMENTS

CRAIG, ALASKA

REAL ESTATE PLAN

PURPOSE:

This Real Estate Plan (REP) will be consolidated into the decision document Feasibility Report for Navigation Improvements for Craig, Alaska. The purpose of the feasibility study is to evaluate potential navigation improvements. The REP identifies and describes the real estate requirements for the lands, easements, rights-of-way, relocations and disposal areas (LERRD) that will be required.

PROJECT TYPE AND APPLICABILITY:

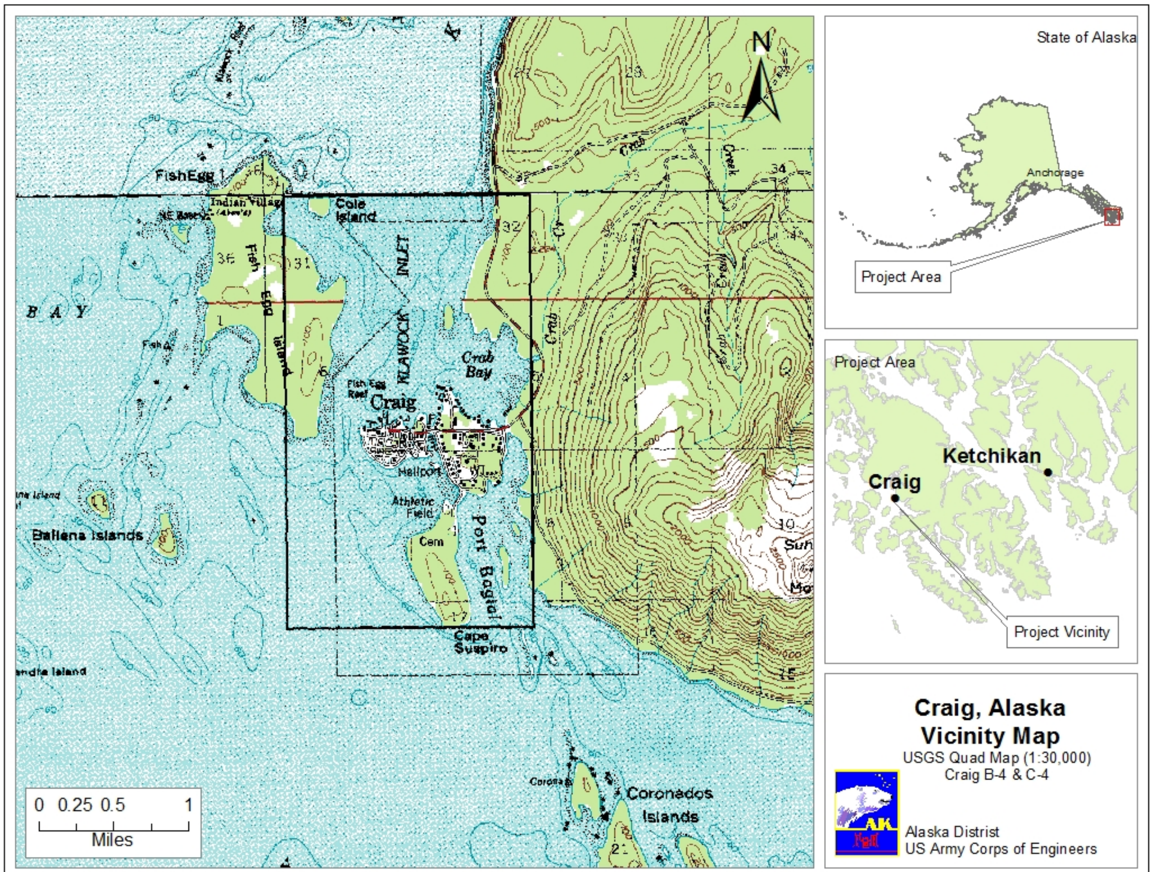
This feasibility study is being conducted under authority granted by a resolution adopted on December 2, 1970, by the Committee on Public Works of the U.S. House of Representatives. The resolution states:

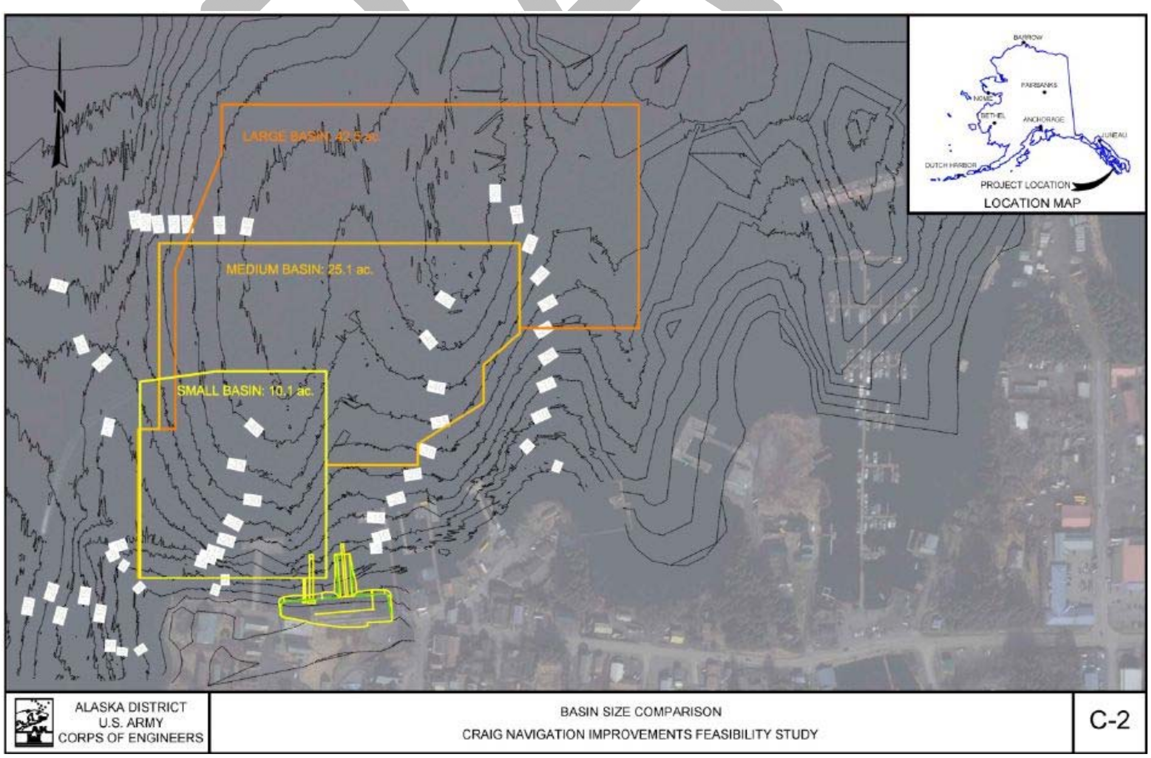
> *"Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Rivers and Harbors in Alaska, published as House Document Numbered 414, 83rd Congress, 2nd Session; and other pertinent reports, with a view to determine whether any modifications of the recommendations contained therein are advisable at the present time."*

Nonfederal Sponsor for the project is the City of Craig.

PROJECT SCOPE AND CONTENT:

The Navigation Improvement Project, Craig, Alaska involves the development of increased moorage capacity at Craig, Alaska. The City of Craig's moorage capacity is 215 slips at the North and South Cove boat basins plus an additional 12 slips at the city dock. Moorage is currently provided for excess vessels by rafting boats 5 to 10 deep, resulting in overcrowding and unsafe and inefficient operating conditions. The City of Craig has a wait list of approximately 82 vessels waiting for permanent moorage. Once the Wards Cove location was selected, three alternatives were developed for the site including three different sized basin harbors, small at 10+ acres, medium at 25+ acres and large at 42+ acres. The first design for Alternative 2 was eliminate and Alternatives 2a and 2b were developed. Alternative 2 was redesigned to incorporate a fish passage and Alternative 1 was added with a mooring basin of 7.5 acres. Alternative 2b is the preferred configuration for the tentative selected plan (TSP).


State of Alaska
Anchorage
Project Area
Ketchikan
Craig
Project Vicinity
Craig, Alaska
Vicinity Map
USGS Quad Map (1:30,000)
Craig B-4 & C-4
Alaska District
US Army Corps of Engineers
0 0.25 0.5 1
Miles
Fish Egg I
Cole Island
KLAWOCK INLET
Crab Bay
Craig
Heliport
Athletic Field
Cem
Port Bagial
Cape Suspiro
Ballena Islands
Coronados Islands
B A Y

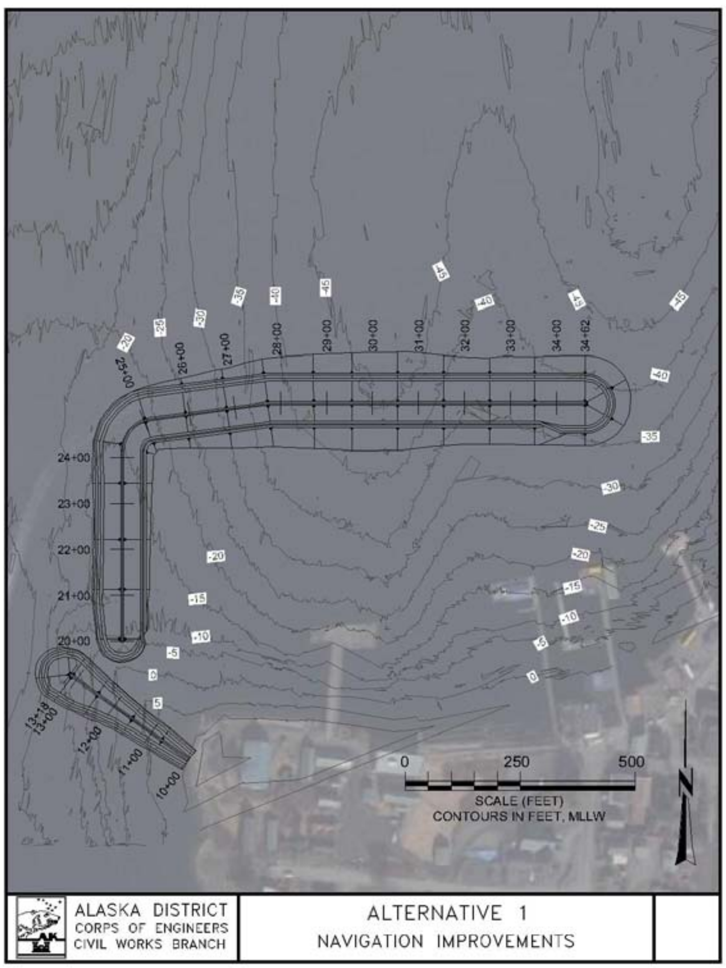

LARGE BASIN: 42.5 ac.
MEDIUM BASIN: 25.1 ac.
SMALL BASIN: 10.1 ac.
PROJECT LOCATION
LOCATION MAP
ALASKA DISTRICT
U.S. ARMY
CORPS OF ENGINEERS
BASIN SIZE COMPARISON
CRAIG NAVIGATION IMPROVEMENTS FEASIBILITY STUDY
C-2

Alternative 1: Small Basin with No Western Entrance Channel:

This alternative would consist of a mooring basin approximately 7.5 acres in size and would be able to accommodate 105 vessels if configured as shown in **Error! Reference source not found.** . Fish passage was incorporated into the design similar what is shown in Alternative 2b. This alternative is estimated to have a total project cost of $33.5 million.

Table 1. Alternative 1 Configuration

Berth Length	Number of Berths
20	12
28	20
36	30
46	18
60	24
75	0
120	1



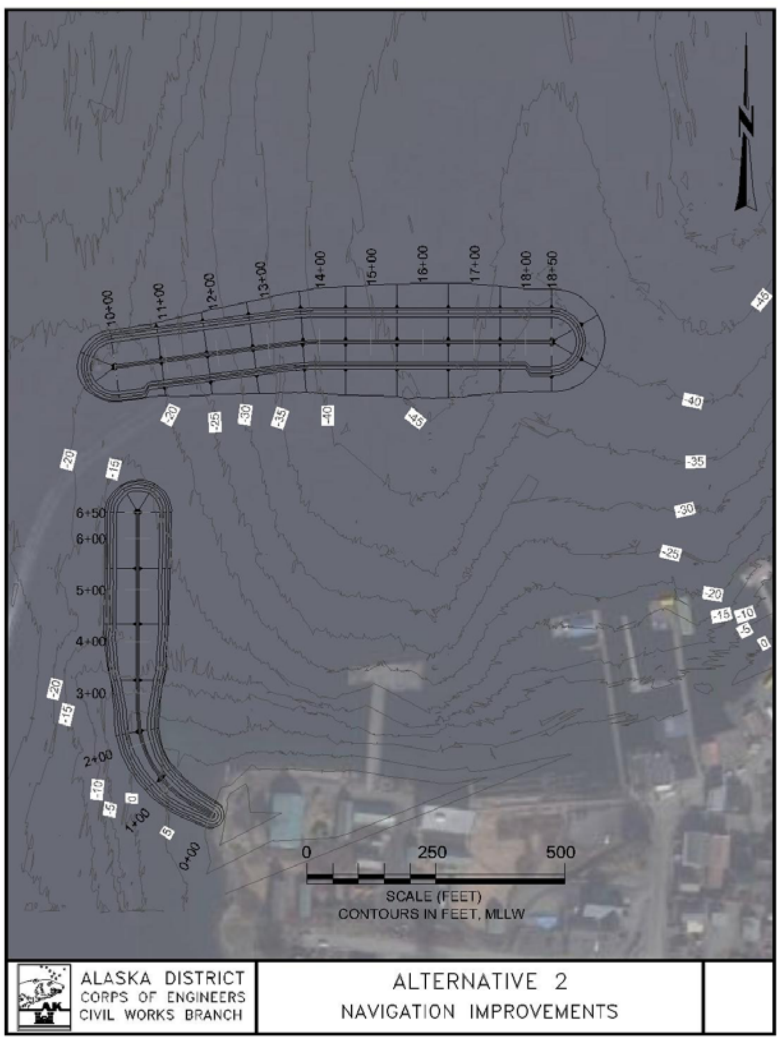
Alternative 1

Alternative 2: Small Basin:

This alternative would consist of a 10.1-acre basin protected by a 650-foot long western breakwater in a north-south alignment and an 850-foot long northern breakwater in an east-west alignment. This basin would be able to accommodate 145 vessels if configured as shown in Table 2. This alternative is estimated to have an initial project cost of $30.8 million.

Table 2. Alternative 2 Configuration

Berth Length	Number of Berths
20	12
28	28
36	38
46	30
60	36
75	0
120	1

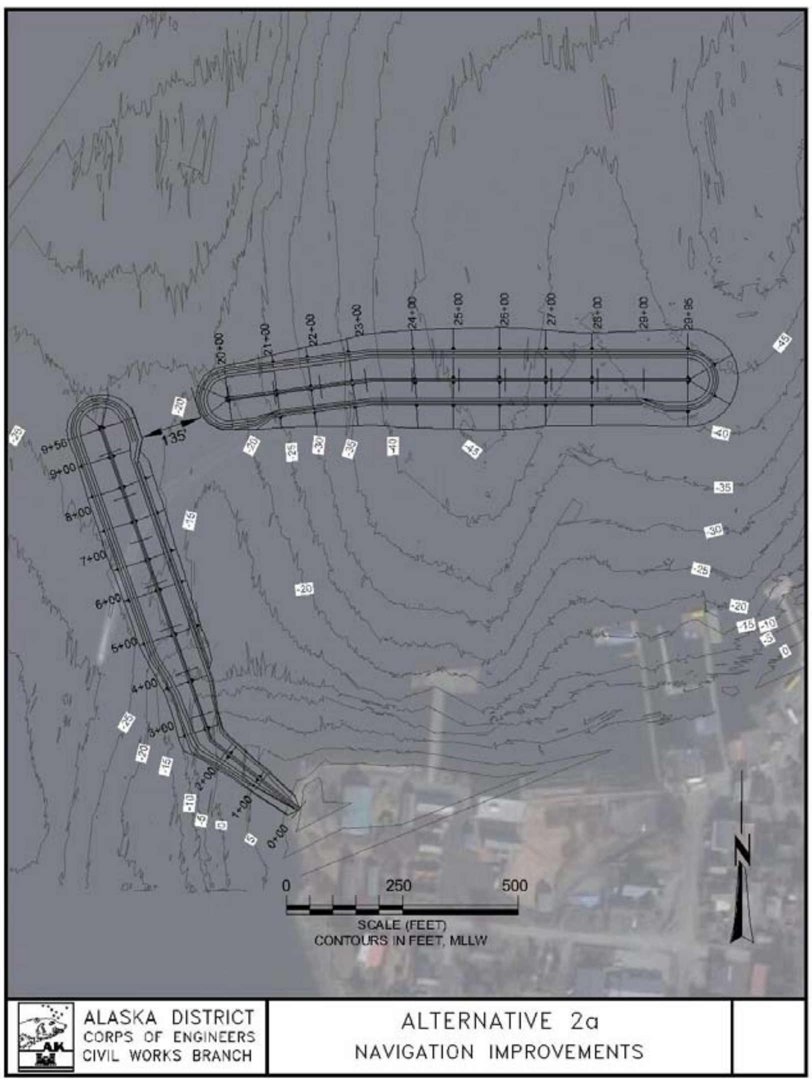


Alternative 2

Alternative 2a: Small Basin with Modified Western Entrance Channel:
This alternative would consist of a 10.1-acre basin protected by a 960-foot long western breakwater in a north-south alignment and a 960-foot long northern breakwater in an east-west alignment. This basin would be able to accommodate 145 vessels if configured as shown in Table 3. This alternative is estimated to have a total project cost of $38.7 million.

Table 3. Alternative 2a Configuration

Berth Length	Number of Berths
20	12
28	28
36	38
46	30
60	36
75	0
120	1



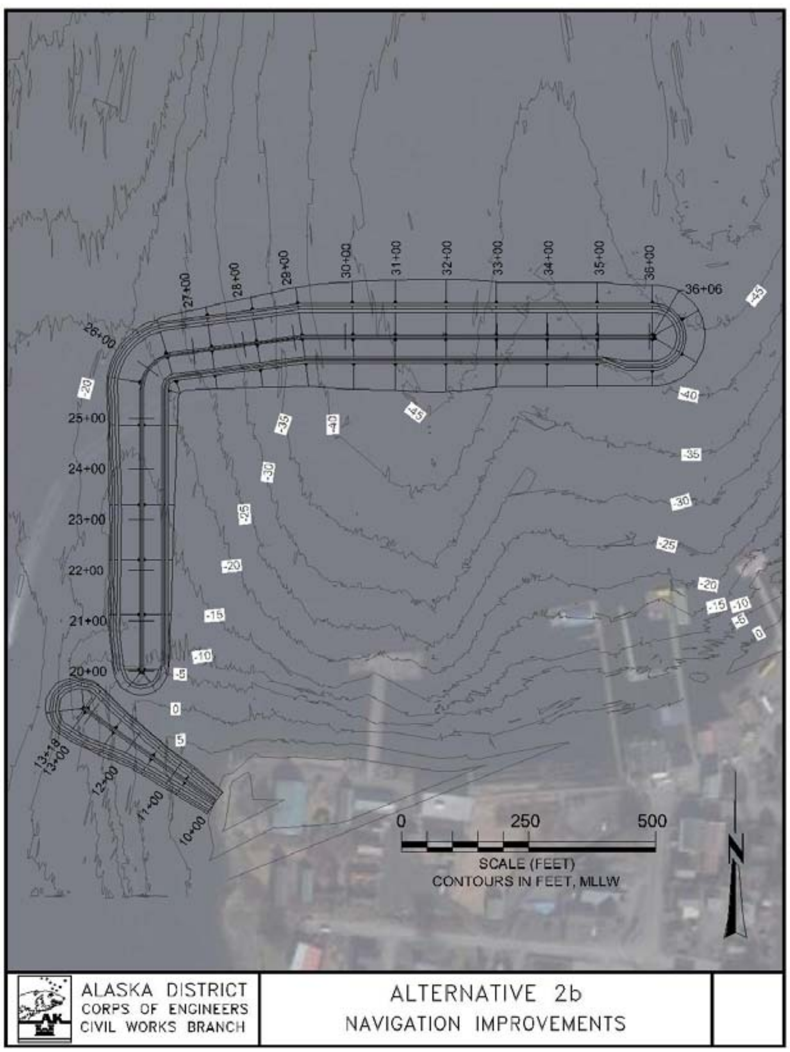
Alternative 2a

Alternative 2b: Small Basin with No Western Entrance Channel:

This alternative would consist of a 10.1-acre basin protected by a 1,933-foot breakwater in an "L-shape". This design mostly eliminates the western opening completely except for an overlapping gap in the western alignment to provide for fish passage. This basin would be able to accommodate 145 vessels if configured as shown in Table 4. This alternative is estimated to have a total project cost of $36.4 million.

Table 4. Alternative 2b Configuration

Berth Length	Number of Berths
20	12
28	28
36	38
46	30
60	36
75	0
120	1



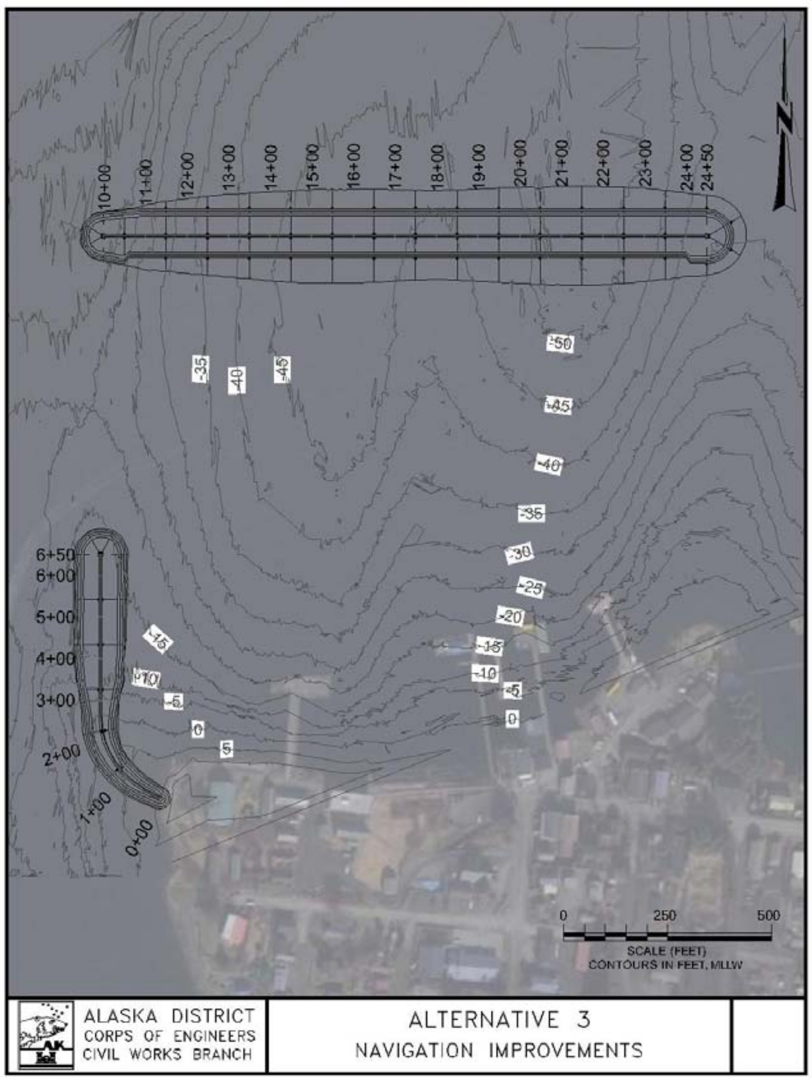
Alternative 2b

Alternative 3: Medium Basin:

This alternative would consist of a 25.1-acre basin protected by a 650-foot long western breakwater in a north-south alignment and a 1,450-foot long northern breakwater in an east-west alignment. This basin would be able to accommodate 303 vessels if configured as shown in Table 5. This alternative is estimated to have a total project cost of $50.1 million

Table 5. Alternative 3 Configuration

Berth Length	Number of Berths
20	8
28	0
36	72
46	73
60	142
75	7
120	1



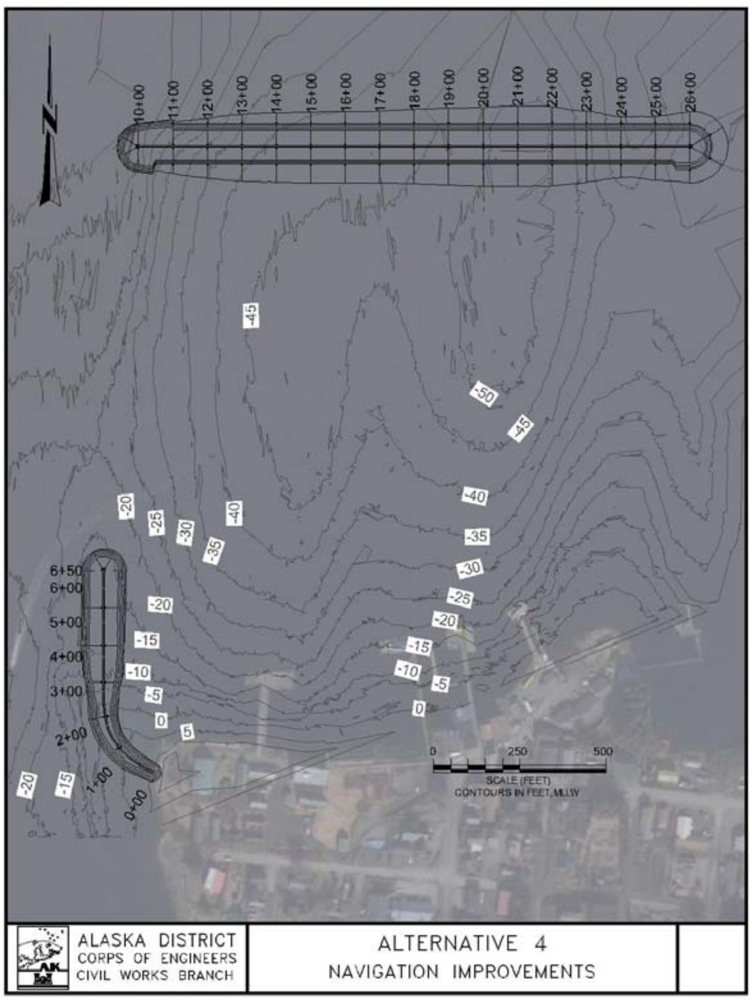
Alternative 3

Alternative 4: Large Basin:

This alternative would consist of a 42.5-acre basin protected by a 650-foot long western breakwater in a north-south alignment and a 1,600-foot long northern breakwater in an east-west alignment. This basin would be able to accommodate 530 vessels if configured as shown in Table 6. This alternative is estimated to have a total project cost of $56.1 million.

Table 6. Alternative 4 Configuration

Berth Length	Number of Berths
20	10
28	29
36	101
46	132
60	245
75	12
120	1



Alternative 4

DESCRIPTION OF LANDS, EASEMENTS, RIGHTS-OF-WAY, RELOCATION and DISPOSAL (LERRD):
The project area is located on the western coast of Prince of Wales Island, approximately 55 air miles west-northwest of Ketchikan. It lies along the southern end of Klawock Inlet, within Section 6, Township 74 South, Range 81 East, USS 1429A and ATS 212, Copper River Meridian. The City owns all the land in the project area.

LERD necessary to implement this project include NFS, State of Alaska, fee-simple lands for project, no staging, disposal areas or perpetual easements have not been identified. The State of Alaska owns the tides and submerged lands lying within this section, and the City owns the uplands.

Real estate requirements are as follows:

TABLE 7- LERRD REQUIREMENTS

FEATURES	**OWNERS**	**ACRES**	**INTEREST**	**GNF/ LOCAL**
Entrance Channel, Breakwater, (Portions Below Mean High Water)	City of Craig and State of Alaska	8.4 AC	Nav Serv	GNF
Breakwater AMHW	City of Craig	2,000 SF	Fee	GNF
Mooring Basin (BMHW)	City of Craig and State of Alaska	10.1 AC	Nav Serv	GNF
Temporary Staging	City of Craig	0.75 AC	Temporary Work Area Easement	Local
TOTAL PROJECT BOUNARY				

PROJECT COMPONENTS:
See Baseline Cost Estimate Section.

STANDARD ESTATES:
Fee and Temporary Work Area Easement

NON-STANDARD ESTATES:
None

FEDERAL LANDS:
None

NEAREST OTHER EXISTING FEDERAL PROJECT:
There are no other existing Federal Projects that will be affected by the project footprint.

NAVIGATION SERVITUDE:

Per 33 CFR § 329.4, navigable waters of the United States are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability was discussed with our office council and it was determined that the application of navigational servitude is appropriate for construction of the breakwaters. Navigational servitude will apply laterally over the entire surface of the water-body, and is not extinguished by later actions or events which impede or destroy navigable capacity.

INDUCED FLOODING:
Flooding is not expected as a result of the project.

BASELINE COST ESTIMATE FOR REAL ESTATE:
The NFS will negotiate to secure real estate interest in the privately owned lands for the project (See Exhibit “A” -Real Estate Map). The NFS will acquire all necessary real estate interest in the lands necessary for the project.

The City of Craig is a Class 2 city and is not subjected to taxation, therefore, baseline cost estimates are being calculated on a previous report of sales and appraisals in remote Alaska.

Table 8: Baseline Cost Estimates for Land, Easements, Rights-of-Way, Relocations and Disposal Area

ITEM	FEDERAL	LOCAL	TOTAL
Admin Costs	$8,000	$12,000	$20,000
Land Acquisition Costs (To be Determined)	$0	$3,000*	$3,000*
Subtotal	$8,000	$15,000	$23,000
20% Contingency - Crediting	$1,600	$3,000	$4,600
PROJECT TOTALS	**$9,600**	**$18,000**	**$27,600**

* Estimate is based on $1.50 per square foot.
Values in the Baseline Cost Estimate are estimates and not a final LERRD value for crediting purposes.

UTILITIES & FACILITIES RELOCATIONS:
No known utilities or facilities are located in this area and no relocations are required.

RELOCATION ASSISTANCE BENEFITS:
There are no P.L. 91-646 businesses or residential relocation assistance benefits required for this project.

HTRW IMPACTS:
There are no known information pertaining to hazardous, toxic and radioactive wastes or materials, within the project footprint was provided.

MINERAL/TIMBER ACTIVITY:
There are no current or anticipated mineral or timber activities within the vicinity of the proposed project that will affect construction, operation, or maintenance of the proposed project. Nor will any subsurface minerals or timber harvesting take place within the project.

REAL ESTATE MAP:
The Real Estate Map will be produced by POA, in collaboration with the City of Craig.

SPONSORSHIP CAPABILITY:
The City of Craig is working in concert with their …and they are a fully capable sponsor for acquiring the required lands, easements, and rights-of-way (See Exhibit "A" - Sponsor Real Estate Acquisition Capability Assessment). The Sponsor has professional experienced staff and legal capability to provide all lands, easements, and rights-of-way required for project purposes. The city has been advised of P.L. 91-646 requirements; and they have been advised of the requirements for documenting expenses for LERRD crediting purposes. The Sponsor's point of contact information is:

Brian Templin, City Planner
P.O. Box 725
Craig, Alaska 99921

NOTIFICATION OF SPONSOR AS TO PRE-PCA LAND ACQUISITION:
The non-Federal sponsor has been notified in writing about the risks associated with acquiring land before the execution of the PCA and the Government's formal notice to proceed with acquisition.

ZONING ORDINANCES ENACTED:
No zoning ordinances will be enacted to facilitate the proposed ecosystem restoration activities. Therefore, no takings are anticipated as a result of zoning ordinance changes. No zoning ordinances are proposed in lieu of, or to facilitate acquisition in connection with the project.

SCHEDULE:
The anticipated project schedule, unless revised after coordination with NFS, as shown in Table 9.

Table 9: Project Schedule

NAVIGATION IMPROVEMENTS CRAIG, ALASKA	COE START
RECEIPT OF FINAL DRAWINGS FROM ENGINEERING	2-4 weeks after PPA execution
FORMAL TRANSMISSION OF ROW DRAWINGS & INSTRUCTIONS TO ACQUIRE LERRD	4-6 weeks after PPA execution
CERTIFY ALL NECESSARY LERRD AVAILABLE FOR CONSTRUCTION	6-9 months after PPA execution
PREPARE & SUBMIT CREDIT REQUESTS	6-8 months upon completion of Project
REVIEW/APPROVE OR DENY CREDIT REQUESTS	6 months of Sponsor submission

VIEWS OF FEDERAL, STATE, AND REGIONAL AGENCIES:

This project is supported by Federal, State, and Regional agencies. The Corps has met with representatives of the City of Craig and other pertinent parties to discuss aspects of the proposed action. Further coordination will be ongoing. In compliance with NEPA rules/regulations, letters will be sent to resource agencies and residents in the area; public notices will transpire within the project vicinity.

VIEWS OF LOCAL RESIDENTS:

The City of Craig has conducted public meetings concerning this project. Local residents are in favor of the project with funding remaining an issue to be resolved. Further coordination will be ongoing between the City of Craig, US Army Corps of Engineers, State and Federal resource agencies, and residents in the area.

ANY OTHER RELEVANT REAL ESTATE ISSUES:

None.

PREPARED BY:

____

JOHN J SMITH
Realty Specialist

REVIEWED AND APPROVED BY:

____

MICHAEL D COY
Chief, Real Estate

EXHIBIT A

NAVIGATIONAL IMPROVEMENTS

CRAIG, ALASKA

ASSESSMENT OF NON-FEDERAL SPONSOR'S

REAL ESTATE ACQUISITION CAPABILITY

1. **LEGAL AUTHORITY**:

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? **YES __X__** **NO ____**

b. Does the sponsor have the power of eminent domain for this project? **YES __X__** **NO ____**

Does the sponsor have "Quick-Take" authority for this project?

YES ____ **NO __X__**

c. Are any of the lands/interests in land required for this project located outside the sponsor's political boundary? **YES __X__** **NO ____**

d. Are any of the lands/interests in land required for this project owned by an entity whose property the sponsor cannot condemn? **YES __X__** **NO ____**

2. **HUMAN RESOURCE REQUIREMENTS**:

a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended? **YES ____** **NO __X__**

b. If the answer to 2a is "YES" has a reasonable plan been developed to provide such training? **YES ____** **NO ____**

c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? **YES __X__** **NO ____**

d. Is the sponsor's projected in-house staffing level sufficient considering its other work load, if any, and the project schedule? **YES __X__** **NO ____**

e. Can the sponsor obtain contractor support, if required in a timely fashion? **YES __X__** **NO ____**

f. Will the sponsor likely request USACE assistance in acquiring real estate?

YES ________ NO __X____

3. **OTHER PROJECT VAIRABLES**:

a. Will the sponsor's staff be located within reasonable proximity to the project site?

YES __X____ NO ________

b. Has the sponsor approved the project/real estate schedule/milestones?

YES __X____ NO ________

4. **OVERALL ASSESSMENT**:

a. Has the sponsor performed satisfactorily on other USACE projects?

YES __X____ NO ________

b. With regard to this project, the sponsor is anticipated to be:

HIGLY CAPABLE _____ **FULLY CAPABLE _X____**

MODERATELY CAPABLE _____ **MARGINALLY CAPABLE _____**

INSUFFICIENTLY CAPABLE _____

Justification for Insufficient Capability:

5. **COORDINATION**:

a. Has this assessment been coordinated with the sponsor?

YES __X____ NO ________

b. Does the sponsor concur with this assessment?

YES __X____ NO ________

Justification for Sponsor Non-concurrence:

SPONSOR:

____
Name
Title

PREPARED BY: **REVIEWED AND APPROVED BY:**

____
JOHN J SMITH
Realty Specialist

____
MICHAEL D COY
Chief, Real Estate