# NAVIGATION IMPROVEMENTS CRAIG, ALASKA FINAL INTERIM FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

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## COMMUNICATION

FROM

## THE ASSISTANT SECRETARY OF THE ARMY, CIVIL WORKS, DEPARTMENT OF DEFENSE

TRANSMITTING

THE NAVIGATION IMPROVEMENTS CRAIG, ALASKA FINAL INTERIM FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT FOR MARCH 16, 2016



SEPTEMBER 22, 2016.—Referred to the Committee on Transportation and Infrastructure and ordered to be printed

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DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0108

AUG 22 2016

Honorable Paul Ryan
Speaker of the House of Representatives
U.S. Capitol Building, Room H-232
Washington, DC 20515-0001

Dear Mr. Speaker:

In response to section 204 of the Flood Control Act of 1948, and a study resolution from the Committee on Public Works of the U.S. House of Representatives, adopted December of 1970, the Secretary of the Army supports authorization and construction of the Craig Harbor, Alaska, Navigation Improvement Project. The proposal is described in the report of the Chief of Engineers, dated March 16, 2016, which includes other pertinent documents. The Secretary of the Army plans to implement the project at the appropriate time, considering National priorities and the availability of funds.

This project study was conducted to analyze and formulate navigation improvements for Craig Harbor, Alaska. The recommended plan is the National Economic Development (NED) plan. The recommended plan includes construction of 1,900 feet of breakwater constructed in two sections. The breakwater feature consists of a 300-foot long breakwater extending from the northwest tip of Craig Island and a 1,600-foot long breakwater in an "L" shape. The breakwaters would have side slopes of 1 vertical on 1.5 horizontal and a crest of 7 feet at elevation 18 feet NAVD88. Construction of the NED plan includes placement of 208,000 cubic yards of rock for the breakwaters and installation of floats sufficient to provide moorage of 145 vessels ranging from 20 feet to 140 feet in length. The recommended configuration will provide 3 feet of water for fish passage for essential fish habitat, in accordance with National Marine Fisheries Service recommendations.

Based on October 2015 (Fiscal Year (FY) 2016) price levels, the estimated project first cost is $32,317,000, which includes the cost of constructing General Navigation Features (GNF) and the value of lands, easements, rights-of-way and relocations estimated as follows: $32,294,000 for GNF (breakwaters); $26,000 for lands, easements, rights-of-way, and relocations provided by the non-Federal sponsor; $1,544,000 for Pre-construction Engineering and Design efforts; and $2,395,000 for construction management. In accordance with the cost share provisions of section 101 of the Water Resources Development Act of 1986, as amended, the Federal and non-Federal shares of the project first cost are $29,062,000 and $3,255,000 respectively, which equates to 90 percent Federal and 10 percent non-Federal contributions. An additional non-Federal payment of 10 percent of the cost of GNF is required over a period not to exceed 30 years. This payment without accrued interest is estimated to be $3,229,000.

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Based on FY 2016 price levels, a 3.125 percent discount rate, and a 50-year period of analysis, the total equivalent average annual costs of the project are estimated to be $1,536,000, including operations and maintenance (O&M). The project average annual benefits are estimated at $1,897,000 with a resulting net benefit of $361,000 and a benefit-to-cost ratio of 1.24 to 1. It is estimated that there will be an annual Federal O&M cost of $39,000.

An Environmental Assessment was prepared in accordance with the National Environmental Policy Act. The recommended plan has been identified as the environmentally preferred alternative. Adverse environmental impacts have been avoided and minimized and no compensatory mitigation is required. The EA resulted in a Finding of No Significant Impact to the environment, therefore, preparation of an Environmental Impact Statement is not required.

A Type I Independent External Peer Review (IEPR) was not completed for the Feasibility Report. The Corps' Director of Civil Works approved an IEPR exclusion request on November 12, 2015 stating that the project was not subject to Type I IEPR as it did not meet any of the mandatory requirements.

The Office of Management and Budget (OMB) advises that there is no objection to the submission of the report to Congress and concludes that the report recommendation is consistent with the policy and programs of the President. However, OMB also noted that should the Congress authorize this project for construction, it would need to compete with other proposed investments for funding in future budgets. A copy of OMB's letter, dated August 12, 2016, is enclosed. I am providing a copy of this transmittal and the OMB letter to the Subcommittee on Water Resources and Environment of the House Committee on Transportation and Infrastructure, and the Subcommittee on Energy and Water Development of the House Committee on Appropriations. I am also sending an identical letter to the President of the Senate.

Very truly yours,

Jo-Ellen Darcy
Assistant Secretary of the Army
(Civil Works)

Enclosures

5 Enclosures

1. Report of the Chief of Engineers, March 16, 2016
2. OMB Clearance Letter, August 12, 2016
3. Finding of No Significant Impact, August 12, 2016
4. State and Agency Review Letters
5. Craig Alaska Navigation Improvement Project Final Feasibility Report, September 2015 (revised April 2016)

4. Based on October 2015 price levels, a 3.125-percent discount rate and a 50-year period of analysis, the total equivalent average annual costs of the project are estimated to be $1,536,000, including OMRR&R. Equivalent annual National Economic Development (NED) benefits are estimated at $1,897,000, for a benefit to cost ratio of 1.24 to 1 with average annual net benefits amounting to $361,000.

5. Risk and uncertainty were evaluated for economic costs and sea level rise. In accordance with the Corps Engineering Circular on sea level change the study analyzed three sea level rise rates; low (baseline), intermediate, and high. The baseline, intermediate, and high sea level rise values at the end of the 50-year period of analysis were projected to be -0.04 ft., 0.43 ft., and 1.93 ft., respectively. In general, regional sea level rise (baseline, intermediate, and high) will not affect channel availability or the function of the project which is designed for overtopping.

6. In accordance with the Corps Engineering Circular on review of decision documents, all technical, engineering and scientific work underwent an open, dynamic and vigorous review process to ensure technical quality. This included District Quality Control, Agency Technical Review, policy and legal compliance review, and Cost Engineering Directory of Expertise review and certification. Overall the reviews resulted in improvements to the technical quality of the report.

7. Washington level review indicates that the plan recommended by the reporting officers is technically sound, environmentally and socially acceptable, economically justified, and policy compliant. The views of interested parties, including federal, state and local agencies have been considered.

8. I concur in the findings, conclusions, and recommendations of the reporting officers, which identify the NED plan in accordance with applicable laws and policies. Accordingly, I recommend that the cost efficient plan for improved navigation access to Craig, Alaska be authorized in accordance with the reporting officers' recommended plan at an estimated cost of $32,317,000 with such modifications as in the discretion of the Chief of Engineers may be advisable. My recommendation is subject to cost sharing, financing, and other applicable requirements of federal and state laws and policies, including Section 101 of WRDA 1986, as amended. The non-federal sponsors would provide the non-federal cost share and all LERR. This recommendation is subject to the non-federal sponsors agreeing to comply with all applicable federal laws and policies including that the non-federal sponsors must agree with the following requirements prior to project implementation.

a. Provide, during the periods of design and construction, a cash contribution equal to the following percentages of the total cost of construction of the GNF (which include the construction of land-based and aquatic dredged material disposal facilities that are necessary for the placement of dredged material required for project construction or operation and maintenance and for which a contract for the federal facility's construction or improvement was not awarded on or before October 12, 1996):

(1) 10 percent of the costs attributable to dredging to a depth not in excess of 20 feet;

(2) 25 percent of the costs attributable to dredging to a depth in excess of 20 feet but not in excess of 45 feet;

b. Provide all lands, easements, and rights-of-way, including those necessary for the borrowing of material and the disposal of dredged or excavated material, and perform or ensure the performance of all relocations, including utility relocations, all as determined by the Federal Government to be necessary for the construction or operation and maintenance of the GNF, all in compliance with applicable provisions of the Uniform Relocation and Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. 4601-4655) and the regulations contained in 49 C.F.R. Part 24;

c. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the GNF, an additional amount equal to 10 percent of the total cost of construction of the GNF less the amount of credit afforded by the government for the value of LERR, including utility relocations, provided by the non-federal sponsor for the GNF. If the amount of credit afforded by the government for the value of LERR, including utility relocations, provided by the non-federal sponsor equals or exceeds 10 percent of the total cost of construction of the GNF, 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 LERR, including utility relocations, in excess of 10 percent of the total cost of construction of the GNF;

d. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function;

e. Provide, operate, and maintain at no cost to the government, the local service facilities including docks, floats, local access channels, mooring areas, etc.; 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;

f. 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;

g. 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), 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, and rights-of-way that the Federal Government determines to be necessary for the construction or operation and maintenance of the GNF. However, for lands, easements, and rights-of-way that the government determines to be subject to the navigation servitude, only the government shall perform such investigation 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;

g. Assume complete financial responsibility, as between the Federal Government and the non-federal sponsor, for all 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 necessary for the construction or operation and maintenance of the GNF; and

h. Agree, as between the Federal Government and the non-federal sponsor, that the non-federal sponsor shall be considered the operator of the local service facilities for the purpose of CERCLA liability, and to the maximum extent practicable, perform its obligations related to the project in a manner that will not cause liability to arise under CERCLA; and

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

9. The recommendation contained herein reflects the information available at this time and current departmental policies governing formulation of individual projects. It does not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program or the perspective of higher review levels within the executive branch. Consequently, the recommendation may be modified before it is transmitted to the Congress as a proposal for authorization and implementation funding. However, prior to transmittal to Congress, the sponsor, the state, interested federal agencies, and other parties will be advised of any significant modifications and will be afforded an opportunity to comment further.

THOMAS P. BOSTICK
Lieutenant General, USA
Chief of Engineers

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

August 12, 2016

The Honorable Jo-Ellen Darcy
Assistant Secretary of the Army (Civil Works)
U.S. Army Corps of Engineers
108 Army Pentagon
Washington, D.C. 20310-0108

Dear Assistant Secretary Darcy:

As required by Executive Order 12322, the Office of Management and Budget has reviewed an April 2016 Army Corps of Engineers (Corps) feasibility study for potential navigation improvements on the island of Craig, AK, with a first cost of $32,317,000 (FY 2016 prices).

Based on an analysis of costs and benefits, the Corps estimated that the benefit-to-cost ratio for the project, is 1.23 to 1 at a discount rate of 3.125 percent, which is the discount rate that the Corps is required to use for FY 2016 under section 80 of the Water Resources Development Act of 1974 to evaluate and formulate its proposed water resources projects. According to the Corps, the equivalent benefit-to-cost ratio is 0.65 to 1.0 at a seven percent discount rate, which suggests the project may not provide a positive return from a National investment perspective at this time. This is the discount rate that the Administration uses in the Budget to measure the performance of Corps construction projects whose primary purpose is to provide an economic return to the Nation. We would like to work with you to ensure that in the development of future Corps reports, non-Federal sponsors are made fully aware of the basis upon which the Executive Branch evaluates projects.

The Office of Management and Budget does not object to your submitting this report to Congress. When you do so, please advise the Congress that should the Congress authorize this project for construction, the project, like all other Corps projects, would need to compete with other proposed investments for funding in future budgets. We anticipate future Budgets will continue to be limited to investments that demonstrate a high return to the Nation.

John Pasquantino
Deputy Associate Director
Energy, Science and Water

# FINDING OF NO SIGNIFICANT IMPACT

## NAVIGATION IMPROVEMENTS
## CRAIG, ALASKA

## INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT

The U.S. Army Corps of Engineers, Alaska District (Corps), has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The Corps assessed the effects of the following actions in the Final Feasibility Study and Environmental Assessment, dated September 2015, for the navigation improvements project at Craig, Alaska. The final recommendation is contained in the report of the Chief of Engineers, dated 16 March 2016. These reports are incorporated herein by reference.

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.

In addition to the "no action" alternative, five alternatives varying in size and layout were evaluated for the new harbor, including the recommended plan. The recommended plan was identified as the National Economic Development (NED) plan, and is the environmentally preferred alternative. All practical means to avoid and minimize adverse environmental effects have been incorporated into the recommended plan. The recommended plan would not result in any impacts to federally-listed threatened or endangered species or their designated critical habitat, and would not significantly affect any wetlands or water of the U.S., nor any important wildlife habitat. Therefore, no compensatory mitigation is required.

In accordance with section 106 of the National Historic Preservation Act of 1966, as amended, the U.S. Army Corps of Engineers determined that historic properties may be adversely affected by the recommended plan. The Corps has consulted with the Alaska State Historic Preservation Officer (SHPO). The SHPO has concurred on the Corps' determination and is in agreement with the proposed mitigation action. The Corps and SHPO will finalize a memorandum of agreement (MOA) during the pre-construction, engineering and design phase and implement the MOA prior to construction. All terms and conditions resulting from the agreement shall be implemented in order to minimize adverse impacts to historic properties.

Technical and economic criteria used in the formulation of alternative plans were those specified in the Water Resource Council's 1983 Economic and Environmental Principles for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in the evaluation of the

alternatives. It is my determination that the recommended plan does not constitute a major federal action that would significantly affect the human environment; therefore, preparation of an Enyironmental Impact Statement is not required.

Date: 12AUG2011

Michael S. Brooks
Colonel, Corps of Engineers
District Commander

United States Department of the Interior
Office of the Secretary
Office of Environmental Policy and Compliance
1849 C Street, NW - MS 2462 - MIB
Washington, D.C. 20240

DEC 3 1 2015

9043.1
PEP/NRM

ER15/0656

Mr. Theodore A. Brown, P.E.
Chief, Planning and Policy Division
Directorate of Civil Works
U.S. Army Corps of Engineers
CECW-P (SA)
7701 Telegraph Road
Alexandria, VA 22315-3860
ATTN: Doug Gorecki

Re: Proposed Chief of Engineers Report for Navigation Improvements in Craig, Alaska

Dear Mr. Brown:

The Department of the Interior (Department) has reviewed the above referenced documents and the Department has no comments to submit.

For questions or further information regarding this response, please contact Cheryl Kelly on my Natural Resources Management Team, at 202-208-7565 or at cheryl_kelly@ios.doi.gov.

Thank you for the opportunity to review and comment on this study.

Sincerely,

Mary Josie Blanchard

Mary Josie Blanchard, Deputy Director
Office of Environmental Policy and Compliance

TRANSMITTED ELECTRONICALLY – NO HARDCOPY TO FOLLOW

**UNITED STATES DEPARTMENT OF COMMERCE**
**National Oceanic and Atmospheric Administration**
*National Marine Fisheries Service*
*P.O. Box 21668*
*Juneau, Alaska 99802-1668*
January 22, 2016

Theodore A. Brown
U.S. Army Corps of Engineers
CECW-P (SA)
Telegraph Road
Alexandria, VA 22315-3860

Re: Craig, Alaska, Navigation 7701
Improvements Project

Dear Mr. Brown:

The National Marine Fisheries Service (NMFS) has reviewed the information provided in the Interim Integrated Feasibility Report, Environmental Assessment, and Finding of No Significant Impact, for the above referenced project, dated September 2015.

Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires federal agencies to consult with NMFS on any action that may adversely affect Essential Fish Habitat (EFH). The trigger for an EFH consultation is a federal action agency's determination that an action may adversely affect EFH. If a federal action agency determines that an action will not adversely affect EFH, no consultation is required, and the federal action agency is not required to contact NMFS about their determination. A "no effect on EFH" letter is not required or addressed by either the MSA or the EFH regulations. As such, NMFS is under no obligation to concur with a "no effect on EFH" letter received by an action agency.

As described in the EFH section (Appendix B), the proposed action may adversely affect EFH for all five species of Pacific salmon (pink, *O. gorbuscha*; coho, *O. kisutch*; sockeye, *O. nerka*; chum, *O. keta*; and Chinook, *O. tshawytscha*); as the proposed harbor improvements may restrict the movement of marine juvenile/adult salmon through nearshore habitat. NMFS supports the mitigation measures listed in the EFH assessment, including the incorporation of fish passage to facilitate nearshore fish movements described in the section entitled "Avoidance and Minimization of Impacts."

Based on the information you have provided, NMFS agrees that the adverse effects from this action could be alleviated through the proposed mitigation measures. Additional EFH consultation is not necessary. However, NMFS encourages the Corps of Engineers (Corps) to consider the following:

- Complete removal of the existing pilings from the nearshore habitat, in lieu of benthic cutting. Pilings should be removed within a silt curtain to minimize the potential impacts of suspended sediments and contaminants on EFH.
- Routine dredging of the fish passage channel to -3 Mean Lower Low Water when necessary. Incorporating this "harbor maintenance plan" will help preserve the effectiveness of the Corps' mitigation measures.

NMFS appreciates the Corps providing a thorough assessment for this consultation. Should activities or plans significantly change, NMFS wishes to be informed in order to reassess this determination. Should you have further questions or concerns, please contact LT Charlene Felkley of my staff at charlene.felkley@noaa.gov or at (907) 271-1301.

Sincerely,

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

cc:
Michael.noah@usace.army.mil
Matthew.eagelton@noaa.gov
Jeanne.hanson@noaa.gov
Jon.kurland@noaa.gov
Greg.balogh@noaa.gov

G: COE Craig navigation letter_ cf_sbk 1-21-16

DEPARTMENT OF THE ARMY
CHIEF OF ENGINEERS
2600 ARMY PENTAGON
WASHINGTON, DC 20310-2600

DAEN

MAR 1 6 2016

SUBJECT: Craig, Alaska, Navigation Improvements Project

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report on navigation improvements in the vicinity of Craig, Alaska. It is accompanied by the report of the district and division engineer. This report was prepared in partial response to Section 204 of the Flood Control Act of 1948 and a resolution by the Committee on Public Works of the House of Representatives, adopted 2 December 1970. Section 204 of the Flood Control Act of 1948 authorized and directed the Chief of Engineers to determine the advisability of improvements in the interest of navigation in Alaska. The study resolution requested a review of the report of the Chief of Engineers on Rivers and Harbors in Alaska, published as House Document 414, 83rd Congress, and other pertinent reports, with a view to determine whether any modifications of the recommendations contained therein are advisable. Preconstruction engineering and design activities, if funded, would be continued under the authority provided by the resolution cited above.

2. The reporting officers recommend authorizing a project to improve navigation access at Craig, Alaska. Based on an economic evaluation of alternative plan costs and economic benefits, alternative 2b was identified as the plan that reasonably maximizes net national economic development benefits consistent with protecting the Nation's environment. The project consists of approximately 1,900 feet of breakwater protecting a 10.1-acre mooring basin.

a. The breakwater has two sections with a 300-foot breakwater extending from the northwest tip of Craig Island and a 1,600-foot long breakwater in an "L" shape. This configuration provides protection from southerly long-period swell and northerly short-period waves and provides 3 feet of water for fish passage during 95 percent of tides commensurate with National Marine Fisheries Service recommendations for essential fish habitat. The breakwaters are constructed of rock fill with armor stones that average about 1 ton. The breakwaters would have side slopes of 1V on 1.5H and a crest width of 7 feet at elevation 18 feet NAVD88.

b. Construction of the recommended plan includes placement of 208,000 cubic yards of associated rock for the breakwaters and installation of floats sufficient to provide moorage to 145 vessels ranging from 20 feet to 140 feet in length.

c. Determination has been made that no compensatory mitigation is needed as there are no impacts to significant resources.

DAEN
SUBJECT: Craig, Alaska, Navigation Improvements Project

3. Project Costs Breakdown based on October 2015 Prices.

a. Project First Cost. The estimated project first cost is $32,317,000, which includes the cost of constructing the General Navigation Features (GNF) and the lands, easements, rights-of-way, and relocations (LERR) estimated as follows: $32,291,000 for GNF; $26,000 for the value of LERR (except utility relocations) provided by the non-federal sponsor; and, as applicable if the project involves a deep draft harbor.

b. Estimated federal and non-federal shares. The estimated federal and non-federal shares of the project first cost are $29,062,000 and $3,255,000 respectively, as apportioned in accordance with cost sharing provisions of Section 101 of the Water Resources Development Act (WRDA) of 1986, as amended (33 U.S.C. 2211), as follows:

(1) The cost of GNFs less than 20 feet Mean Lower Low Water will be shared at a rate of 90 percent by the government and 10 percent by the non-federal sponsor.

(2) The entire $26,000 for LERR is eligible for credit.

c. Additional 10 Percent Payment. In addition to the non-federal sponsor's estimated share of the total first cost of construction of the project in the amount of $3,229,000, pursuant to Section 101 of WRDA 1986, as amended, the non-federal sponsor must pay an additional 10 percent of the costs for GNFs of the project, $3,229,000, in cash over a period not to exceed 30 years, with interest. The value of LERR will be credited toward this payment.

d. Operations and Maintenance Costs. Operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) of the project after construction will have average annual federal costs of $39,000. There are no anticipated federal costs associated with maintaining the launch area or non-federal OMRR&R costs associated with the local service facilities.

e. Local Service Facilities. The associated cost for local service facilities is approximately $4,128,000, which consists of demolishing an existing pier and piles and constructing gangways and floats. Aids to Navigation were calculated at $18,000 and are an associated federal cost. These costs are 100 percent non-federal and are not included in the project first costs, although they are considered in the total construction costs of $36,463,000 for purposes of economic analysis.

f. Authorized Project Cost and Section 902 Calculation. The project first cost, for the purposes of authorization and calculating the maximum cost of the project pursuant to Section 902 of WRDA 1986, as amended, includes estimates for GNF construction costs, the value of LERR provided under Section 101(a)(3) of WRDA 1986, as amended. Accordingly, as set forth in paragraph 3(a) above, based on an October 2015 Price Level, the estimated project first cost for these purposes is $32,317,000 with a federal share of $29,062,000 and a non-federal share of $3,255,000.

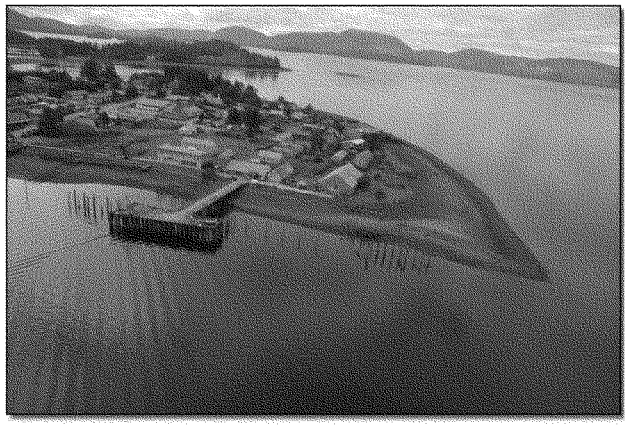
US Army Corps of Engineers

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

# *Craig Navigation Improvements*

**Craig, Alaska, Alaska District, Pacific Ocean Division**

September 2015
REVISED April 2016



# ERRATA SHEET

Navigation Improvements, Craig, Alaska
Integrated Feasibility Report and Environmental Assessment and Finding of No Significant Impact

The Integrated Feasibility Report and Environmental Assessment (EA) dated September 2015 has been revised in sections 9.1, 9.2.1.3, 9.2.1.9, 10.2, Appendix A, and FONSI to clarify determinations of effect made by the U.S. Army Corps of Engineers under the Endangered Species Act. The EA cover notes the date of revision (September 2014). These revisions have been made in the EA.

**Section 9.1 Public/Scoping Meetings**
**Replace paragraph two with the following:**
A public presentation was given at the February 2014 City of Craig City Council meeting. This meeting was regularly scheduled, advertised, and open to the public. During this meeting, the Corps presented an update on study progress and enumerated remaining tasks and risks. The City Council approved moving forward with the study based on the work that had been completed and the path to completion. No comments were received from the general public.

In November 2014, the Corps gave an additional presentation at the annual Craig Tribal Association meeting. This meeting is an annual gathering of the tribe's membership and is well attended. The Corps presented information on study progress including the expected release of the draft report for public review. No comments were received from the tribal membership.

During the study process, the Corps maintained informal communication with Craig Tribal Association. The tribe expressed concern about the possibility of cultural assets located within the uplands and requested a full archaeological survey of the entire cannery site. The Corps responded that this area lies outside of the Federal area of potential effect and on land wholly owned by the City of Craig. While the City of Craig does have a development plan for the Cannery site, the timeline of any development is sufficiently uncertain as to disqualify said development as a cumulative long-term impact. The cannery site currently acts as an industry support area as currently configured and could continue to do so without additional development.

The Draft Integrated Feasibility Report and Environmental Assessment and Draft Finding of No Significant Impact were released for the required 30-day NEPA public review on January 5, 2015. Public Notice ER-15-01 was sent to known interested parties including members of the general public. The draft products were posted to both the Alaska District and City of Craig websites and a dedicated email address was set up for commenters who wished to submit comments electronically. No comments were received as part of this review.

**Section 10.2 Items of Local Cooperation**
**Insert after Item q:**

r. Provide a cash contribution equal to the non-Federal cost share of the project's total historic preservation and mitigation and data recovery costs attributable to commercial navigation that are in excess of 1 percent of the total amount authorized to be appropriated for commercial navigation.

**Section 9.2.1.3**
**Replace paragraph one with the following:**
Section 10 of the Rivers and Harbors Act of 1899 prohibits the unauthorized obstruction or alteration of any navigable water of the United States. This section provides that the construction of any structure in or over any navigable water of the United States, or accomplishment of any other work affecting the course, location, condition, or physical capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army. The Secretary's approval authority has since been delegated to the Chief of Engineers. The Chief of Engineers determination in the final Chief's Report, subsequent to the final feasibility/EA report will be the final decision as it relates to compliance with Section 10 of the Rivers and Harbors Act of 1899.

**Section 9.2.1.9**
**Replace paragraph two with the following:**
An initial letter dated July 16, 2014, the Corps informed SHPO of the proposed Federal undertaking that had the potential to adversely affect historic properties. Specifically, the Corps identified potential adverse effects to the cannery site and an existing associated pier and pilings in the nearshore area of Wards Cove. The cannery, pier, and pilings were evaluated for eligibility for inclusion on the National Register and were found to be eligible under Criteria A, C, and D. Specifically, the adverse effect of project construction would include removal of the pier and pilings during harbor construction. While no ground disturbing activities are planned as part of the Federal project, the Corps' identified actions to mitigate for the adverse effect to historic properties to include documenting the structure through Historic American Buildings Survey (HABS) documentation procedures and having an archaeological monitor be on site during pier and piling removal and intertidal breakwater construction to monitor demolition and be positioned to mitigate adverse effects to other cultural resources, should inadvertent discoveries be made.

The Corps determined that it was more appropriate to finalize the Memorandum of Agreement during the pre-construction, engineering and design phase when the project design is more

complete and the full extent of the impact is defined. The Corps has incorporated all associated costs, including contingencies, for the mitigation to the historic properties and for the MOA execution in the total project first costs. Follow-up letters dated October 23, 2014, November 28, 2014, and February 11, 2015 provided additional information regarding potential effects and determinations of eligibility. A letter from SHPO dated December 29, 2014 concurred with Corps findings related to structure eligibility and decision to complete consultation via the Memorandum of Agreement executed during the pre-construction engineering and design phase, prior to the construction phase.

**Appendix A**
**Insert 404(b)(1) analysis after State of Alaska Letter dated April 10, 2015**
See attached

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

## Craig Navigation Improvements
## Craig, Alaska

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

September 2015
REVISED April 2016

# FINDING OF NO SIGNIFICANT IMPACT

## NAVIGATION IMPROVEMENTS
## CRAIG, ALASKA

## INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT

The U.S. Army Corps of Engineers, Alaska District (Corps), has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The Corps assessed the effects of the following actions in the Final Feasibility Study and Environmental Assessment, dated September 2015, for the navigation improvements project at Craig, Alaska. The final recommendation is contained in the report of the Chief of Engineers, dated 16 March 2016. These reports are incorporated herein by reference.

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.

In addition to the "no action" alternative, five alternatives varying in size and layout were evaluated for the new harbor, including the recommended plan. The recommended plan was identified as the National Economic Development (NED) plan, and is the environmentally preferred alternative. All practical means to avoid and minimize adverse environmental effects have been incorporated into the recommended plan. The recommended plan would not result in any impacts to federally-listed threatened or endangered species or their designated critical habitat, and would not significantly affect any wetlands or water of the U.S., nor any important wildlife habitat. Therefore, no compensatory mitigation is required.

In accordance with section 106 of the National Historic Preservation Act of 1966, as amended, the U.S. Army Corps of Engineers determined that historic properties may be adversely affected by the recommended plan. The Corps has consulted with the Alaska State Historic Preservation Officer (SHPO). The SHPO has concurred on the Corps' determination and is in agreement with the proposed mitigation action. The Corps and SHPO will finalize a memorandum of agreement (MOA) during the pre-construction, engineering and design phase and implement the MOA prior to construction. All terms and conditions resulting from the agreement shall be implemented in order to minimize adverse impacts to historic properties.

Technical and economic criteria used in the formulation of alternative plans were those specified in the Water Resource Council's 1983 Economic and Environmental Principles for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in the evaluation of the

alternatives. It is my determination that the recommended plan does not constitute a major federal action that would significantly affect the human environment; therefore, preparation of an Environmental Impact Statement is not required.

Date: _____ _____

Michael S. Brooks
Colonel, 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. The recommended plan 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 10.1-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 annual Economic Cost of the project, including the cost of operation and maintenance is $1.52 million with annual NED benefits of $1.90 million. The project's benefit-to-cost ratio is 1.31 with net annual benefits of $446,000.

The project first cost is $36.4 million. 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) as well as the entire cost of the non-GNF, referred to as "local service facilities" (LSF). The estimated final Federal share of the total project cost is $25.9 million, which includes $18,300 for navigation aids to be provided by the U.S. Coast Guard. The estimated final non-Federal share of the project first cost is $10.6 million which includes $6.5 million for GNF and $4.1 million for LSF.

## Pertinent Data

### Recommended plan

| Channel and Basin | | Main Breakwater | |
|---|---|---|---|
| Entrance Channel | 2.4 acres | Length, Total | 1,933 feet |
| Mooring Basin | 10.1 acres | Crest Elevation | +18 feet MLLW |
| Total | 12.5 acres | Crest Width | 7 feet |
| Dredging Volume | 0 cy | Primary Armor | 31,100 cy |
| | | Secondary Armor | 42,650 cy |
| | | Core Rock | 205,300 cy |

### Project First Costs*

| Item | Federal ($) | Non-Federal ($) | Total ($) |
|---|---|---|---|
| General Navigation Features (including aids to navigation) | $29,062,000 | $3,255,000 | $32,317,000 |
| Associated costs – local service facilities | $0 | $4,128,000 | $4,128,000 |
| LERR (GNF) Admin Costs | $0 | $26,000 | $26,000 |
| 10% of GNF, Non-Federal** | $(3,229,000) | $3,229,000 | $3,229,000 |
| Final Initial Cost Requirements | $25,877,000 | $10,586,000 | $36,464,000 |
| Annual cost, benefit, and benefit cost ratio based on October 2015 price levels, 3.125 percent, 50-year period of analysis | | | |
| NED Investment Cost (Interest During Construction) | | | $1,080,000 |
| Annual Operation, Maintenance, Repair, Rehabilitation, and Replacement | | | $39,000 |
| Total Annual NED Cost | | | $1,536,000 |
| Annual NED Benefits | | | $1,897,000 |
| Net Annual NED Benefits | | | $361,000 |
| Benefit/Cost Ratio | | | 1.24 |

*Total Project Costs as defined in Director of Civil Works' Memorandum dated 25 August 2011

**Reflects provisions of the Water Resources Development Act of 1986, non-Federal initial share 10 percent of GNF minus LERR credit and 10 percent GNF over time. Sums may not total due to rounding.

| 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 |

## 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 |
| AKDOL&WD | Alaska Department of Labor and Workforce Development |
| ATS | Alaska Townsite Survey |
| AWC | Anadromous Waters Catalog |
| C | Celsius |
| C-MAN | Coastal Marine Automated Network |
| 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 |
| HTRW | Hazardous, Toxic, and Radioactive Wastes |
| IDC | Interest During Construction |
| kg | Kilograms |
| lbs | Pounds |
| LERR | Lands, Easements, Real Estate, and Rights-Of-Way |

| | |
|---|---|
| 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 |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| USS | United States Survey |

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# 1.0 INTRODUCTION

## 1.1 Authority

This feasibility study was conducted under authority granted by Section 204 of the Flood Control Act of 1948 which states in part:

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

The Report of the Chief of Engineers on Rivers and Harbors in Alaska, published as House Document Numbered 414, 83rd Congress, 2nd Session provided an interim response to the authority granted by Section 204 of the Flood Control Act of 1948 including specific recommendations for construction of improvements at Sitka, Dry Pass, and Neva and Olga Straits as well as construction of various previously-authorized projects that had not been completed, including Craig.

A U.S. House of Representatives Public Works Committee Resolution for Rivers and Harbors in Alaska, adopted December 2, 1970 authorized additional reviews of the recommendations contained within that report, stating, "*Resolved by the committee on Public Works of the House of Representative, 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; Cook Inlet and Tributaries, Alaska, published as House Document 34, 85th Congress, 1st Session; Copper River and Gulf Coast, Alaska published as House Document Numbered 182, 83rd Congress, 1st session; Tanana River Basin, Alaska, published as House Document Numbered 137, 84th Congress, 1st session; Southwestern Alaska, published as House Document Numbered 390, 84th Congress, 2nd session; Northwestern Alaska, published as House Document Numbered 99, 86th Congress, 1st session; Yukon and Kuskokwim River Basins, Alaska, published as House Document Numbered 218, 88th Congress, 2nd session; and other pertinent reports with a view to determining 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 of Ketchikan. The project area is shown below in Figure 1.

This study has been cost-shared, with 50 percent of the study funding provided by the City of Craig, acting as the non-Federal partner. 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).

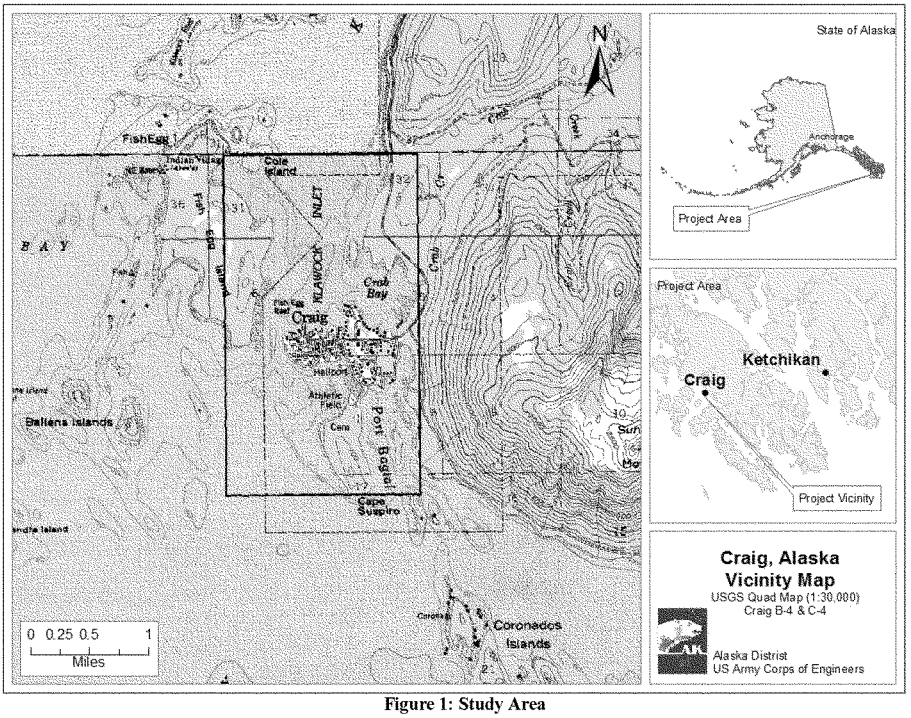


**Figure 1: Study Area**

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 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. 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), National Marine Fisheries Service (NMFS), 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

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.

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.

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.

2003 – U.S. Army Corps of Engineers, Section 905(b) (WRDA 86) Analysis – Craig Small Boat Harbor, Alaska (Jan 2003). The reconnaissance study evaluated various sites at Craig and recommended a feasibility analysis be conducted. The selected alternative was located at the Ward Cove site. Benefits to the Nation would include reduced damage costs, increased efficient

use of time, decreased delays, increased efficient harbor operations, and increased recreational opportunities.

# 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 two existing harbors (see Figure 2) have been fully subscribed. 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. There are currently 78 vessels on the waiting list for permanent moorage, and transient moorage is limited, when available at all. Transient vessels are 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 must 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.

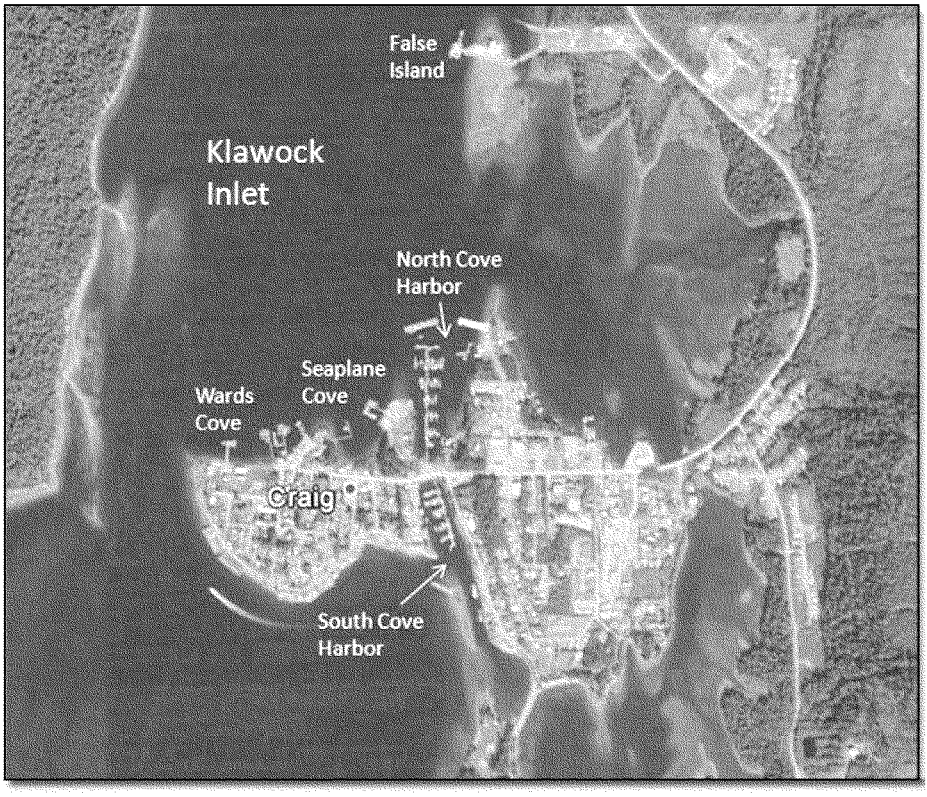


**Figure 2: Existing Facilities**

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 permanent 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 $1,809 (2015 dollars).

### 2.1.3 Vessel Delays

Vessels are delayed due to rafting as vessel owners must wait for their vessel to be retrieved from a raft before they can depart. Delays also occur when entering or exiting Craig's overcrowded harbor. This can be incredibly problematic for commercial fishermen who are seeking to take advantage of a limited fishing opening. Delays in exiting the harbor lead to a decrease in available fishing time. Delays are also experienced 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). Additional detail regarding vessel delays is presented in Section 4.2.3.2 and the Economics Appendix.

### 2.1.4 Travel Costs

Overcrowded conditions increases 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. Thirty-six commercial fishing vessel respondents indicated that they currently homeport elsewhere but would prefer to homeport in Craig. These vessels currently make their 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. Recreation vessels suffer delays entering and exiting the harbor, which diminishes the overall recreation experience.

## 2.2 Opportunities and Considerations

### 2.2.1 Opportunities

A general opportunity exists to provide navigation improvements and to address stated problems. In addition, enhanced marine infrastructure at Craig will encourage additional business opportunities for the region.

### 2.2.2 Considerations

While no issues rose to the level of formal planning constraints, the following items were raised by stakeholders early in the planning process and therefore they have been considered throughout the planning process.

#### 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

Access to sufficient uplands is 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. However, while the selected alternative should have access to sufficient uplands for development of support function, this development is not necessarily required to take place at the time the Federal project is constructed and this development may or may not be included in the final feasibility design.

#### 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 generally 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 October 2015 prices, a period of analysis of 50 years, and the Federal Fiscal Year 2016 interest rate of 3.125 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 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 a site that has adequate space for these features. However, as previously stated, these features may not be constructed in concert with the Federal project and may be constructed by the non-Federal partner at a later time.

#### 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

Federally-authorized harbors are open to all potential users on an equal basis. The chosen 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. Historically, Craig's townsite was called Fish Egg and was primarily utilized as a seasonal fishing camp for the gathering of herring eggs. Fish Egg Island (to the west of Craig Island) was an important burial site and was also used for seasonal food-gathering activities. (See Figure 3) Around 1907 Craig Miller and local Haida residents set up a fish saltery, 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 to Alaska as a result of the Depression 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.

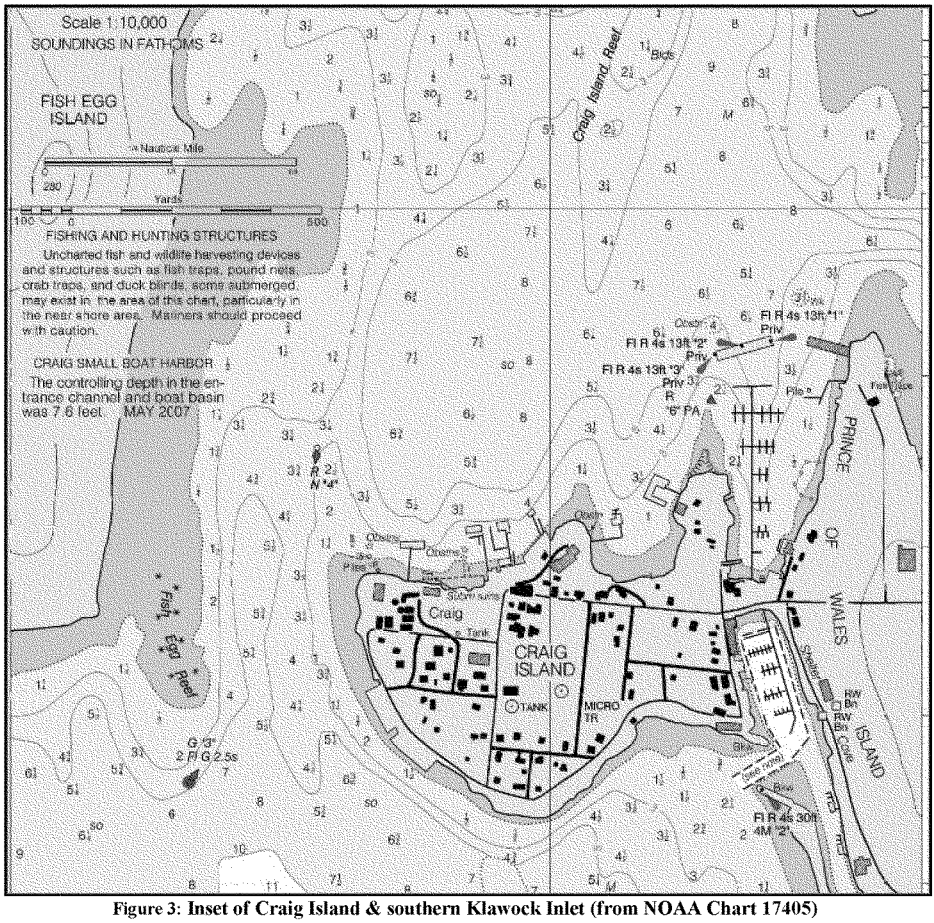


**Figure 3: Inset of Craig Island & southern Klawock Inlet (from NOAA Chart 17405)**

### 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&WD). 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&WD, 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 (ADFG 2010a). 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 sources 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 (2014$) |
|---|---|---|---|---|---|
| 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 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, and 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 | 99 | 700 |
| South Cove Harbor | 119 | 125 |
| City Dock | | 350 |
| False Island Dock | | 223 |
| **Total** | **218** | **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 337 commercial fishing vessels for Prince of Wales Island residents in 2013, with 148 commercial fishing vessels belonging to residents of Craig. Individual vessels can hold more than one permit. 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.

Additional information on the fleet which currently utilizes Craig harbor facilities was determined through survey response data. Table 6 summarizes the survey results related to vessel beam and draft. Further analysis of survey results shows that 92 percent of respondents have vessels which draft 10 feet or less.

**Table 6: Additional Fleet Information**

| Category | 0-20' | 21-27' | 28-36' | 37-45' | 56-60' | >60' |
|---|---|---|---|---|---|---|
| Average Beam (feet), | 6.25 | 7.99 | 10.48 | 12.90 | 16.45 | 21.94 |
| Average Unloaded Draft (feet) | 1.28 | 2.24 | 3.80 | 5.22 | 6.74 | 7.40 |
| Average Loaded Draft (feet) | 1.76 | 2.65 | 4.60 | 5.79 | 8.00 | 8.46 |
| Max Loaded Reported Draft (feet) | 3.0 | 4.0 | 8.0 | 9.0 | 15.0 | 14.0 |

*Source:* Craig Small Boat Harbor Survey response data

*Note:* One vessel in the 28-36-foot size class reported a loaded draft of 18-feet. Based on the size of this vessel, this is believed to be a data error, or at least an outlier and is not included as the Max Loaded Draft for this vessel size class in the table above. Regardless, a vessel drafting 18-feet could still be accommodated at the Ward's Cove harbor site, given natural depths.

#### 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 was 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 218 slips available between South Cove Harbor and North Cove Harbor with more than 63 percent of the slips being filled on a permanent basis as of July 2013. Of the vessels with permanent moorage at Craig, 28 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 7).

[1] The moorage totals presented in this paragraph and in Table 7 are based upon extrapolation of Craig survey results. See economic appendix for detailed discussion.

Table 7: 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** |

## 3.2 Physical Environment

The City of Craig is 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.

### 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).

The nearest monitoring station is located north of Fish Egg Island, just outside of Klawock Inlet. Data collected from that station showed a highest predicted flood current of 1.5 knots and a highest predicted ebb current of 1.9 knots. Average current velocities are shown in Table 8.

**Table 8: Average Current Velocities**

| Item | Reading | | | | | |
|---|---|---|---|---|---|---|
| Approximate Depth (feet) | 5.4 | 15.3 | 25.1 | 34.9 | 44.8 | 54.6 |
| Average Velocity (knots) | 0.44 | 0.40 | 0.38 | 0.35 | 0.33 | 0.30 |

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 9 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 9: 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.

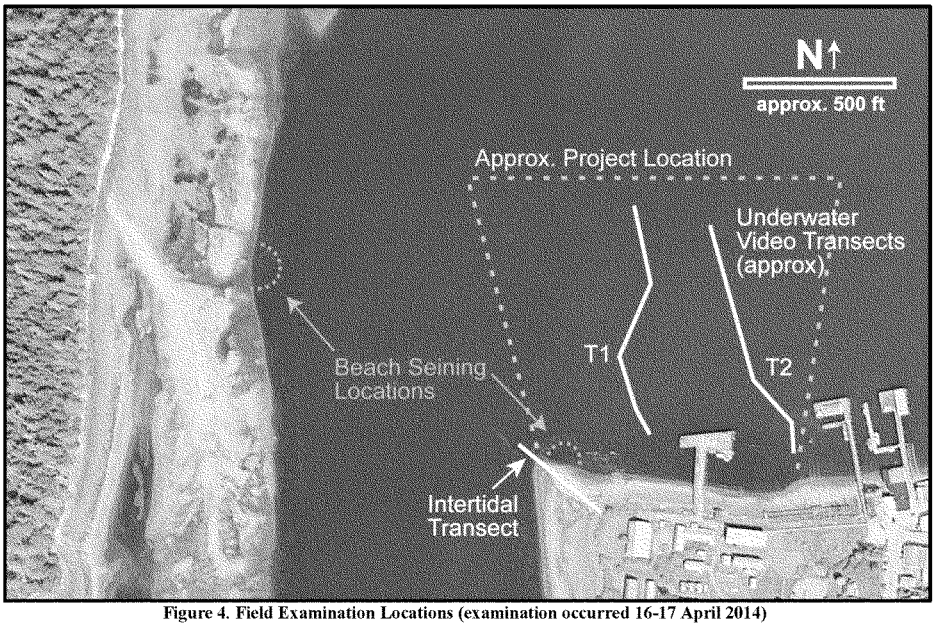


**Figure 4. Field Examination Locations (examination occurred 16-17 April 2014)**

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 10 shows results of the examination.

**Table 10: 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 5: Intertidal transect, 17 April 2014 (looking to the northwest)

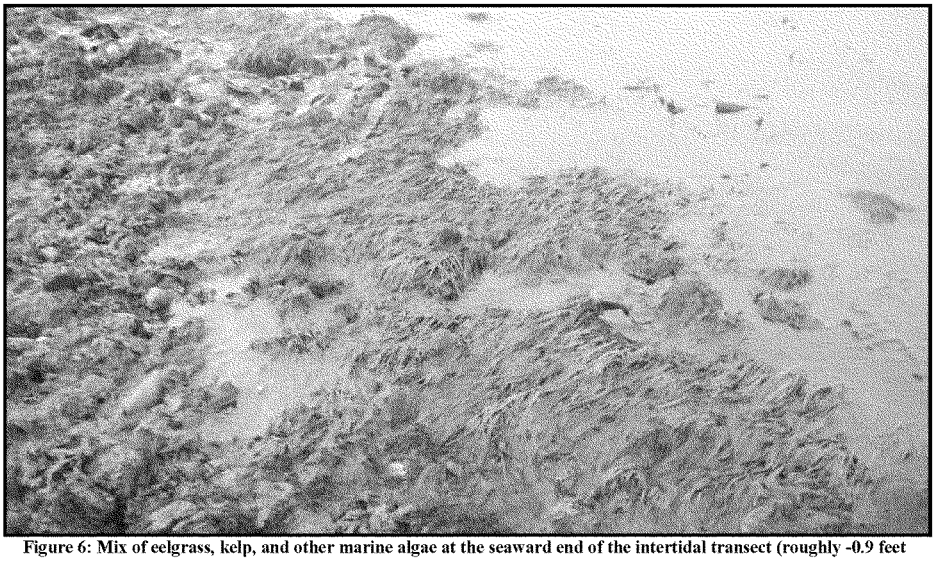

Figure 6: Mix of eelgrass, kelp, and other marine algae at the seaward end of the intertidal transect (roughly -0.9 feet MLLW)

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.

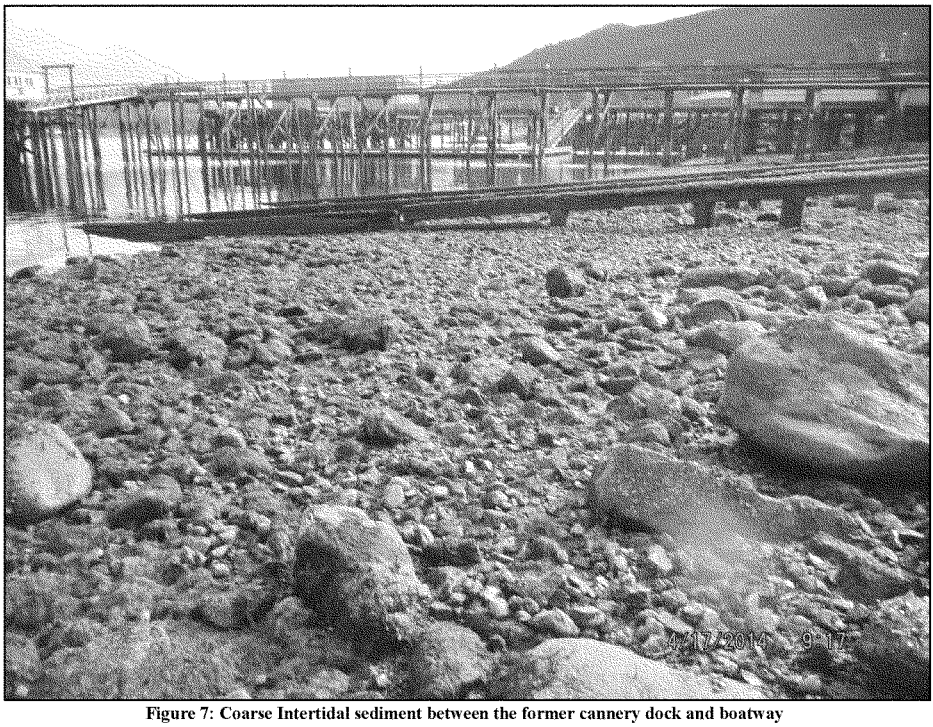


**Figure 7: Coarse Intertidal sediment between the former cannery dock and boatway**

#### 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.

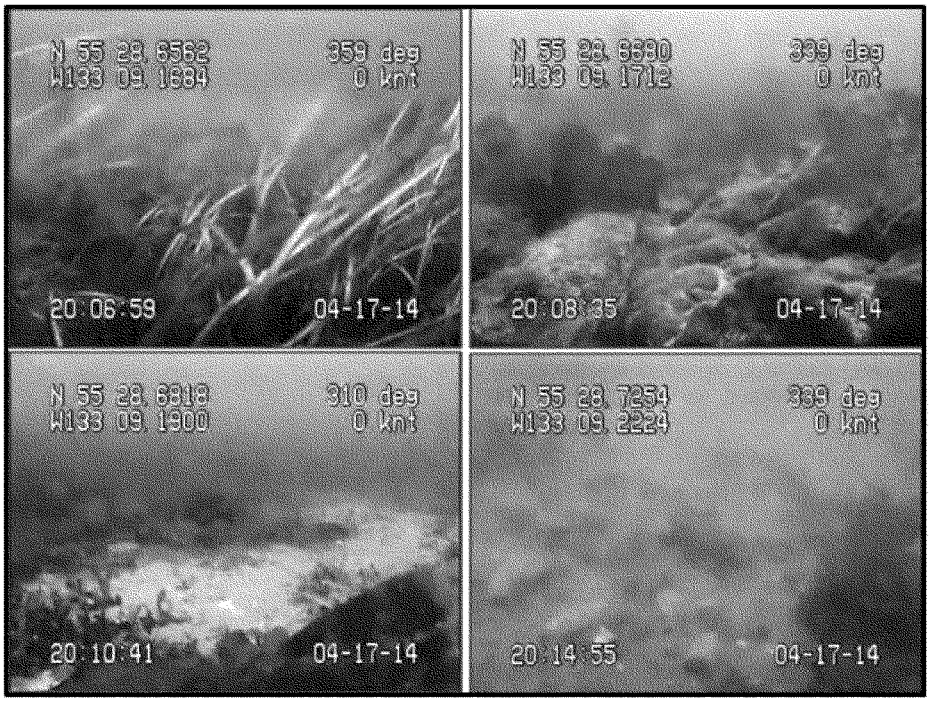


**Figure 8: Screenshots from underwater video along transect T2 showing eelgrass (upper left), continuous brown algae (upper right), exposed patches of sediment with discontinuous brown and red algae (lower left), and mostly bare sediment with isolate clumps of algae (lower right).**

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 9 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.

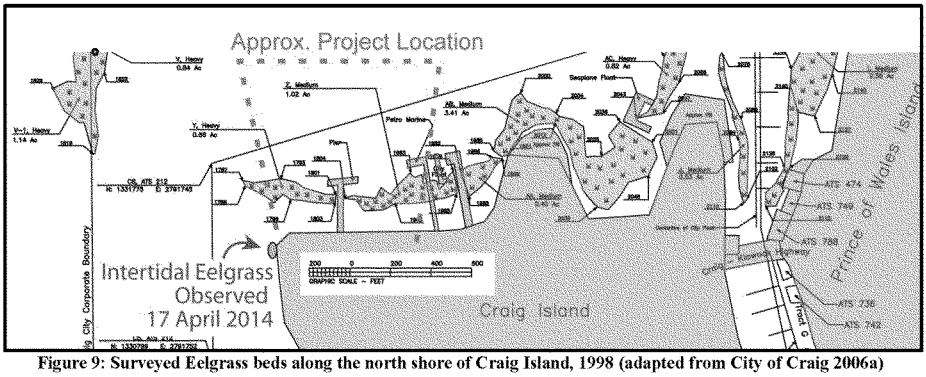


**Figure 9: Surveyed Eelgrass beds along the north shore of Craig Island, 1998 (adapted from City of Craig 2006a)**

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 10).



**Figure 10: 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 11.

**Table 11: 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.

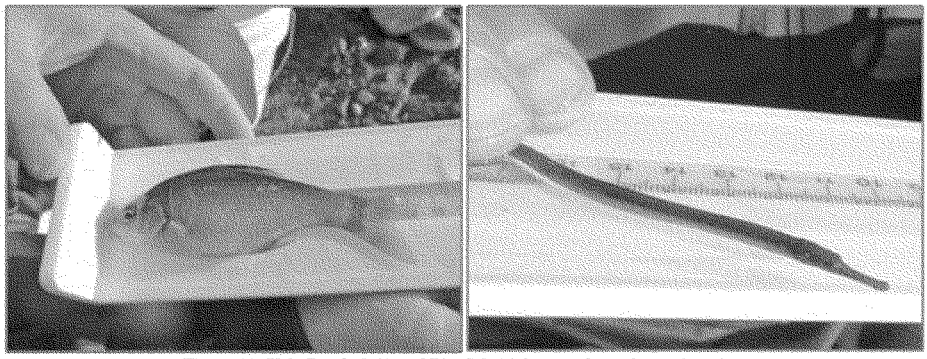

**Figure 11: Kelp Perch (left) and Pipefish (right) caught at the project site**

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 properties identified within and adjacent to the project's area of potential effect include CRG-721 (Wards Cove Cannery Site, within), CRG-722 (Wards Cove Cannery Pier, within), and CRG-728 (Old Craig Historic Site, adjacent). These sites were evaluated to determine eligibility for listing on the National Register of Historic Places. It was determined that CRG-721 was eligible for listing under Criteria A, C, and D. CRG-728 was determined to be eligible for listing under Criterion D. It was also determined that CRG-722 was a contributing feature to CRG-721 and was therefore eligible for listing under Criterion A. These determinations were detailed in a letter to the State of Alaska State Historic Preservation Officer dated 24 November 2014. The Officer concurred with these determinations in a letter dated 29 December 2014.

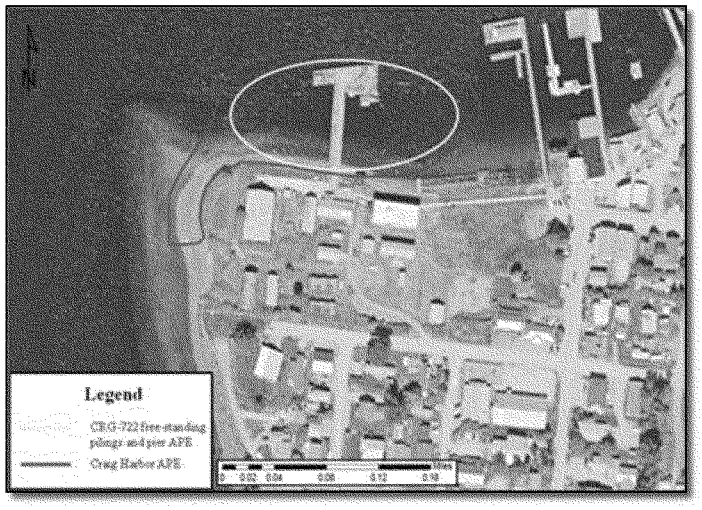


**Figure 12: Area of Potential Effect**

Construction of the recommended plan would require removal of the existing dilapidated, historic dock and associated free-standing pilings (CRG-722) in order to accommodate construction of the proposed harbor with pier pilings being cut at grade to minimize sediment disturbance. Construction of the breakwater would occur in the sub-littoral area of Wards Cove. Due to the high probability of cultural resources residing in the uplands, construction of the breakwater would not extend upland of the existing seawall with the breakwater terminating flush with the seawall surface.

Due to tribal concerns surrounding the possible presence of petroglyphs in the intertidal zone surrounding Wards Cove Cannery (CRG-721), the intertidal zone was added to the project's area of potential effect as shown in Figure 12. In addition, the project's area of potential effect also has the potential to extend to the unnamed roads that allow access to the cannery. Site access, final construction and removal plans, and designation of equipment staging areas will be developed in concert with the contractor prior to construction.

## 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 cases where 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 2016 discount rate of 3.125 percent and an October 2015 price level is used. The analysis utilizes a 50-year project period of analysis with a base year of 2020, (the year in which it is expected benefits will begin to accrue).

## 4.1 Environmental Conditions

Absent Federal action, the conditions described in Section 3.0 are generally expected to persist through the planning period of analysis with the exception of sea level. Engineer Regulation 1110-2-8162 provides guidance on the calculation of sea level change. This guidance was used to perform an analysis of potential sea level change at Craig over the next 100 years. The results of the analysis are available in the H&H appendix with a summary provided below in Table 12.

**Table 12: Sea Level Change Calculations**

| Sea Level Change | Low | Intermediate | High |
|---|---|---|---|
| 50 years (2065) | -.04 feet | 0.43 feet | 1.93 feet |
| 100 years (2115) | -0.08 feet | 1.27 feet | 5.53 feet |

*Note:* It is unlikely that sea level would rise as much as that shown under the "High" scenario since much of southeast Alaska is generally experiencing isostatic rebound.

## 4.2 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.

### 4.2.1 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.

### 4.2.2 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 change in the availability of moorage over the period of analysis.

### 4.2.3 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.

#### 4.2.3.1 Vessel Damages

In the future, vessel damages will continue to occur at Craig. Survey results showed that vessel damages range from a minimum of $273 to a maximum of $4,704. To address this wide range of potential damages, a triangular distribution was applied to the 85 potential vessel damages annually. Using this approach, the present value of vessel damages caused by congestion and overcrowding are $5.0 million over the 50-year period of analysis with an average annual value of $199,000.

#### 4.2.3.2 Vessel Delays

In addition, vessels will continue to be delayed entering/exiting Craig's existing harbors (Table 13). 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 at the boat ramp, overcrowding/congestions, and ice in the harbor.

**Table 13: 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 14.

**Table 14: Average Annual Vessel Delay Costs**

| Delay Category | 0-20' | 21-27' | 28-36' | 37-45' | 46-60' | >60' | Total |
|---|---|---|---|---|---|---|---|
| Permanent | $3,545 | $26,850 | $56,437 | $215,661 | $169,500 | $0 | $471,994 |
| Transient | $0 | $0 | $18,894 | $57,871 | $150,853 | $16,289 | $243,907 |
| Boat Launch | $840 | $0 | $0 | $0 | $0 | $0 | $840 |
| Other | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| Total | **$4,385** | **$26,850** | **$75,331** | **$273,532** | **$320,354** | **$16,289** | **$716,742** |

The present value of total vessel delays costs over the 50-year period of analysis is $18.0 million with an average annual value of $717,000.

#### 4.2.3.3 Foregone Subsistence Harvests

Congestion and overcrowding at Craig also contributes to a decrease in subsistence harvest due to reduced access to fishing, hunting, and gathering grounds. This reduced harvest level is expected to persist in the future without project condition. 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 16 percent lower than the average rate of subsistence harvests of the other communities on Prince of Wales Island. These communities 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 the same amount of subsistence resources as the surrounding communities, or approximately 303 pounds per person, per year. Through studies by ADFG and the Corps of Engineers, it was found that the value per pound of subsistence resources range from $4.17 to $24.40. Given this, the total present value of future without project subsistence harvests over the 50-year period of analysis is $87 million with an average annual value of $3.5 million.

Variations in subsistence catch rates between Prince of Wales Island communities are undoubtedly based on more than the availability of navigation improvements or navigation conditions in any one community. However, this method of comparison among communities is used as representative given a lack of alternate empirical data source and because detailed surveying of subsistence harvests at Craig is beyond the scope of this analysis. The comparison of Craig harvest levels to that of other communities on Prince of Wales Island is intended to show that Craig harvests are less than average and therefore have room for some improvements. Comparing Craig to all other communities on Prince of Wales Island smoothes the impacts to comparison of any one community; some communities already harvest less than Craig. In addition, an @Risk triangular distribution is used to represent the potential harvest increases which addresses some of the uncertainty in this assumption.

#### 4.2.3.4 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 $7.4 million over the 50-year period of analysis with an average annual value of $296,000.

#### 4.2.3.5 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 $21.0 million over the 50-year period of analysis with an average annual value of $834,000.

#### 4.2.3.6 Recreation Unit Day Value

Congestion in the existing harbors decreases the boaters' enjoyment of recreation activities as measured by Unit Day Value calculations. Unit Day Value measures changes in five criteria including: recreation experience, availability of opportunity, carrying capacity, accessibility, and environmental factors. Based on the answers of a six-person focus group composed of Craig residents who are primarily recreational boaters, it was determined that the Unit Day Value per recreational visit could increase 34 percent over the without-project condition. The present value of the decrease in recreation experience due to congestion is $52.0 million over the 50-year period of analysis with an average annual value of $2.1 million.

#### 4.2.3.7 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.

### 4.2.4 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 15.

**Table 15: Summary of Future Without-Project Condition Damages**

| Category: | Net Present Value | Average Annual |
|---|---|---|
| Vessel damages | $5,002,000 | $199,000 |
| Vessel delays | $18,012,000 | $717,000 |
| Subsistence | $86,862,000 | $3,456,000 |
| Travel Cost | $7,446,000 | $296,000 |
| Infrastructure Damage | $20,964,000 | $834,000 |
| Recreation UDV | $52,020,000 | $2,070,000 |
| **Total** | **$190,306,000** | **$7,572,000** |

# 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 13 and discussed below.

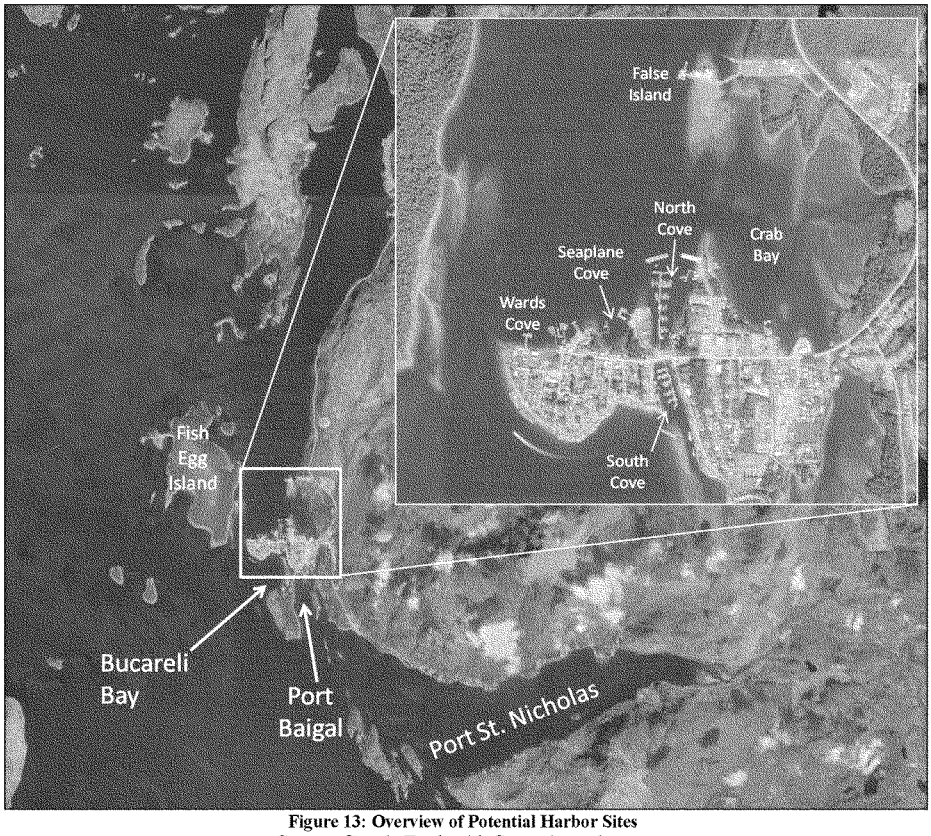


**Figure 13: Overview of Potential Harbor Sites**
*Source*: Google Earth with Corps Amendments

#### 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. The FAA does not produce a chart for this facility. It is considered an "unregulated seaway" since there are no marking end features such as buoys.

A number of factors combined to make Wards Cove the most desirable site for harbor development. 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. The City of Craig's Development plan for the uplands includes mixed use commercial, industrial, and retail uses. 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. Redevelopment of a previously-used area can be advantageous from an environmental standpoint. Because of previous vessel maintenance operations at the existing boatway, it is likely that there are legacy contaminants in the sediments at the far eastern end of the cove. 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.

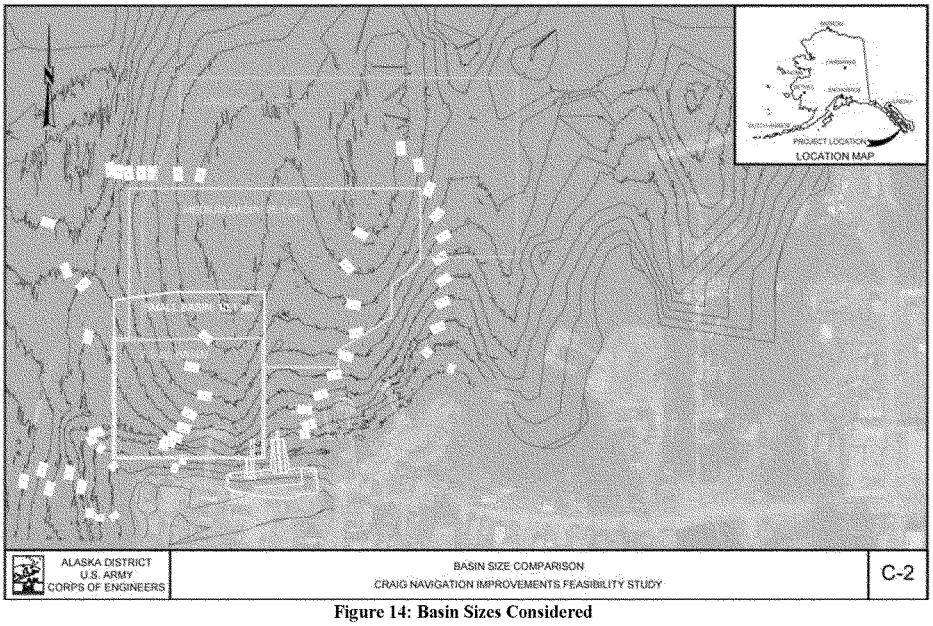


**Figure 14: Basin Sizes Considered**

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 14, 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 14, is 10.1 acres in size and would provide moorage for 145 vessels. The third basin size, shown in orange in Figure 14, 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 14. 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 16 . Fish passage was incorporated into the design. This alternative is estimated to have a project first cost of $33.1 million. The proposed layout of Alternative 1 is shown in Figure 15.

**Table 16: Alternative 1 Configuration**

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

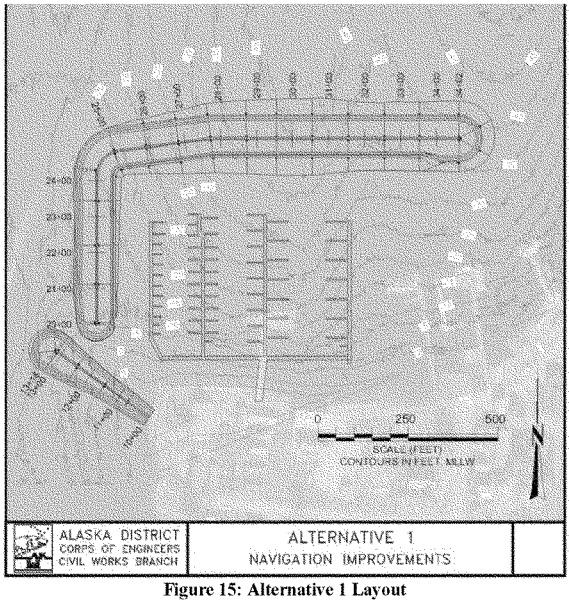


**Figure 15: Alternative 1 Layout**

*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 17. The proposed layout of Alternative 2 is shown in Figure 16.

**Table 17: Alternative 2 Configuration**

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

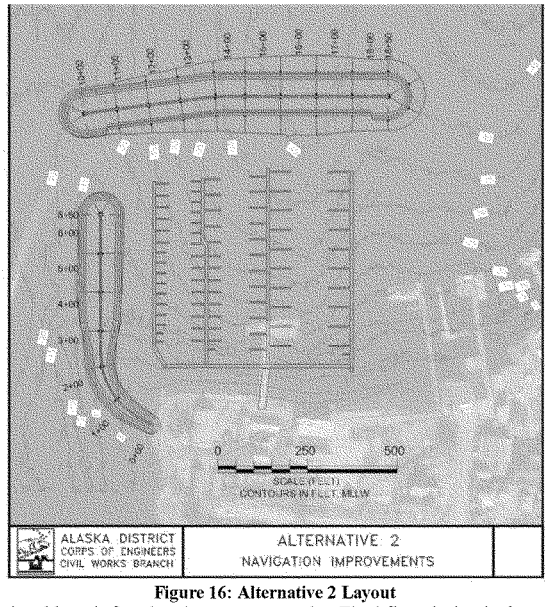


**Figure 16: Alternative 2 Layout**

*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 16 would not meet study objectives. Therefore, Alternative 2 was reconfigured as Alternatives 2a and 2b.

#### 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 18 and would have an estimated project first cost of $39.6 million. The proposed layout of the harbor is shown in Figure 17.

**Table 18: Alternative 2a Configuration**

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

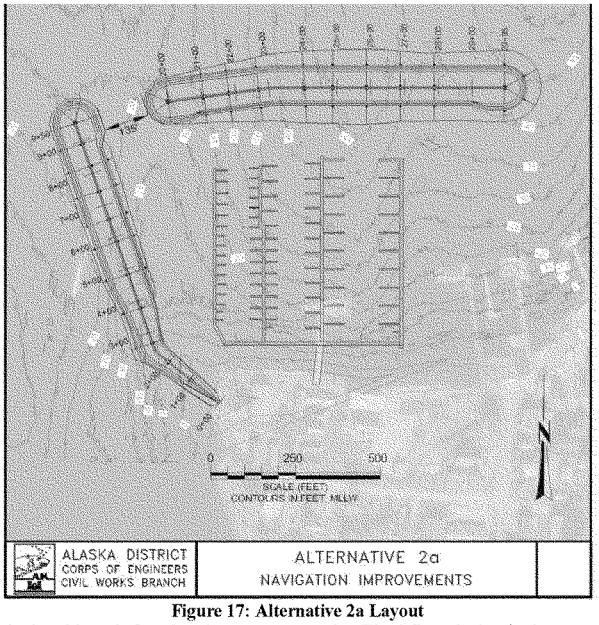


**Figure 17: Alternative 2a Layout**

*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 19 and has an estimated project first cost of $36.4 million. Alternative 2b layout is shown in Figure 18.

**Table 19: Alternative 2b Configuration**

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

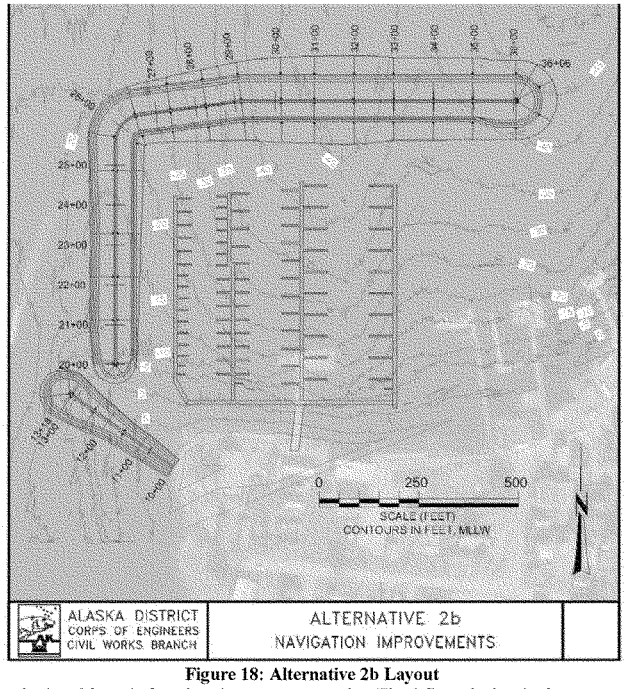


**Figure 18: Alternative 2b Layout**

*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 20. This alternative is estimated to have a project first cost of $52.9 million. The proposed layout of Alternative 3 is shown in Figure 19. It should be noted that this alternative has the same western opening that cause Alternative 2 to be eliminated. However, it is carried forward for comparison purposes. Should this alternative prove competitive, the breakwater configuration would need to be adjusted.

**Table 20: Alternative 3 Configuration**

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

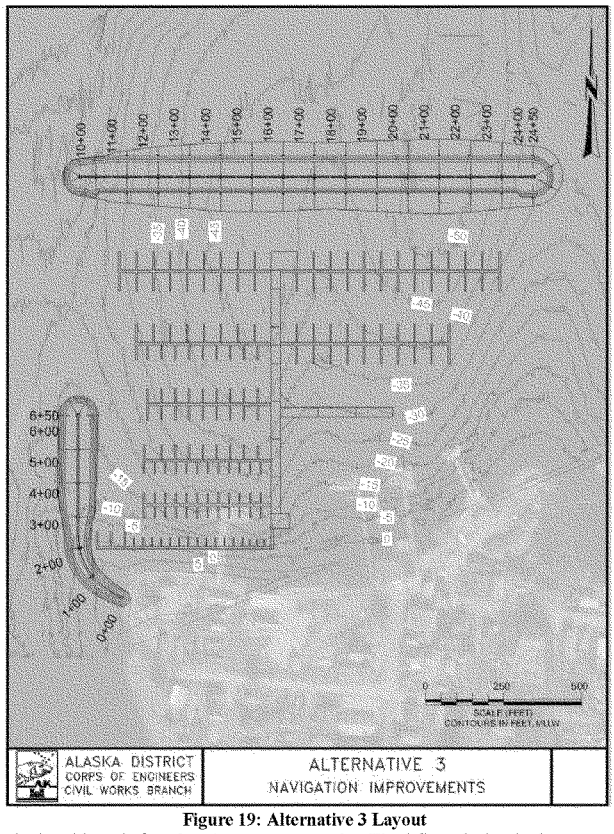


**Figure 19: Alternative 3 Layout**

*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 21 and has an estimated project first cost of $59.0 million. The proposed layout of Alternative 4 is shown in Figure 20. It should be noted that this alternative has the same western opening that cause Alternative 2 to be eliminated. However, it is carried forward for comparison purposes. Should this alternative prove competitive, the breakwater configuration would need to be adjusted.

**Table 21: Alternative 4 Configuration**

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

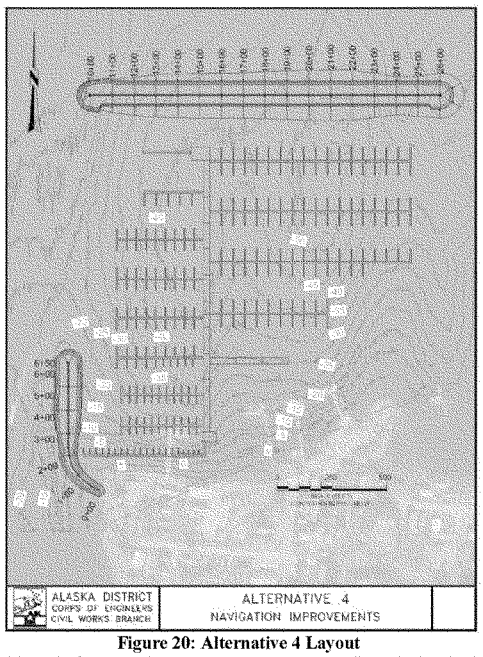


**Figure 20: Alternative 4 Layout**

*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 22. 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 22: Summary of Costs by Alternative**

| Alternative | Project First Cost | IDC | PV OMRR&R | Present Value | Avg. Annual Value |
|---|---|---|---|---|---|
| 1 | $33,092,000 | $1,039,000 | $947,000 | $35,077,000 | $1,396,000 |
| 2a | $39,613,000 | $1,243,000 | $1,386,000 | $42,150,000 | $1,677,000 |
| 2b | $36,464,000 | $1,145,000 | $991,000 | $38,600,000 | $1,536,000 |
| 3 | $52,848,000 | $1,659,000 | $2,691,000 | $57,198,000 | $2,276,000 |
| 4 | $58,968,000 | $1,851,000 | $3,985,000 | $64,805,000 | $2,579,000 |

*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.

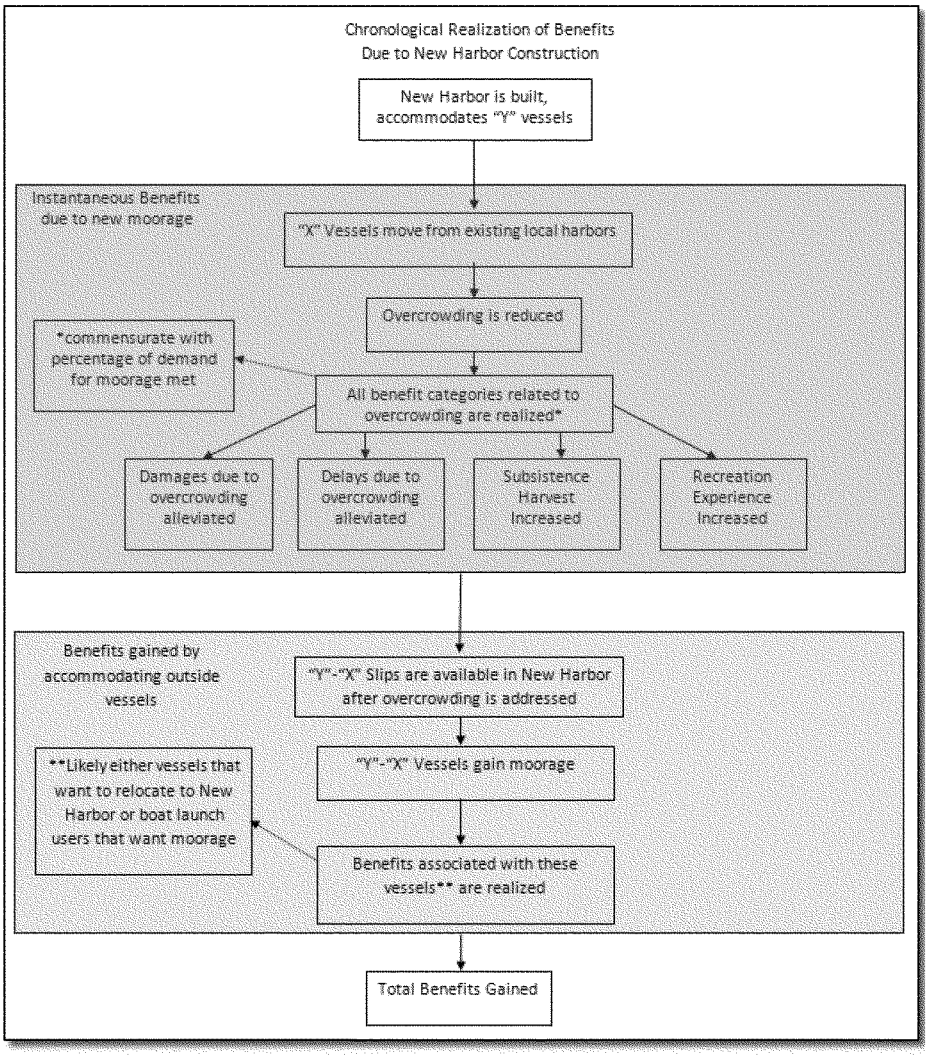


**Figure 21: Chronological Realization of Benefits Due to New Harbor Construction**

### 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 23 shows the total vessel damages decreased by each alternative.

Table 23: Avoided Vessel Damages, by Alternative

| Alternative | Average Annual Benefits |
|---|---|
| **Alternative 1** | $109,000 |
| **Alternative 2a** | $131,000 |
| **Alternative 2b** | $131,000 |
| **Alternative 3** | $195,000 |
| **Alternative 4** | $195,000 |

### 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 4.2.3.2, 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 24.

Table 24: Avoided Vessel Delays, by Alternative

| Alternative: | Average Annual Value |
|---|---|
| **Alternative 1** | $366,000 |
| **Alternative 2a** | $410,000 |
| **Alternative 2b** | $410,000 |
| **Alternative 3** | $539,000 |
| **Alternative 4** | $539,000 |

### 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 25.

Table 25: Increase Subsistence Harvests, by Alternative

| Alternative: | Average Annual Value |
|---|---|
| **Alternative 1** | $453,000 |
| **Alternative 2a** | $540,000 |
| **Alternative 2b** | $540,000 |
| **Alternative 3** | $540,000 |
| **Alternative 4** | $540,000 |

### 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 26.

Table 26: Decreased Travel Costs, by Alternative

| Alternative: | Average Annual Value |
|---|---|
| **Alternative 1** | $296,000 |
| **Alternative 2a** | $296,000 |
| **Alternative 2b** | $296,000 |
| **Alternative 3** | $296,000 |
| **Alternative 4** | $296,000 |

### 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 40 years. The benefit of this extension of useful life is shown in Table 27.

Table 27: Decreased Infrastructure Damage, by Alternative

| Alternative: | Average Annual Value |
|---|---|
| **Alternative 1** | $246,000 |
| **Alternative 2a** | $246,000 |
| **Alternative 2b** | $246,000 |
| **Alternative 3** | $246,000 |
| **Alternative 4** | $246,000 |

### 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 28.

**Table 28: Increased Unit Day Values, by Alternative**

| Alternative: | Average Annual Value |
|---|---|
| **Alternative 1** | $274,000 |
| **Alternative 2a** | $274,000 |
| **Alternative 2b** | $274,000 |
| **Alternative 3** | $274,000 |
| **Alternative 4** | $274,000 |

## 6.4 Net Benefits of Alternative Plans

Given the quantified benefits discussed above, the net annual benefits of each alternative are shown in Table 29.

**Table 29: Summary of With-Project Benefits**

| Criteria | Alt. 1 | Alt. 2a | Alt. 2b | Alt. 3 | Alt. 4 |
|---|---|---|---|---|---|
| Vessel Damages | $109,000 | $131,000 | $131,000 | $195,000 | $195,000 |
| Vessel Delays | $366,000 | $410,000 | $410,000 | $539,000 | $539,000 |
| Subsistence | $453,000 | $540,000 | $540,000 | $540,000 | $540,000 |
| Travel Cost | $296,000 | $296,000 | $296,000 | $296,000 | $296,000 |
| Infrastructure Damage | $246,000 | $246,000 | $246,000 | $246,000 | $246,000 |
| Recreation UDV | $274,000 | $274,000 | $274,000 | $274,000 | $274,000 |
| Average Annual Benefits | **$1,744,000** | **$1,897,000** | **$1,897,000** | **$2,090,000** | **$2,090,000** |

## 6.5 Summary of Accounts and Plan Comparison

The physical characteristics of the alternatives are shown in Table 30. A comparison of the NED costs and benefits associated with the various alternatives is shown in Table 31. 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 30: 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".

As shown in Table 31, Alternatives 3 and 4 are not competitive with the other alternatives and would be even less so if the western opening were closed with additional sections of breakwater. 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.

Table 31: Comparison of Alternatives: Costs and Benefits

| Item | Alt. 1 | Alt. 2a | Alt. 2b | Alt. 3 | Alt. 4 |
|---|---|---|---|---|---|
| Mobilization & Demobilization | $1,096,000 | $1,096,000 | $1,096,000 | $1,096,000 | $1,096,000 |
| Demolition | $390,000 | $390,000 | $390,000 | $390,000 | $390,000 |
| Breakwater, Survey, and Navigation Aids | $24,901,000 | $29,828,000 | $27,274,000 | $35,016,000 | $35,585,000 |
| Mooring Floats and Gangways | $1,944,000 | $2,802,000 | $2,577,000 | $8,097,000 | $10,983,000 |
| Piles, Caps, and Anodes | $865,000 | $1,160,000 | $1,161,000 | $2,896,000 | $5,124,000 |
| Construction Contract Cost | $29,196,000 | $35,276,000 | $32,497,000 | $47,495,000 | $53,178,000 |
| | | | | | |
| Real Estate | $26,000 | $26,000 | $26,000 | $26,000 | $26,000 |
| Construction Management | $2,395,000 | $2,395,000 | $2,395,000 | $2,395,000 | $2,395,000 |
| PED | $1,547,000 | $1,547,000 | $1,547,000 | $1,547,000 | $1,547,000 |
| Project Cost | $33,164,000 | $39,244,000 | $36,464,000 | $51,463,000 | $57,146,000 |
| | | | | | |
| Interest During Construction | $1,041,000 | $1,232,000 | $1,145,000 | $1,616,000 | $1,794,000 |
| NED Investment Cost | $34,205,000 | $40,476,000 | $37,609,000 | $53,079,000 | $58,940,000 |
| | | | | | |
| Annual OMRRR | $38,000 | $51,000 | $39,000 | $107,000 | $159,000 |
| Total Annual NED Cost (50 years at 3.125%) | $1,399,000 | $1,662,000 | $1,536,000 | $2,219,000 | $2,504,000 |
| Annual Benefits | $1,744,000 | $1,897,000 | $1,897,000 | $2,090,000 | $2,090,000 |
| Average Annual Net Benefits | $345,000 | $235,000 | **$361,000** | -$129,000 | -$414,000 |
| Benefit to Cost Ratio | 1.25 | 1.14 | **1.24** | 0.94 | 0.83 |
| Rank by NED Benefits | 2 | 3 | **1** | 4 | 5 |

Note: Values include contingency. Sums may not total due to rounding. Table shows Project First Costs per Director of Civil Works' Memorandum dated 25 August 2011.

# 7.0 RECOMMENDED PLAN*

## 7.1 Description of Recommended Plan

The recommended plan is Alternative 2b, shown in Figure 22. This plan reasonably maximizes net NED benefits commensurate with protecting the Nation's environment. 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 to allow for fish passage.

#### 7.1.1.2 Moorage Basin, Inner Harbor Facilities, and Entrance Channel

A float system will be constructed by the non-Federal partner. During discussions with the non-Federal partner, they offered support for a float layout that extends in an east-west alignment parallel to the northern breakwater. The sponsor-preferred layout does not change project costs over the layout shown in Figure 18, but this layout would allow for easier harbor expansion, should it be needed. This layout would provide sufficient draft to each class of vessel at the various floats they are projected to utilize.

Figure 22 shows the reconfigured float layout and entrance channel. The 10.1-acre moorage basin would be accessed from the east. The entrance channel's width as shown allows for safe two-way vessel traffic to proceed to and from the floats taking into account vessels which may be moored at the existing City Dock and assumes that vessels would be moored to the ends of the floats consistent with efficient harbor management practices. The entrance channel's natural controlling depth, defined as "the shallowest portion of the channel that allows access to mooring facilities" is shallower than -20 feet MLLW and therefore the proper cost sharing for this project is 90 percent Federal/10 percent Non-Federal consistent with Policy Guidance Letter 62, Paragraph 2. Minimal sedimentation is expected to occur within the channel and basin. Therefore, dredging is expected to be infrequent, if necessary at all.

This change in configuration is not expected to have any negative effects on nearby docks or piers. Traffic at those docks is often transient and only present during active loading and unloading. While it is up to the non-Federal partner to determine the operating rules of the harbor, it is common for entrance channels to be "no wake zones". Due to the transient nature of vessels moored at the nearby docks and the expected lack of sizeable wakes from vessels entering and exiting the harbor, there are no expected significant impacts to those facilities.

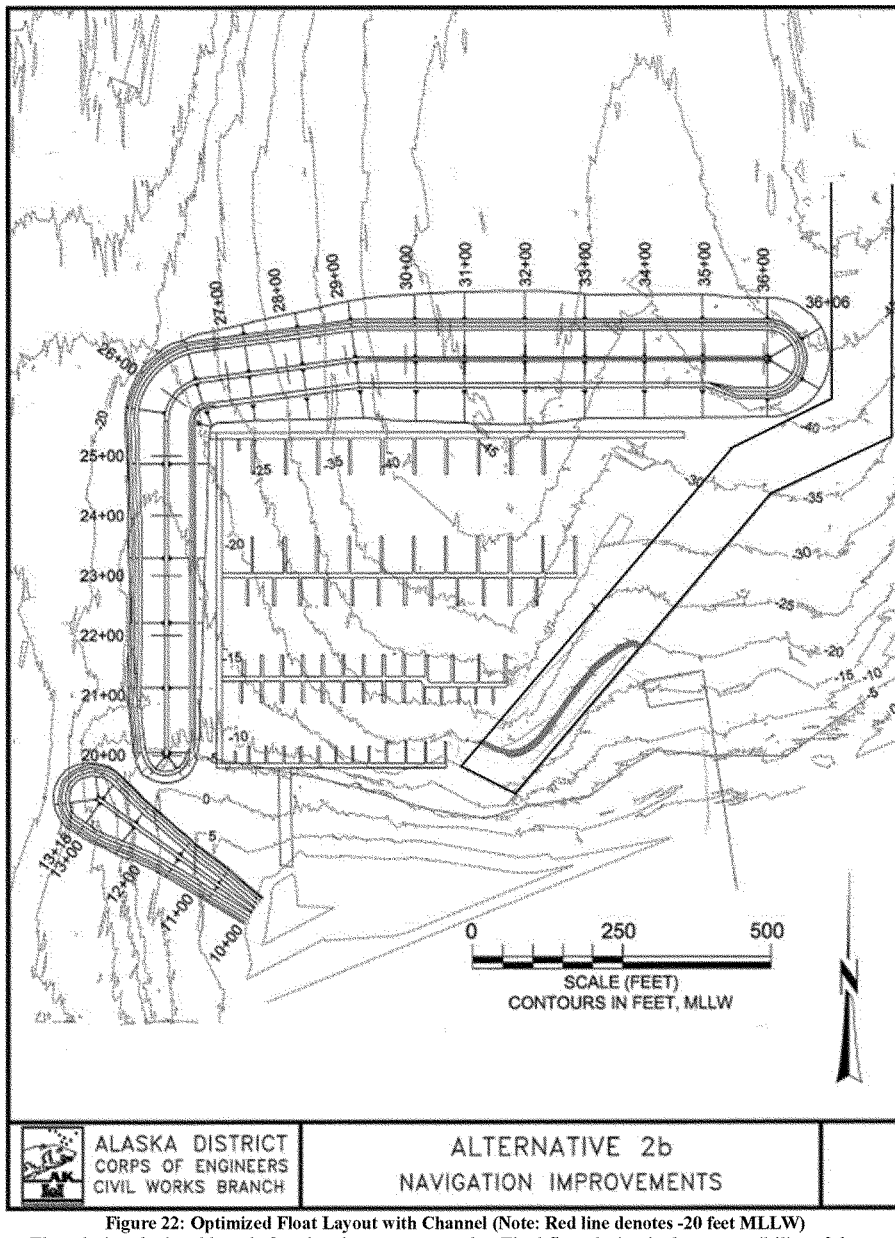


**Figure 22: Optimized Float Layout with Channel (Note: Red line denotes -20 feet MLLW)**

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

### 7.1.2 Plan Costs and Benefits

As shown in Table 31, the Recommended Plan provides annual navigation benefits of $1,897,000. The annual Economic Cost is $1,536,000 with net annual benefits of $361,000 and a benefit to cost ratio of 1.24. Economic analyses are based on October 2015 price levels, a 50-year period of analysis, and the Federal fiscal year 2016 discount rate of 3.125 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 Dredging and Disposal

The recommended plan has been formulated to avoid dredging in order to minimize environmental impacts and lifecycle costs. 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.

### 7.1.5 Operations, Maintenance, Repair, Replacement, and Rehabilitation (OMRRR)

Total present value OMRRR costs for the recommended plan over the 50-year period of analysis are $991,000. This total is based upon replacement of 5 percent of armor rock every 25 years, anode replacement every 15 years, and float replacement every 40 years. These values are a reflection of general conditions seen in other harbors in this region. A brief discussion of Federal and non-Federal OMRRR responsibilities is included below.

#### 7.1.5.1 Federal

The Corps of Engineers will be responsible for maintenance of the breakwaters. Although extremely unlikely, occasional dredging may be required to maintain sufficient entrance channel depths. Should dredging become necessary, a disposal site would need to be identified and measures taken to ensure that any 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.

#### 7.1.5.2 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.

### 7.1.6 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 32.

**Table 32: LERRs Requirements**

| Features | Owner(s) | Area | Interest | GNF/LSF |
|---|---|---|---|---|
| Entrance Channel, Breakwater (Portions Below MHW) | City of Craig and State of Alaska | 8.4 ac | Navigational Servitude | GNF |
| Breakwater (Portions Above MHW) | City of Craig | 2,000 sf | Fee Simple | GNF |
| Mooring Basin (Below MHW) | City of Craig and State of Alaska | 10.1 ac | Navigational Servitude | GNF |
| Temporary Staging | City of Craig | 0.65 ac | 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 Sea Level Change

As the note to Table 12 states, much of southeast Alaska is experiencing isostatic rebound and therefore it is unlikely that the area will experience sea level change of 1.93 feet. However, if significant sea level rise were to take place, additional rock could be added to a breakwater in order to maintain its crest height relative to MLLW. Conversely, isostatic rebound is not expected to significantly affect navigation due to the naturally deep water within the basin.

### 7.5.2 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.

### 7.5.3 Wind and Wave Data

Wind data from a Coastal Marine Automated Network (C-MAN) (shown in the H&H appendix) was utilized to develop a detailed wave analysis for northerly waves. Data from the Five Fingers Lighthouse C-MAN site was used since it provided the most reliable data set for unobstructed winds from the north. Even though wind speed data was available from the Klawock Airport, the airport appears to be sheltered from wind from the north, which is the dominant fetch direction. Therefore, although the C-MAN site is located a further distance from the project area, its data set was used because it is believed to provide the most accurate unobstructed wind speed data from the dominant fetch direction.

Local accounts and video provided evidence that long period swell approaches the project site from the southwest. There is no National Data Buoy Center data for the project area and therefore there is no data available to prove the existence of swell. Further modeling confirmed the evidence provided by the non-Federal partner. It is believed that risks posed by the lack of locally available wind and wave data have been mitigated to the extent possible.

### 7.5.4 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.

### 7.5.5 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.

### 7.5.6 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 appropriate design. The Alaska District has an abundance of experience in including fish passage into breakwater designs. Because of these factors, this risk was tolerated.

### 7.5.7 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.

There is not much uncertainty surrounding construction activities. The Alaska District has more than adequate experience in the design and construction of small boat harbors. This project has multiple local rock sources that could provide material to the project. The non-Federal partner is experienced in constructing, operating, and maintaining small boat harbors.

## 7.6 Implementation

### 7.6.1 Schedule

Table 33 shows the anticipated schedule through the end of construction.

Table 33: Schedule

| Item | Milestone | Date |
|---|---|---|
| Civil Works Review Board | CW245 | November 2015 |
| Chief's Report | CW270 | May 2016 |
| Feasibility Report to Congress | CW180 | August 2016 |
| Sign PED Agreement | CW300 | October 2017 |
| Final Plans and Specifications | CW330 | June 2018 |
| Contract Award/Notice to Proceed | CW440 | October 2018 |
| Notice of Completion/Assumption of OMRRR | CW480 | October 2020 |

### 7.6.2 Preconstruction Engineering and Design

Estimated preconstruction engineering and design activities and costs are shown below in Table 34.

Table 34: Preconstruction Engineering and Design Costs

| Discipline/Task | Amount |
|---|---|
| Project Management | $90,000 |
| Environmental | $90,000 |
| Contracting | $130,000 |
| Cost Engineering | $90,000 |
| Survey | $90,000 |
| Geotechnical | $450,000 |
| Hydraulics and Hydrology | $450,000 |
| Contingency at 10 percent | $150,000 |
| **Total:** | **$1,540,000** |

During this phase, geotechnical borings will be taken along the alignment of the breakwater. The footprint of the breakwater is approximately 650 feet west of the boatway where contaminated soils are assumed to be present due to paint scraping and other maintenance activities that took place during cannery operations (Figure 23). Because of the distance from the source and the amount of time that has passed since these activities took place, it is extremely unlikely that any contaminated soils are located within the breakwater footprint. Significant soil remediation has already been completed throughout the uplands between the boatway and breakwater tie-in site, significantly reducing the risk legacy contaminants are migrating from the cannery operations site or boatway to the breakwater footprint.

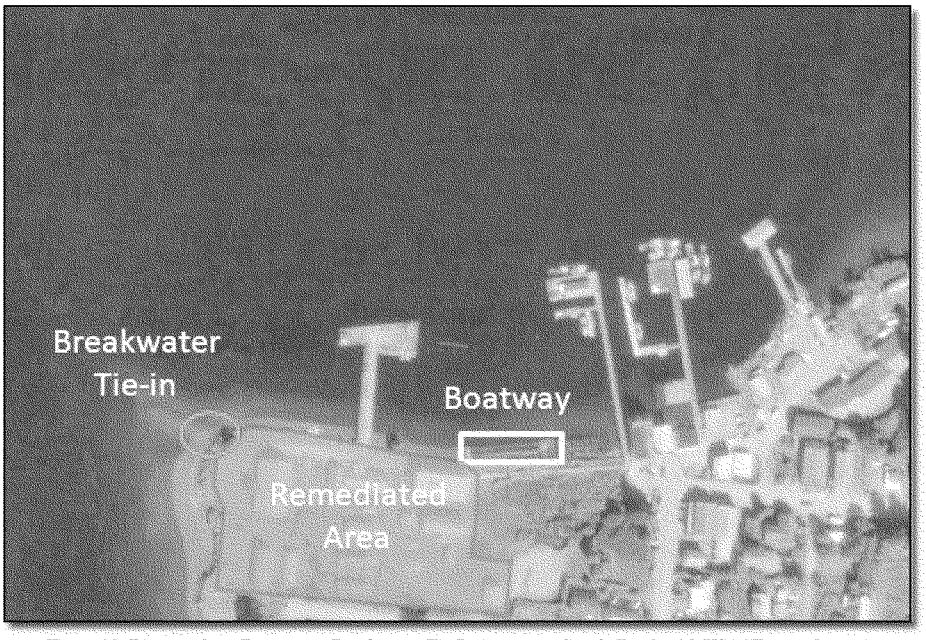


**Figure 23: Distance from Boatway to Breakwater Tie-In (courtesy: Google Earth with USACE amendments)**

However, if during geotechnical borings any indications of HTRW, such as barrels, are discovered, environmental analyses of the soils will be conducted to ensure no HTRW are present. If during these analyses, HTRW is discovered, the sponsor would be responsible for any remediation efforts and construction would only take place once the site was properly remediated.

### 7.6.3 Cost Sharing

#### 7.6.3.1 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 35.

**Table 35: Construction Cost Apportionment**

| | Cost Contribution (%) | |
|---|---|---|
| **Portion of Project** | **Federal** | **Non-Federal** |
| General Navigation Features (breakwater) | 90 | 10 |
| Local Service Facilities (floats) | 0 | 100 |
| Aids to Navigation (provided by USCG) | 100 | 0 |

*Note to Table:* The non-Federal partner will pay an additional 10 percent toward general navigation features over a period not to exceed 30 years. This may be accomplished through crediting for LERRs provided or through direct payments.

### 7.6.3.2 Cost Allocation

Table 36 shows the cost apportionment for the Recommended Plan.

**Table 36: Federal/Non-Federal Initial Cost Apportionment for the Recommended Plan[2]**

| General Navigation Features (GNF): | Total Cost <20 Feet | Federal Share 90% | Non-Federal Share 10% |
|---|---|---|---|
| Mobilization/Demobilization | $1,096,000 | $986,400 | $109,600 |
| Breakwaters | $27,256,000 | $24,530,400 | $2,725,600 |
| Preconstruction Engineering & Design | $1,544,000 | $1,389,600 | $154,400 |
| Construction Management (S&A) | $2,395,000 | $2,155,500 | $239,500 |
| **NED Subtotal Construction of GNF:** | **$32,291,000** | **$29,061,900** | **$3,229,100** |
| LERR Administrative Costs | $26,000 | $ - | $26,000 |
| **NED Total Project First Cost:** | **$32,317,000** | **$29,061,900** | **$3,255,100** |
| **Local Service Facilities (LSF):** | | | |
| Mooring Floats and Gangways | $2,577,000 | $ - | $2,577,000 |
| Piles, Caps, and Anodes | $1,161,000 | $ - | $1,161,000 |
| Demolition | $390,000 | $ - | $390,000 |
| **Subtotal LSF:** | **$4,128,000** | **$ -** | **$4,128,000** |
| Aids to Navigation[3] | $18,000 | $18,000 | $ - |
| Credit for LERR | $ - | $26,000 | $ (26,000) |
| 10% of GNF Non-Federal[4] | $ - | $ (3,229,100) | $3,229,100 |
| **Total NED Cost Allocation:[5][6]** | **$36,463,000** | **$25,876,800** | **$10,586,200** |

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 the natural controlling depth of the project, defined in the case as "the shallowest portion of the channel that allows access to the mooring area" is shallower than -20 feet MLLW. 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 LERR necessary for construction, operation, and maintenance of the general navigation features. This post construction contribution is current estimated at $3,203,100 as shown below.

[2] May not equal previous tables due to differing calculations in PED, OMRR&R, and land acquisition costs. Table shows Project First Costs per Director of Civil Works' Memorandum dated 25 August 2011.
[3] Aids to Navigation are a 100% Federal Cost.
[4] The Non-Federal Partner shall pay an additional 10 percent of the costs of GNF, pursuant to Section 101 of WRDA86.
[5] In addition to these costs, there are annual OMRR&R costs of approximately $39,000.
[6] Final Allocation is 71 percent Federal, 29 percent Non-Federal.

Table 37: Non-Federal Post Construction Contribution

| Total GNF | 10% of GNF | LERR Credit | Non-Federal post-construction contribution |
|---|---|---|---|
| $32,291,000 | $3,229,100 | $26,000 | $3,203,100 |

# 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 with 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 where 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. Sources of rock that are currently under consideration include the Shaan Seet Quarry, (referred to locally as the "Lower and Upper 62 Quarry") and the Southeast Road Builders Quarry (referred to locally as "Klawock Rock"). However, final selection of the rock source used for construction is the responsibility of the contractor. The Contractor will bear this in mind in the selection of rock sources for constructing the breakwaters or placing fill 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 determined that the project activities are "not likely to adversely affect" humpback whales and received 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 9).

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 and a reduction in current velocities from construction of the breakwater may encourage expansion of the existing eelgrass bed.

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. With regards to coordination with NMFS, in response to a preliminary Corps request, NMFS provided EFH recommendations on May 5, 2014. On January 5, 2015, the EFH assessment was provided to NMFS. After receipt of the EFH Assessment in January 2015, NMFS determined that no additional EFH Conservation Recommendations were needed. Accordingly, NMFS did not provide further EFH recommendations beyond the general EFH recommendations it had previously provided on May 5, 2014.

## 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

The proposed removal of the pier and associated free-standing pilings would constitute an adverse effect to CRG-722 and CRG-721 since the pier is a contributing feature to the historic cannery property. Furthermore, construction of the breakwater and removal of CRG-722 has the potential to adversely affect CRG-728, which is currently identified in the uplands of the cannery property. The prehistoric component of this site is largely unknown and does not have sufficiently-delineated boundaries. Any ground disturbing activities in the cannery's uplands have the potential to disturb components of CRG-728 including any potential petroglyphs. Therefore, an archaeologist will be onsite to monitor construction activities in the intertidal zone. The proposed project has the potential to encompass the unnamed roads within the cannery property. Site access, final construction and removal plans, and designation of equipment staging areas will be developed in concert with the contractor prior to construction.

The Corps has completed a preliminary cultural resource survey and made determinations of eligibility within the area of potential effect. A more thorough understanding of project construction methods is necessary before final mitigation strategies can be developed. Mitigation of adverse effects to CRG-722 will be addressed through ongoing consultation with the State Historic Preservation Officer with mitigation strategies contained within a Memorandum of Agreement. The City of Craig and Craig Tribal Association have been invited to join the consultation process for this project. Further courses of action related to historic and cultural resources may be necessary as plans are developed.

## 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 15$^{th}$ and June 15$^{th}$. 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 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) was circulated for public and agency review under Public Notice ER-15-01 dated January 5, 2015. The EA was made available on the Alaska District website for review by 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.

An initial letter dated July 16, 2014 informed SHPO of the proposed Federal undertaking that had the potential to affect historic properties. Follow-up letters dated October 23, 2014 and November 28, 2014 provided additional information regarding potential effects and

determinations of eligibility. Specifically, the Alaska District archaeologist identified potential effects to the Wards Cove Cannery and the Wards Cove Cannery pier as historic structures within the area of potential effect. These historic structures were evaluated for their National Register eligibility and were found to be eligible under Criteria A, C, and D. A letter from SHPO dated December 29, 2014 concurred with the Corps findings. A Memorandum of Agreement will be finalized prior to construction in accordance with ER 1105-2-100.

#### 9.2.1.10 EO 12898 – Environmental Justice, and EO 13045 - Protection of Children from Environmental Health Risks and Safety Risks

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Communities 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 USEPA defines environmental justice as the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences of industrial, municipal, or commercial operations or the execution of federal, state, local, or tribal programs and policies. 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.

Executive Order 13045 mandates federal agencies identify and assess environmental health and safety risks that may disproportionately affect children as a result of federal policies, programs, activities, and standards (63 Federal Register 19883 – 19888). Neither the recommended project nor the no action alternative would result in short or long-term actions that would disproportionately affect the safety and health of children.

#### 9.2.1.11 EO 13112 – Invasive Species

Section 2(a)(3) of Executive Order 13112 - Invasive Species (February 3, 1999) directs federal agencies to "not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species…" The recommended project is expected to utilize locally-quarried rock and locally-contracted heavy machinery and barges. Therefore, the risk of introducing invasive species to the site is minimal. Neither the recommended project nor the no action alternative is anticipated to cause or promote the spread of invasive species.

#### 9.2.1.12 EO 13186 – Migratory Birds

Similar to actions taken under the Migratory Bird Treaty Act of 1918, as amended, 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. Neither the recommended project nor the no action alternative are expected to have a significant impact on migratory birds.

#### 9.2.1.13 EO 11990 – Protection of Wetlands

Executive Order 11990 (Protection of Wetlands) requires the Corps, and other federal agencies, to evaluate the likely impacts of their proposed actions in wetlands. The objectives of the Executive Order are to avoid, to the extent possible, the long-term and short-term adverse impacts associated with occupancy, modification, or destruction of wetlands, and to avoid indirect support of development and new construction in such areas, wherever there is a practicable alternative.

The objectives of Executive Order 11990 have been considered in the formulation of plans for this project. The following determinations have been made in response to requirements of Executive Order 11990 which pertains to wetland management. Wetlands are defined under the Clean Water Act as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

There are no naturally occurring wetlands within the recommended project area, and therefore no impacts to wetlands would occur. The recommended project does not conflict with applicable state and local standards concerning wetland protection and permitting. The recommended project will not significantly affect the natural and beneficial values of adjacent wetlands, and no wetlands will be permanently filled. The recommended project has avoided impacts to adjacent wetlands, and therefore mitigation to ensure no net loss of wetlands is unnecessary. The recommended project is therefore in compliance with Executive Order 11990.

#### 9.2.1.14 Clean Air Act of 1963, as amended (42 USC 7401, et seq.)

Craig is not located in either a maintenance or non-attainment area for any pollutant under the Clean Air Act. Activities due to construction, operation, and maintenance of the project include: surface disturbances, construction equipment movement, and vehicle traffic including some government vehicle traffic used during monitoring and inspection activities. None of these activities are expected to produce any pollutants in quantities that would exceed Federal thresholds.

#### 9.2.1.15 Submerged Lands Act of 1953 (43 USC, 1301 et seq.)

Title II, Section 3, Paragraph (d) of the Submerged Lands Act of 1953 states that the Federal government retains control of submerged lands for the purposes of commercial navigation.

Furthermore, Policy Guidance Letter 44 affirms that lands within navigable waters are subject to the common law principle and that the Federal government need not acquire any further real estate interest in order to construct navigation projects. Therefore, this project is in full compliance with the act.

### 9.2.2 Status of Project Coordination

As of August 2015, 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

An initial letter dated July 16, 2014 informed SHPO of the proposed Federal undertaking that had the potential to affect historic properties. Follow-up letters dated October 23, 2014 and November 28, 2014 provided additional information regarding potential effects and determinations of eligibility. Specifically, the Alaska District archaeologist identified potential effects to the Wards Cove Cannery and the Wards Cove Cannery pier as historic structures within the area of potential effect. These historic structures were evaluated for their National Register eligibility and were found to be eligible under Criteria A, C, and D. A letter from SHPO dated December 29, 2014 concurred with the Corps findings. A Memorandum of Agreement will be finalized prior to construction in accordance with ER 1105-2-100.

#### 9.2.2.3 Federal Aviation Administration

The Federal Aviation Administration conducted an aeronautical study of the proposed project under provisions in 49 USC, Section 44718 and issued a Determination of No Hazard to Air Navigation (FAA 2015). The only required action under this determination is to notify the Federal Aviation Administration within 5 days after the construction reaches its greatest height.

## 9.3 Status of Environmental Compliance (Compliance Table)

Table 38: Summary of Relevant Federal Statutory Authorities

| Federal Statutory Authority | Compliance Status |
|---|---|
| Clean Air Act, as amended | FC |
| Clean Water Act of 1977, as amended | FC |
| Coastal Zone Management Act of 1982 | N/A |
| Endangered Species Act of 1973, as amended | FC |
| Environmental Justice (Executive Order 12898) | FC |
| Fish and Wildlife Coordination Act, as amended | FC |
| Invasive Species (Executive Order 13112) | 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 | FC |
| National Historic Preservation Act of 1966, as amended | FC |
| Protection of Children from Environmental Health Risks and Safety Risks (Executive Order 13045) | FC |
| Protection of Migratory Birds (Executive Order 13186) | FC |
| Protection of Wetlands (Executive Order 11990) | FC |
| Rivers and Harbors Act of 1899 | FC |
| Migratory Birds (Executive Order 13186) | FC |
| Submerged Lands Act, as amended | FC |

*PC = Partial Compliance, FC = Full Compliance*
*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 has been prepared. The Alaska District Office of Counsel has reviewed this document and has issued a certification of legal sufficiency.

## 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 $29.1 million and $39,000 annually for Federal maintenance provided that prior to construction the local sponsor agrees to the following:

a. Provide 10 percent of design costs during the period of design;

b. Provide, during period of construction, any additional funds needed to cover the non-Federal share of design costs;

c. Provide, during the period of construction, a cash contribution equal to the following percentages of the total cost of construction of the general navigation features (which include the construction of land-based and aquatic dredged material disposal facilities that are necessary for the placement of dredged material required for project construction or operation and maintenance and for which a contract for the federal facility's construction or improvement was not awarded on or before October 12, 1996;):

(1) 10 percent of the costs attributable to a project depth not in excess of 20 feet;

(2) 25 percent of the costs attributable to a project depth in excess of 20 feet but not in excess of 45 feet;

(3) 50 percent of the costs attributable to a project depth in excess of 45 feet;

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

e. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the general navigation features, an additional amount equal to 10 percent of the total cost of construction of the general navigation features less the amount of credit afforded by the Government for the value of lands, easements, rights-of-way, and relocations, including utility relocations, provided by the non-Federal sponsor for the general navigation features. If the amount of credit afforded by the Government for the value of lands, easements, rights-of-way, and relocations, including utility relocations, provided by the non-Federal sponsor equals or 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, including utility relocations, in excess of 10 percent of the total cost of construction of the general navigation features;

f. Provide, operate, and maintain at no cost to the Government, the local service facilities including docks, floats, local access channels, mooring areas, etc.; 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 therefor, to meet any of the non-Federal sponsor's obligations for the project unless the Federal agency providing the funds verifies in writing that the funds are authorized to carry out the project;

h. 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 general navigation features for the purpose of completing, inspection, and, if necessary, for the purpose of operating and maintaining the general navigation features;

i. 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;

j. Keep, and maintain books, records, documents, and 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, and other evidence are required, to the extent and in such detail as will properly reflect total cost of construction of the general navigation features, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments at 32 CFR, Section 33.20;

k. 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), 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, and rights-of-way that the Federal Government determines to be necessary for the construction or operation and maintenance of the general navigation features. However, for lands, easements, and rights-of-way that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigation 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;

l. Assume complete financial responsibility, as between the Federal Government and the non-Federal sponsor, for all 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 necessary for the construction or operation and maintenance of the general navigation features;

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

n. 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(e)) which provide that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

o. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655) and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way necessary for construction or operation and maintenance of the general navigation features including those necessary for relocations, the borrowing of material, or the disposal of dredged or excavated material, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act; and

p. Comply with all the requirements of applicable Federal laws and implementing regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto; the Age Discrimination Act of 1975 (42 U.S.C. 6102); the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Army Regulation 600-7 issued pursuant thereto; and 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (labor standards originally enacted as the Davis-Bacon Act, the Contract Work Hours and Safety Standards Act, and the Copeland Anti-Kick Act).

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

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: 3 Sep 2015

COL Michael S. Brooks
Commander
Corps of Engineers, Alaska District

## 11.0 REFERENCES*

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# Appendix A
# 404(b)(1) Evaluation

THE STATE of ALASKA
GOVERNOR BILL WALKER

**Department of Environmental Conservation**

DIVISION OF WATER
Wastewater Discharge Authorization Program

555 Cordova Street
Anchorage, Alaska 99501-2617
Main: 907.269.6285
Fax: 907.334.2415
www.dec.alaska.gov/water/wwdp

April 10, 2015

Certified Mail: 7012-3460-0002-9326-5202

Christopher Floyd
Environmental Resources Section
US Army Corps of Engineers
P.O. Box 6898
JBER, Alaska 99506-0898

Re: Craig Navigation and Harbor Improvements
Reference No. ER-15-01

Dear Mr. Floyd:

In accordance with Section 401 of the Federal Clean Water Act of 1977 and provisions of the Alaska Water Quality Standards, the Department of Environmental Conservation (DEC) is issuing the enclosed Certificate of Reasonable Assurance for placement of fill material in waters of the U.S. in association with construction of a new harbor in 10.1 acres in Klawock Inlet near Craig, Alaska.

DEC regulations provide that any person who disagrees with this decision may request an informal review by the Division Director in accordance with 18 AAC 15.185 or an adjudicatory hearing in accordance with 18 AAC 15.195 – 18 AAC 15.340. An informal review request must be delivered to the Director, Division of Water, 555 Cordova Street, Anchorage, AK 99501, within 15 days of the permit decision. Visit http://www.dec.state.ak.us/commish/ReviewGuidance.htm for information on Administrative Appeals of Department decisions.

An adjudicatory hearing request must be delivered to the Commissioner of the Department of Environmental Conservation, 410 Willoughby Avenue, Suite 303, PO Box 111800, Juneau, AK 99811-1800, within 30 days of the permit decision. If a hearing is not requested within 30 days, the right to appeal is waived.

By copy of this letter we are advising the U.S. Army Corps of Engineers of our actions and enclosing a copy of the certification for their use.

Sincerely,

James Rypkema
Program Manager, Storm Water and Wetlands

Enclosure: 401 Certificate of Reasonable Assurance

cc: (with encl.)
Michael Noah, USACE, Anchorage
Mark Minnillo, ADF&G
USFWS Field Office Juneau
Mark Jen, EPA Operations, Anchorage

# STATE OF ALASKA
# DEPARTMENT OF ENVIRONMENTAL CONSERVATION
# CERTIFICATE OF REASONABLE ASSURANCE

A Certificate of Reasonable Assurance, in accordance with Section 401 of the Federal Clean Water Act and the Alaska Water Quality Standards is issued to U.S. Corps of Engineers, Attention Christopher Floyd, at P.O. Box 6898, JBER, Alaska 99506, for placement of fill material in waters of the U.S. in association with the development of a new harbor in Klawock Inlet. Construction of the breakwaters would require the placement of approximately 31,100 cubic yards of armor rock, 42,650 cubic yards of crushed B-grade rock, and 205,300 cubic yards of core rock. The breakwater would occupy 10.1 acres of submerged land. The rock would be obtained from a local approved source. No dredging would be performed.

A State Water Quality Certification is required under Section 401 because the proposed activity will be authorized by a U.S. Army Corps of Engineers permit, reference number ER-15-01, and a discharge of pollutants to waters of the U.S. located in the State of Alaska may result from the proposed activity. Public notice of the application for this certification was given as required by 18 AAC 15.180 in the Corps Public Notice ER-15-01 posted from January 5, 2015 to February 5, 2015.

The proposed activity is in the near-shore environment at the northwest corner of Craig Island (roughly 55.48° N., -133.16 ° W., adjacent to Craig, Alaska in the Wards Cove Cannery site.

The Department of Environmental Conservation (DEC) reviewed the application and certifies that there is reasonable assurance that the proposed activity, as well as any discharge which may result, will comply with applicable provisions of Section 401 of the Clean Water Act and the Alaska Water Quality Standards, 18 AAC 70, provided that the following alternative measures are adhered to.

1. Reasonable precautions and controls must be used to prevent incidental and accidental discharge of petroleum products or other hazardous substances. Fuel storage and handling activities for equipment must be sited and conducted so there is no petroleum contamination of the ground, surface runoff or water bodies.
2. During construction, spill response equipment and supplies such as sorbent pads shall be available and used immediately to contain and cleanup oil, fuel, hydraulic fluid, antifreeze, or other pollutant spills. Any spill amount must be reported in accordance with Discharge Notification and Reporting Requirements (AS 46.03.755 and 18 AAC 75 Article 3). The applicant must contact by telephone the DEC Area Response Team for Southeast Alaska (907) 465-5340 during work hours or 1-800-478-9300 after hours. Also, the applicant must contact by telephone the National Response Center at 1-800-424-8802.
3. Fill material must be clean sand, gravel or rock, free from petroleum products and toxic contaminants in toxic amounts.

This certification expires five (5) years after the date the certification is signed. If your project is not completed by then and work under U.S Army Corps of Engineers Permit will continue, you must submit an application for renewal of this certification no later than 30 days before the expiration date (18 AAC 15.100).

Date: April 10, 2015

James Rypkema, Program Manager
Storm Water and Wetlands

**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).

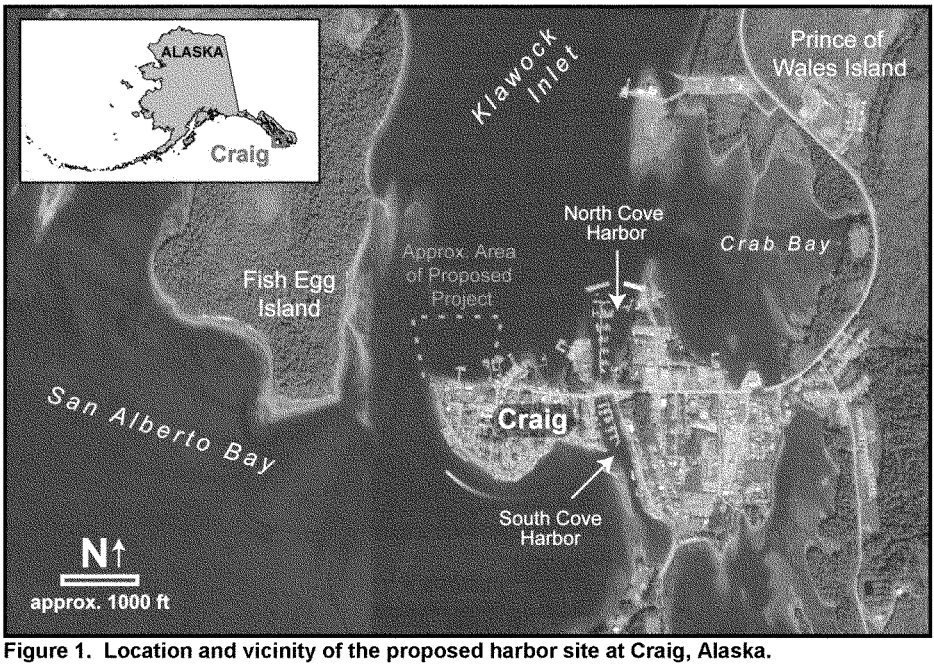


**Figure 1. Location and vicinity of the proposed harbor site at Craig, Alaska.**

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,

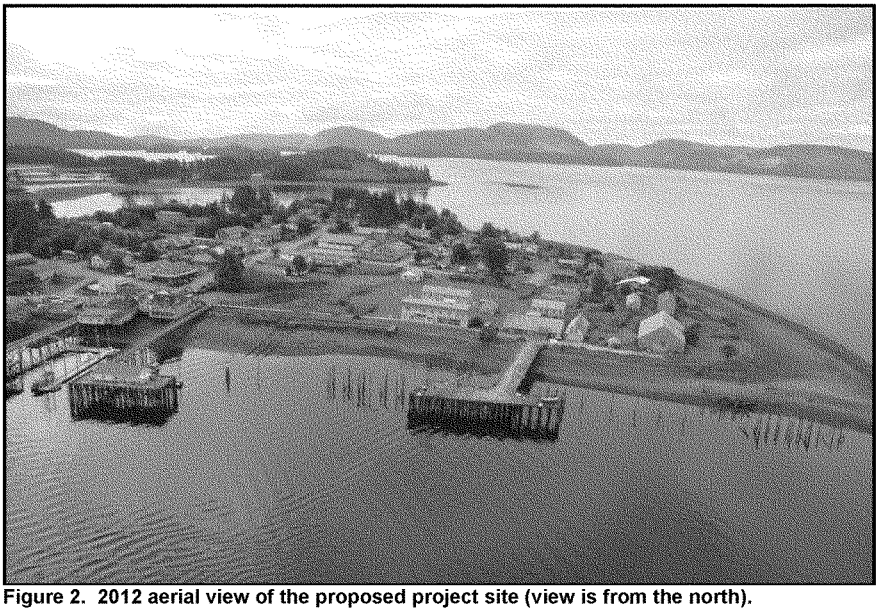

**Figure 2. 2012 aerial view of the proposed project site (view is from the north).**

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 10.1 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 10.1 acres of submerged land. The rock would be obtained from a local approved source. No dredging would be performed.

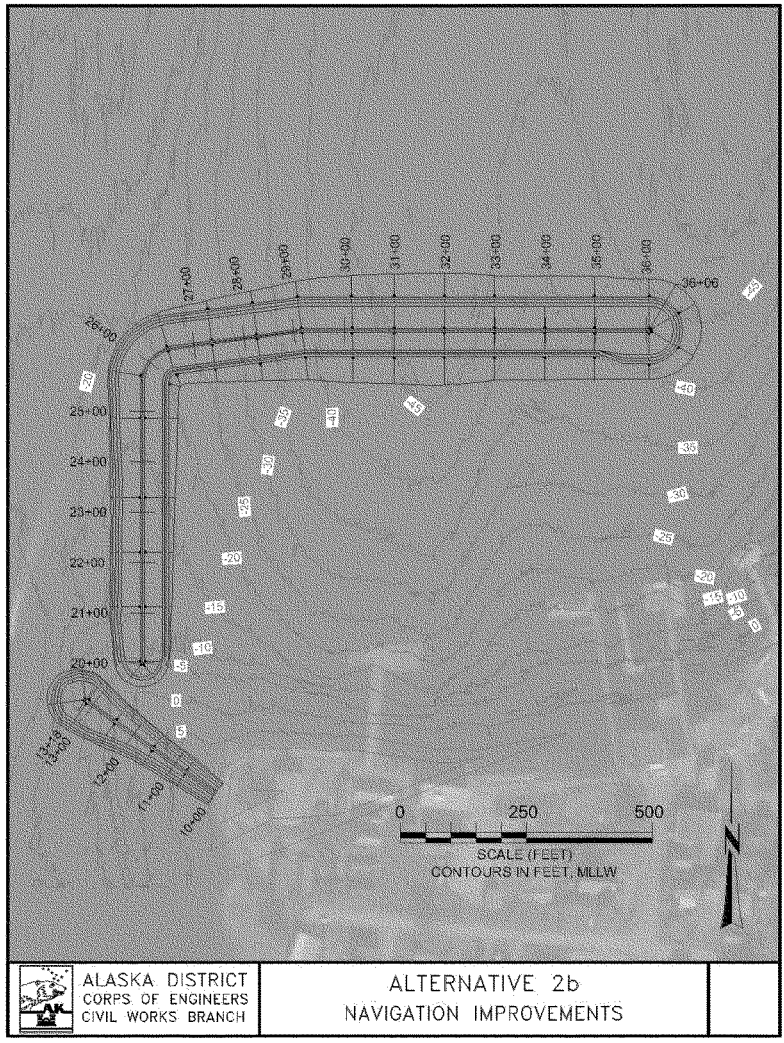


**Figure 1. Layout of Alternative 2b, the Tentatively Selected Plan.**

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 10.1 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.

F. Proposed Disposal Site Determinations: 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.

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

All of the configuration alternatives carried forward for detailed analysis have similar impacts to the aquatic ecosystem. None of these alternatives has less adverse impacts on the aquatic ecosystem.

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

**Prepared by:**

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
JOINT BASE ELMENDORF-RICHARDSON
ALASKA 99506-0898

**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, 83$^{rd}$ Congress, 2$^{nd}$ 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).

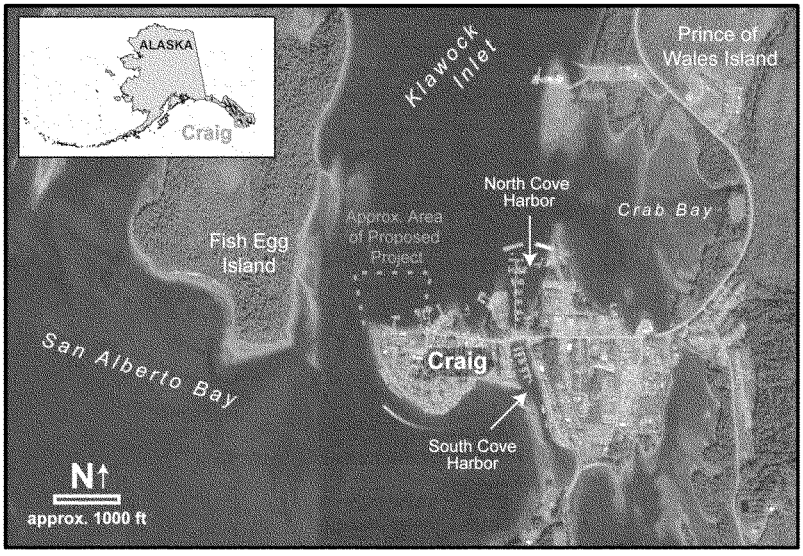


**Figure 1. Project site location**

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.

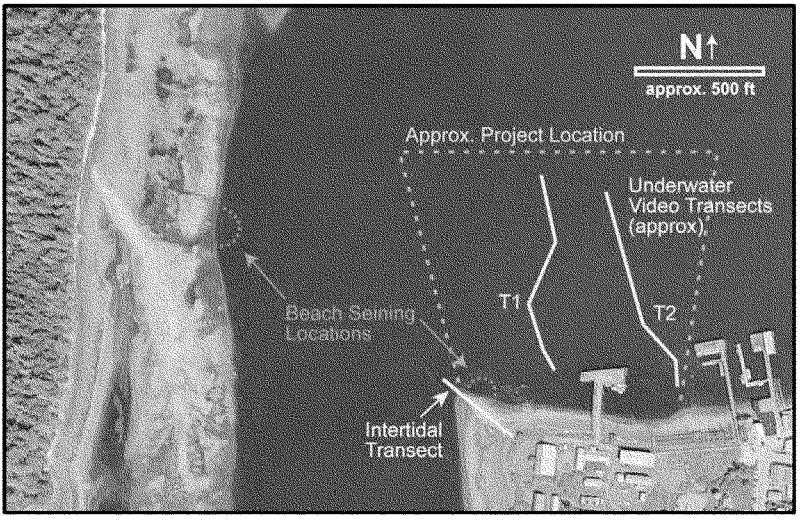


**Figure 2. April 2014 study areas**

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.

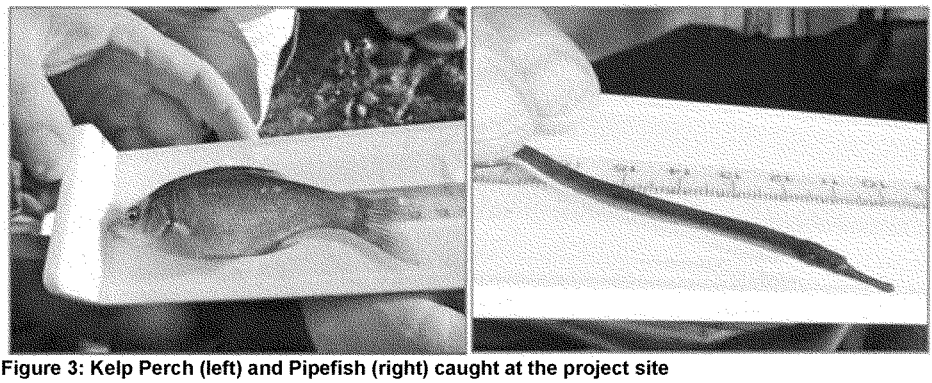

**Figure 3: Kelp Perch (left) and Pipefish (right) caught at the project site**

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 10.1 acres.

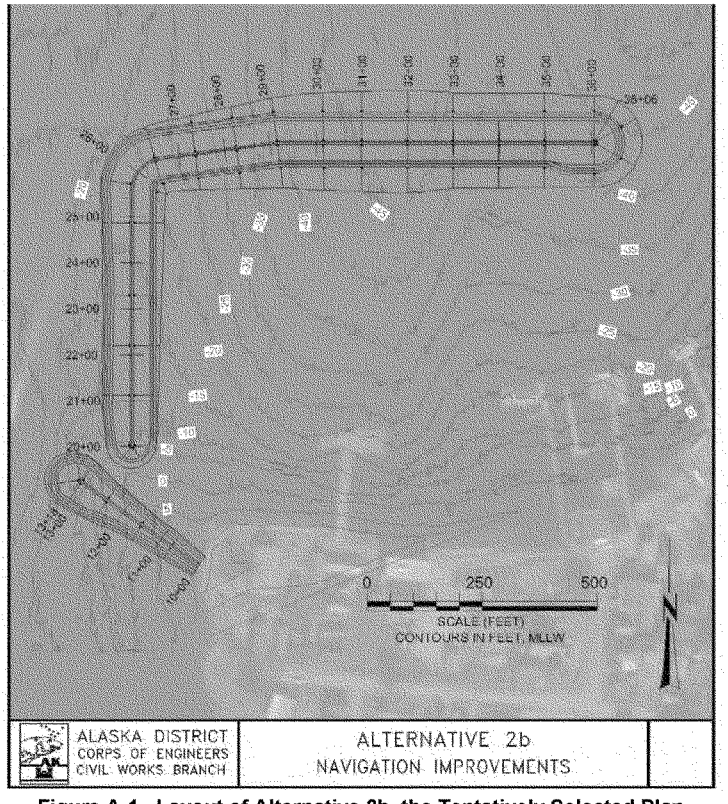


**Figure A-1. Layout of Alternative 2b, the Tentatively Selected Plan.**

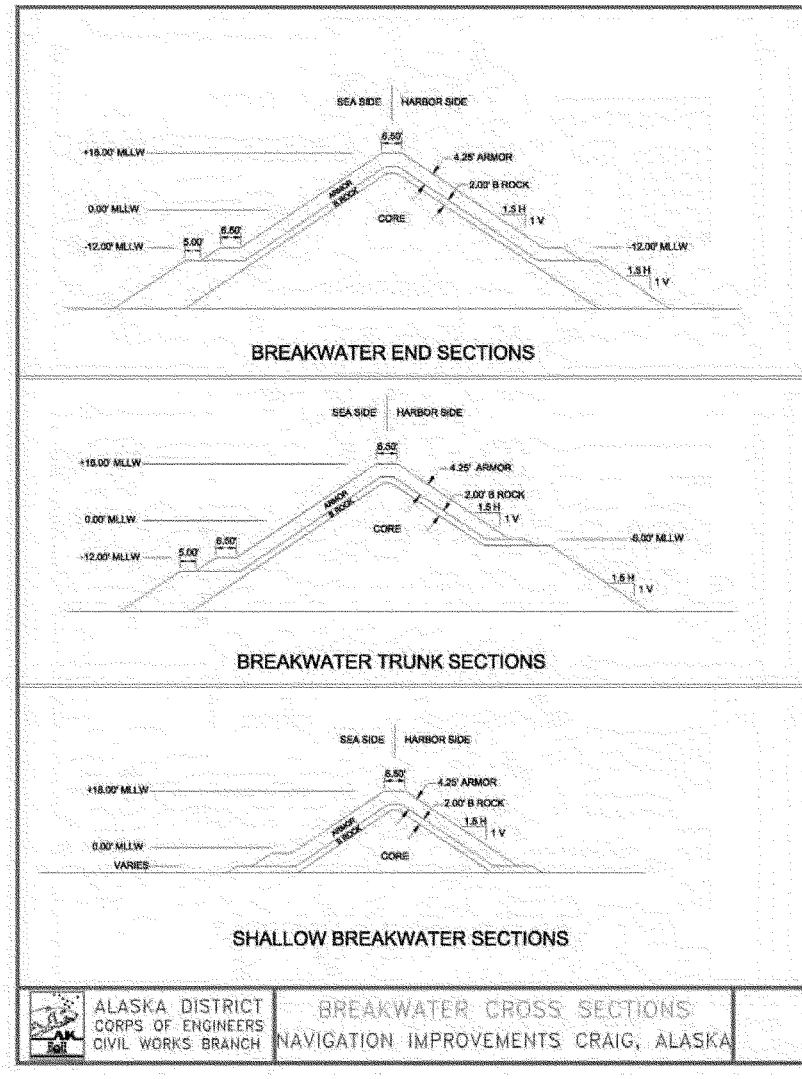


**Figure A-2. Typical breakwater cross sections.**

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.

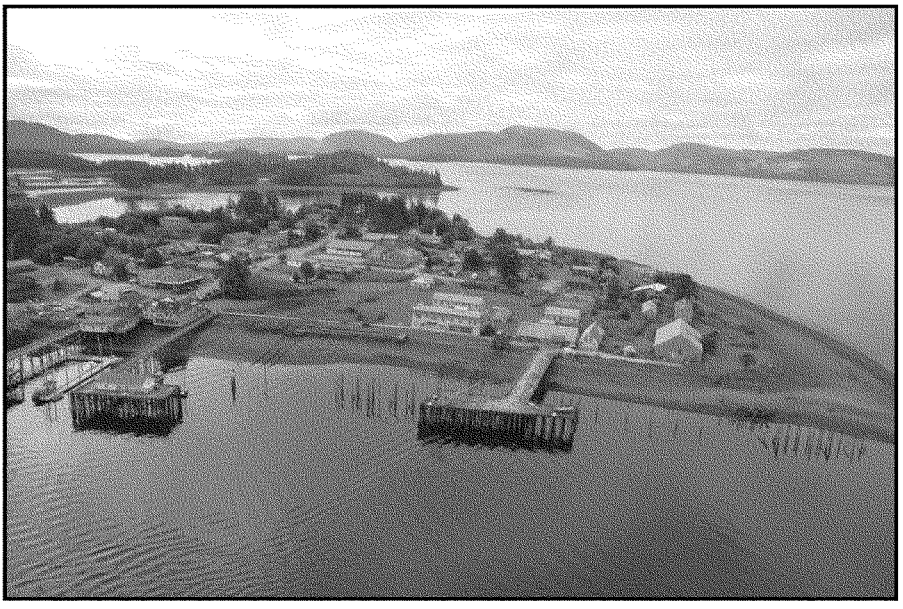

**Figure 2. 2012 aerial view of the proposed project site (view is from the north).**

**Attachment B**

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

**Alaska Stocks of Pacific Salmon**

**Pink Salmon**

**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.

## Coho Salmon

**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 & Hydrology

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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.

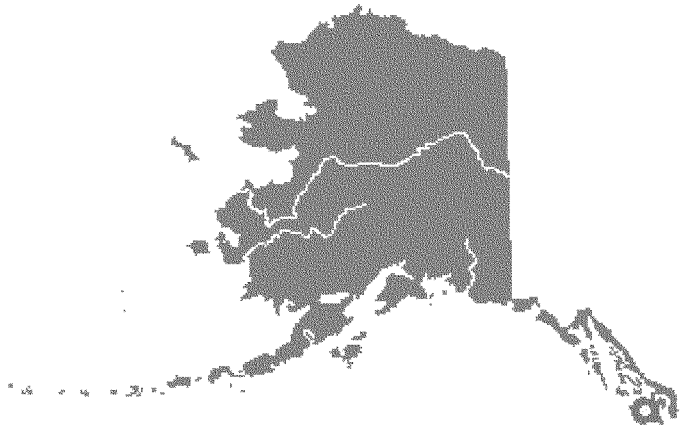

**Figure 1 State of Alaska location map with location of Craig.**

# 2.0 CLIMATOLOGY, METEOROLOGY, HYDROLOGY

## 2.1 Temperature and Precipitation

Craig (Figure 2) is dominated by a cool, moist, maritime climate. Summer temperatures typically range from 48-64° F. Winter temperatures typically range from 30 to 42° F. Average annual precipitation is 97 inches, and average annual snowfall is 22.5 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.

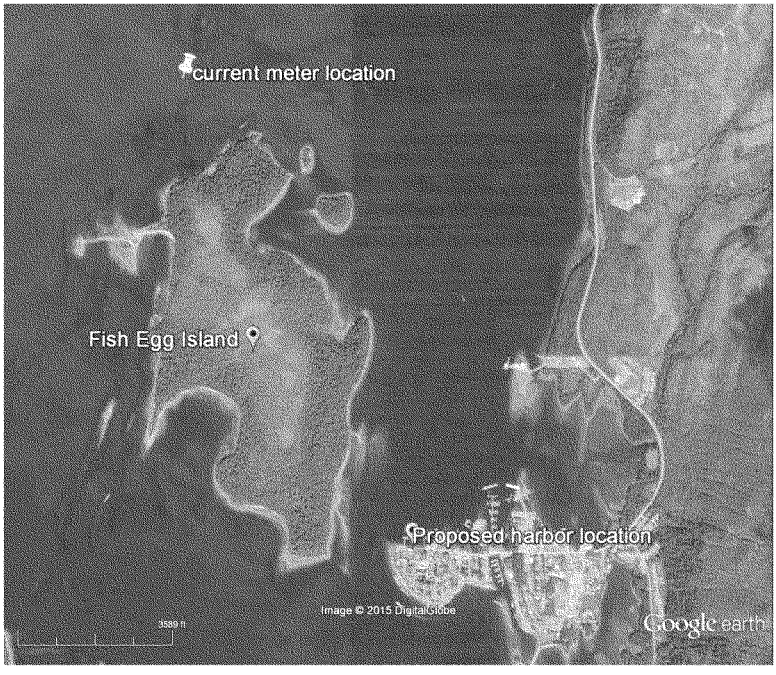


**Figure 3 Location of current meter**

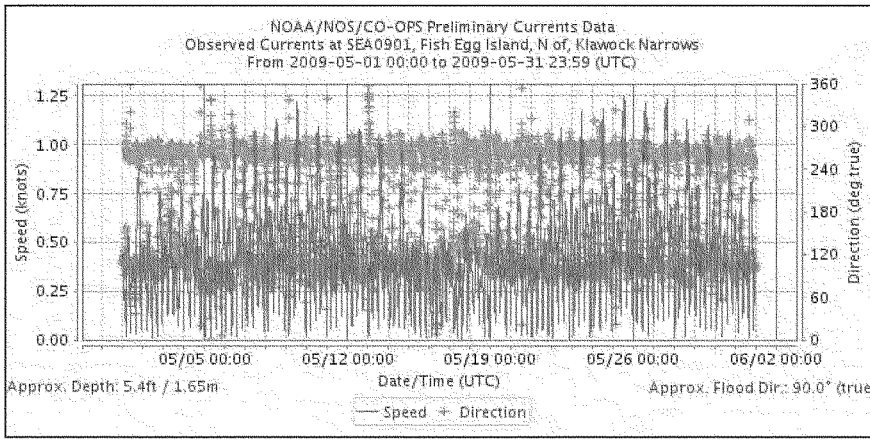


**Figure 4. Sample data from May 2009**

**Table 3 Average Current Velocity**

| **Fish Egg Island, N of, Klawock Narrows (SEA0901)**<br>**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 Engineering Regulation (ER) 1100-2-8162 provides guidance for incorporating the effects of projected future sea level change (SLC). The range of possible future rates of change are 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.

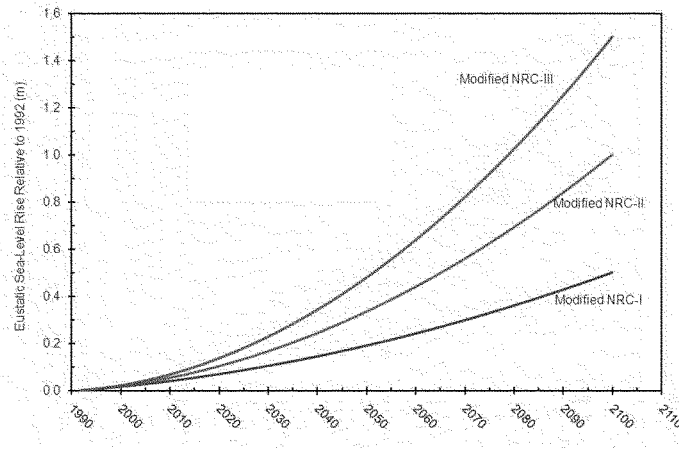


**Figure 5 Scenarios for GMSL Rise (based on updates to NRC 1987 equation).**

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 to be added to a measured sea level trend for the Craig area. NOAA has sea level trends published for Ketchikan, Alaska, which is the closest station to Craig with at least 40 years

of record. The sea level trend for Ketchikan is -0.00062 feet/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 Relative Sea Level Rise Prediction**

| Sea Level Change | Low | Intermediate | High |
|---|---|---|---|
| 50 years (2065) | -0.04 feet | 0.43 feet | 1.93 feet |
| 100 years (2115) | -0.08 feet | 1.27 feet | 5.53 feet |

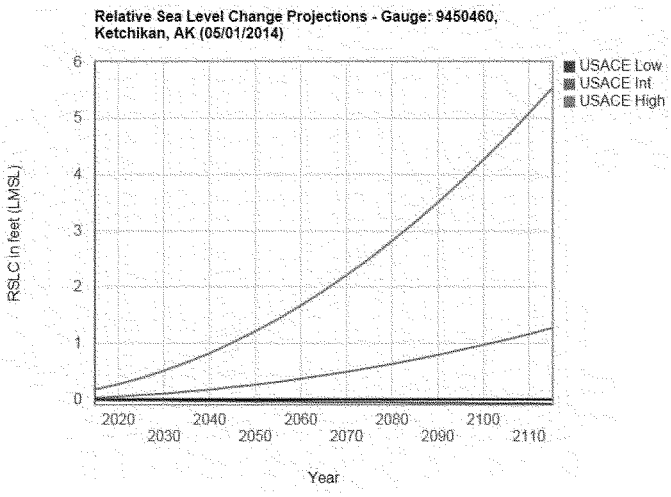


**Figure 6 Plot of Relative Sea Level Rise curves**

For an assumed construction start in 2015 and a fifty year project life, a project at Craig could see the relative sea level fall by 0.04 feet or rise by as much as 1.93 feet. In 100 years, the relative sea level could fall by 0.08 feet or rise by 5.53 feet (Table 4). It is unlikely that the sea level would rise as much as predicted under the High scenario since; in general, the southeast area of Alaska has been experiencing isostatic rebound. The intermediate relative sea level rise scenario is a potential at the site, but unlikely since it does not agree with historic measurements. In the unlikely case that the intermediate scenario occurs, the sea level could rise as much as 0.43 feet during the project life, and 1.27 feet over 100 years. In the unlikely event that the Intermediate or High Level of Relative Sea Level Change noted in Table 4 occurs, the design can be adapted to increase the breakwater height. The proposed design can be modified by adding armor stone or a parapet wall to the breakwater crest to prevent overtopping during storm events. For this study the low level of sea level change was used for calculations since the historic records for the area indicate that the Craig area is experiencing a relative sea level reduction, and not a relative sea level rise.

## 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.

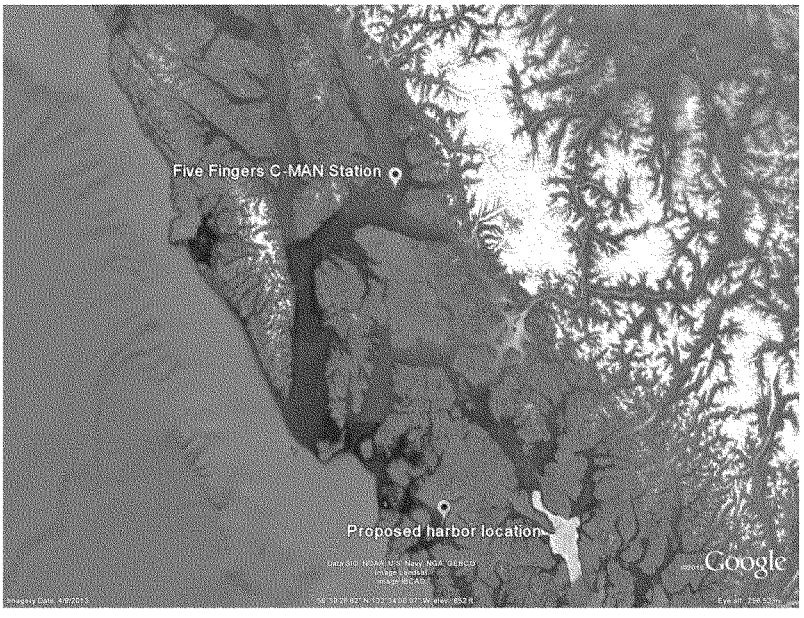


**Figure 7 Location of C-MAN station used for wind data**

**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

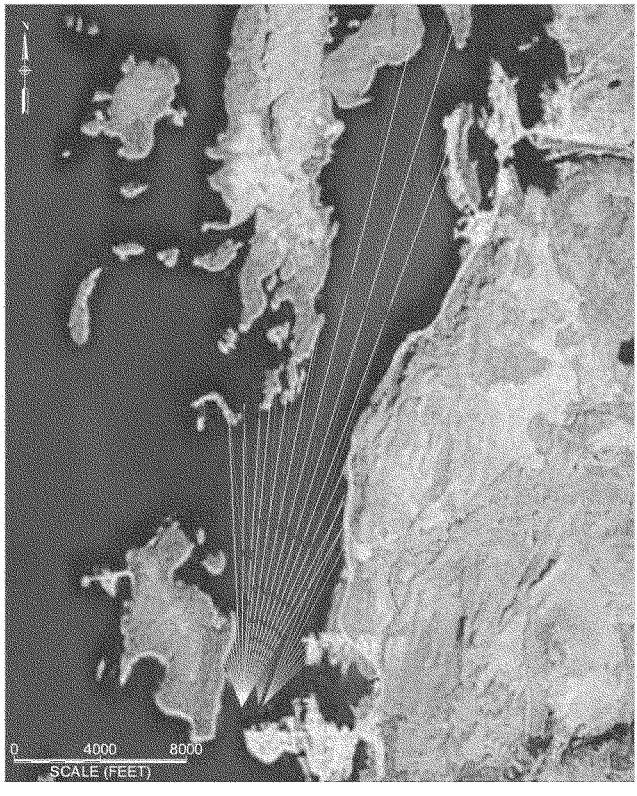


**Figure 8 Fetches used in design**

## 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.

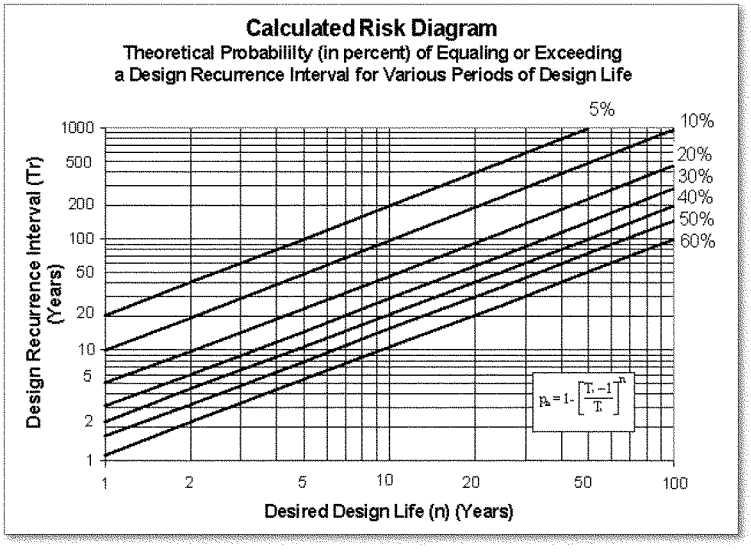


**Figure 9 Calculated Risk Diagram**

# 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 less than 20 feet to greater than 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 for armor stone with a specific weight of 165 pounds per cubic foot. 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.

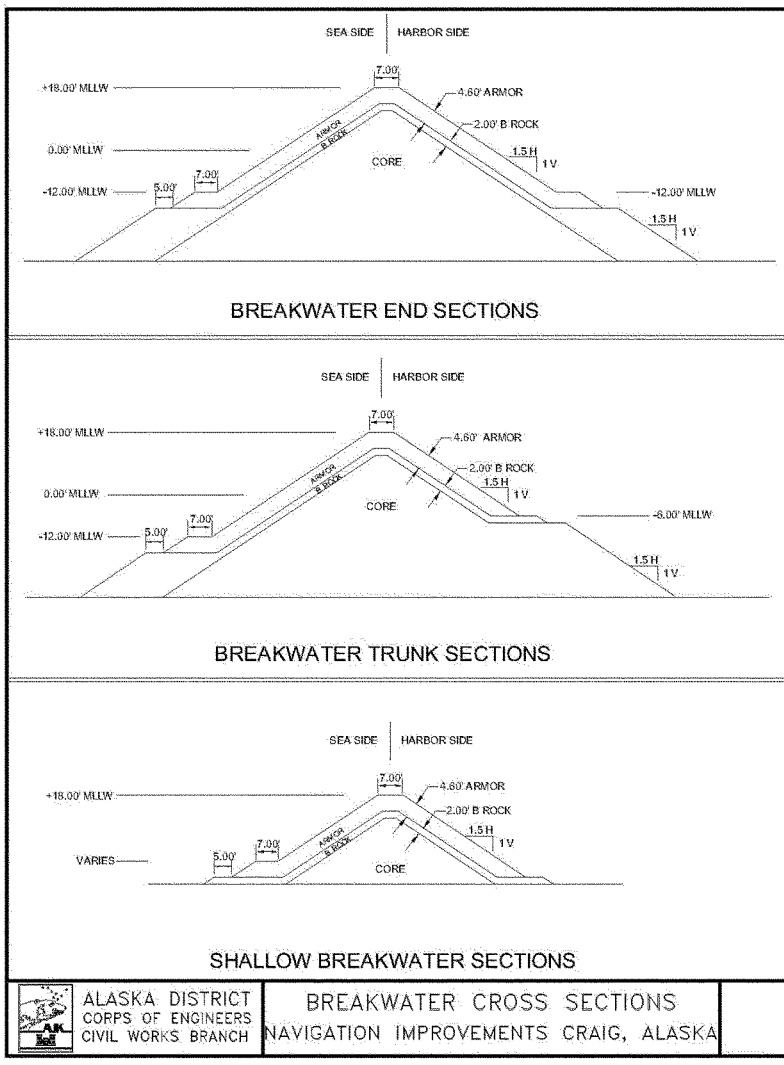


**Figure 10 Typical cross sections**

# 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.

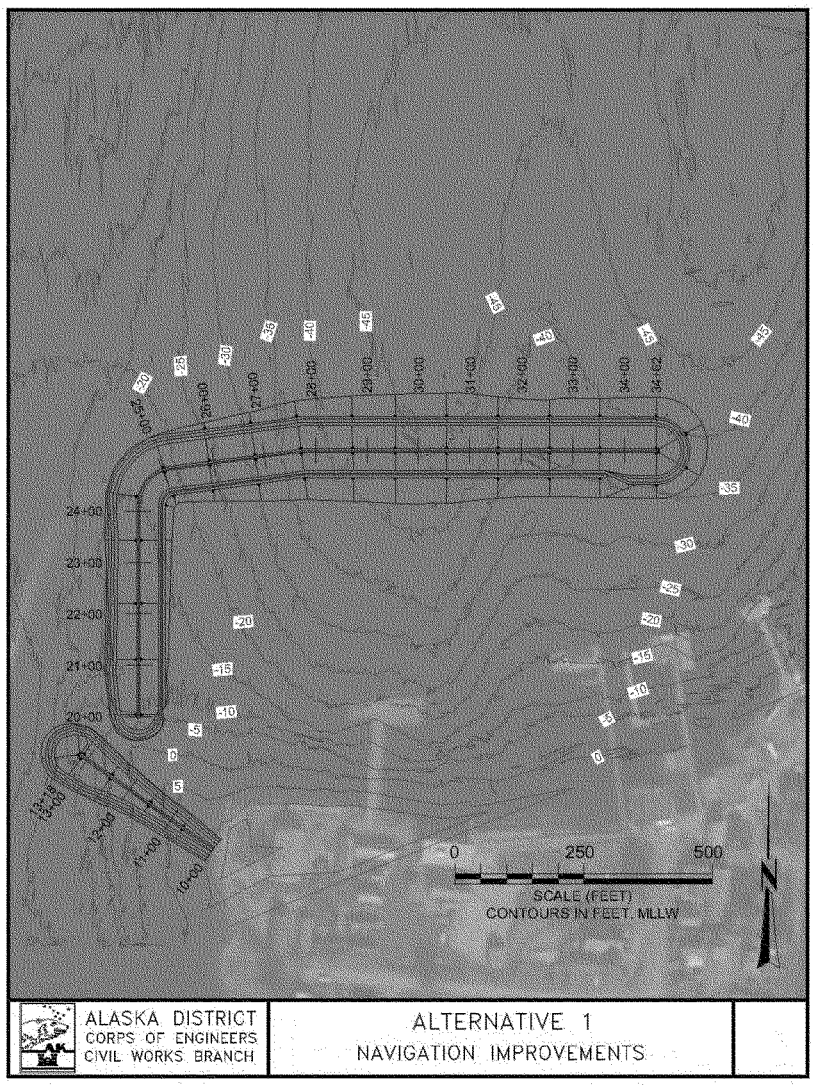


**Figure 11 Plan view of Alternative 1**

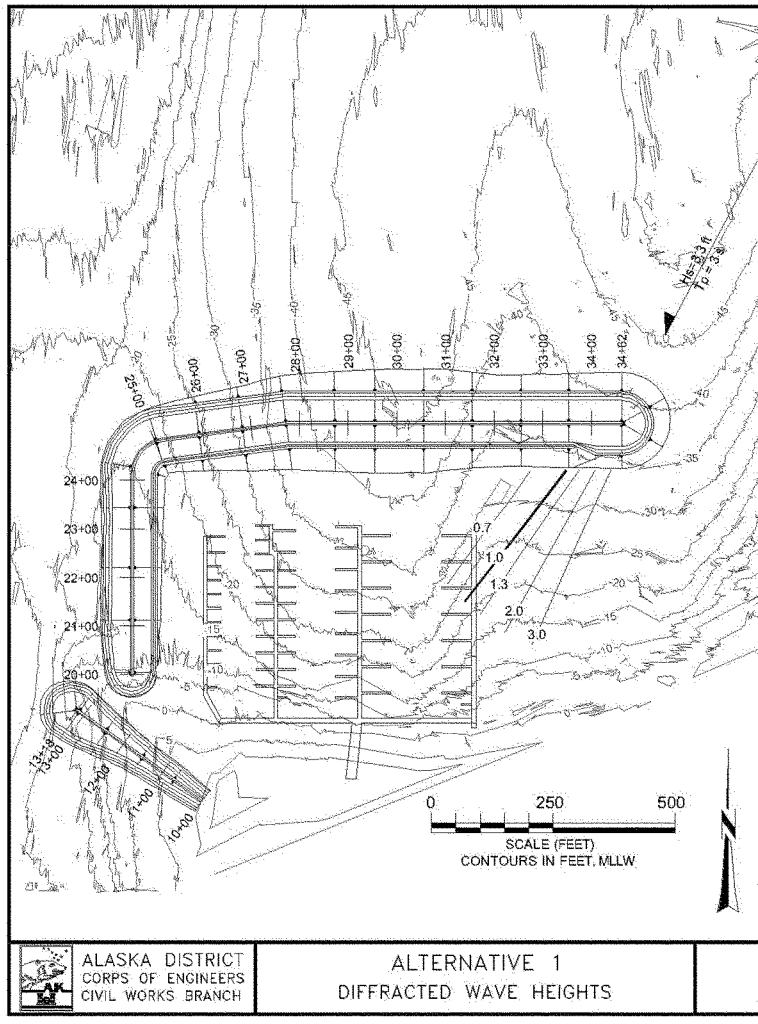


**Figure 12 Diffracted wave heights for Alternative 1. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.**

## 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 during the extreme events.

**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.

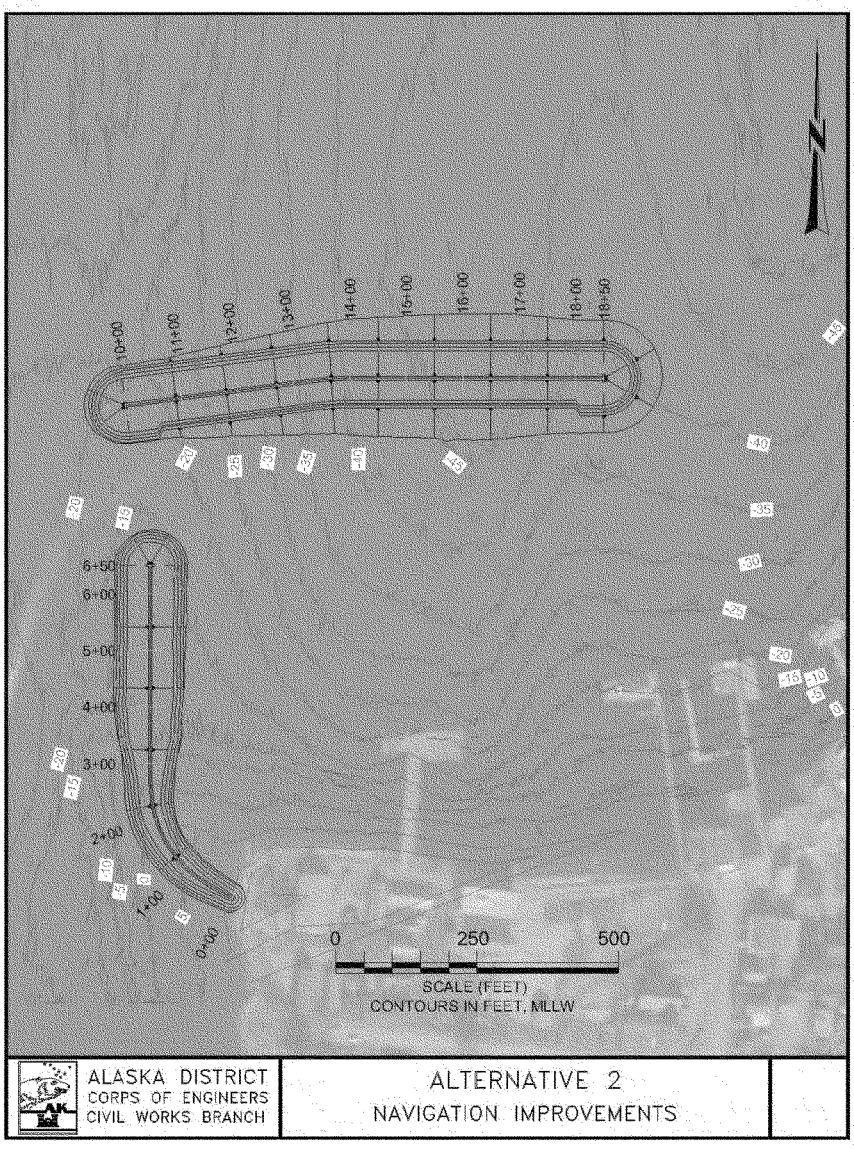


**Figure 13 Plan view of Alternative 2**

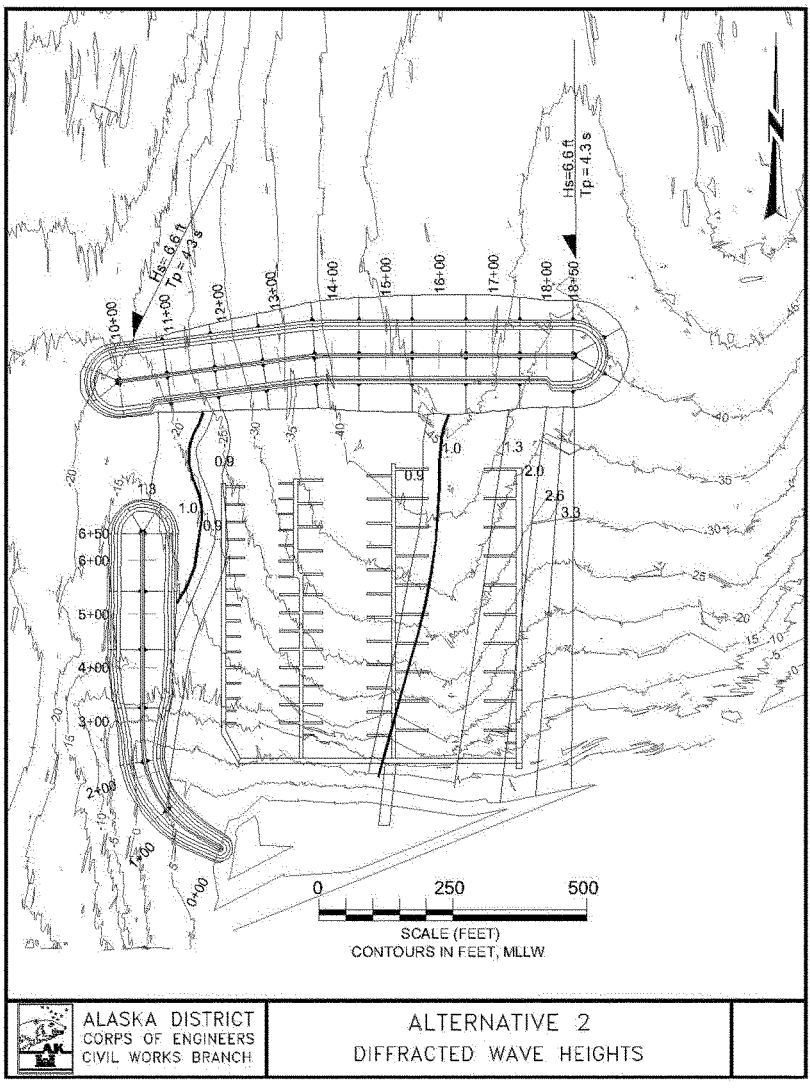


**Figure 14 Diffracted wave heights for Alternative 2. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.**

## 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 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.

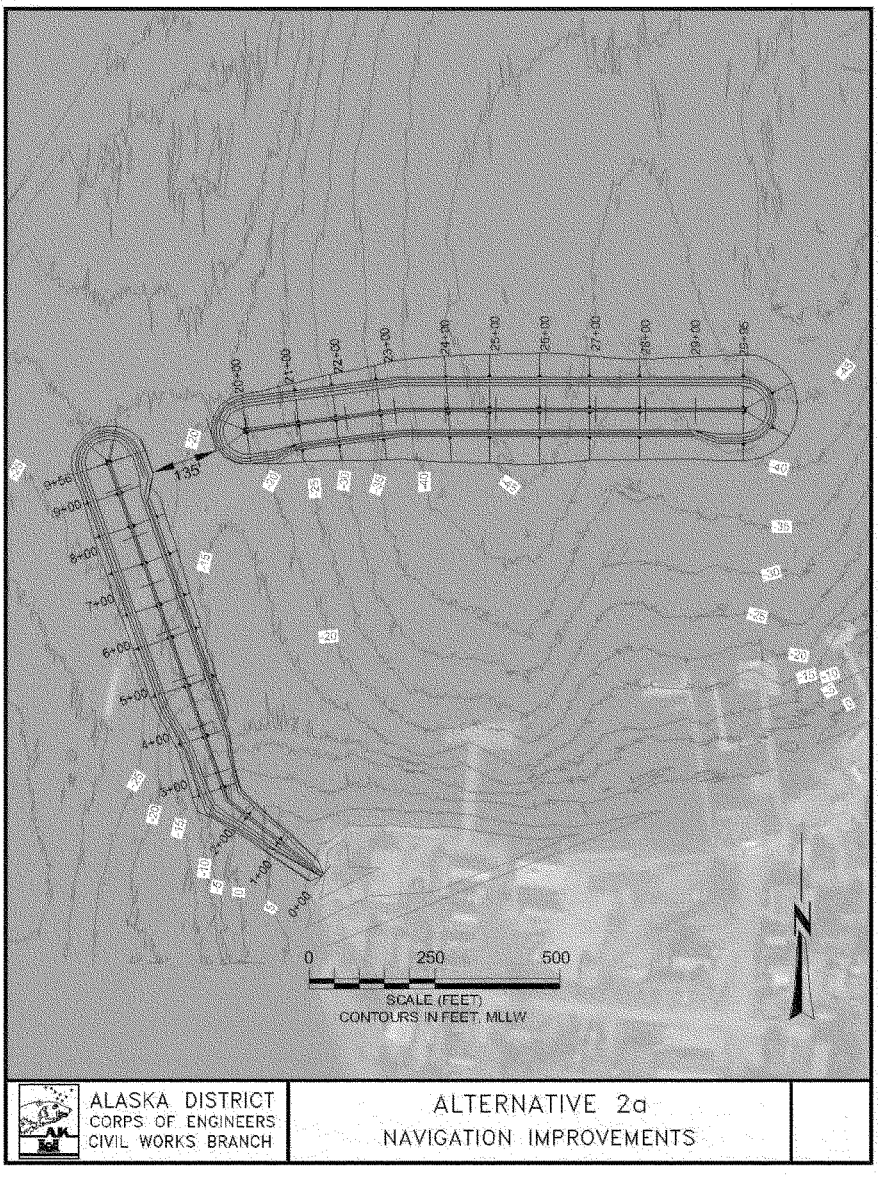


**Figure 15 Plan view of Alternative 2a**

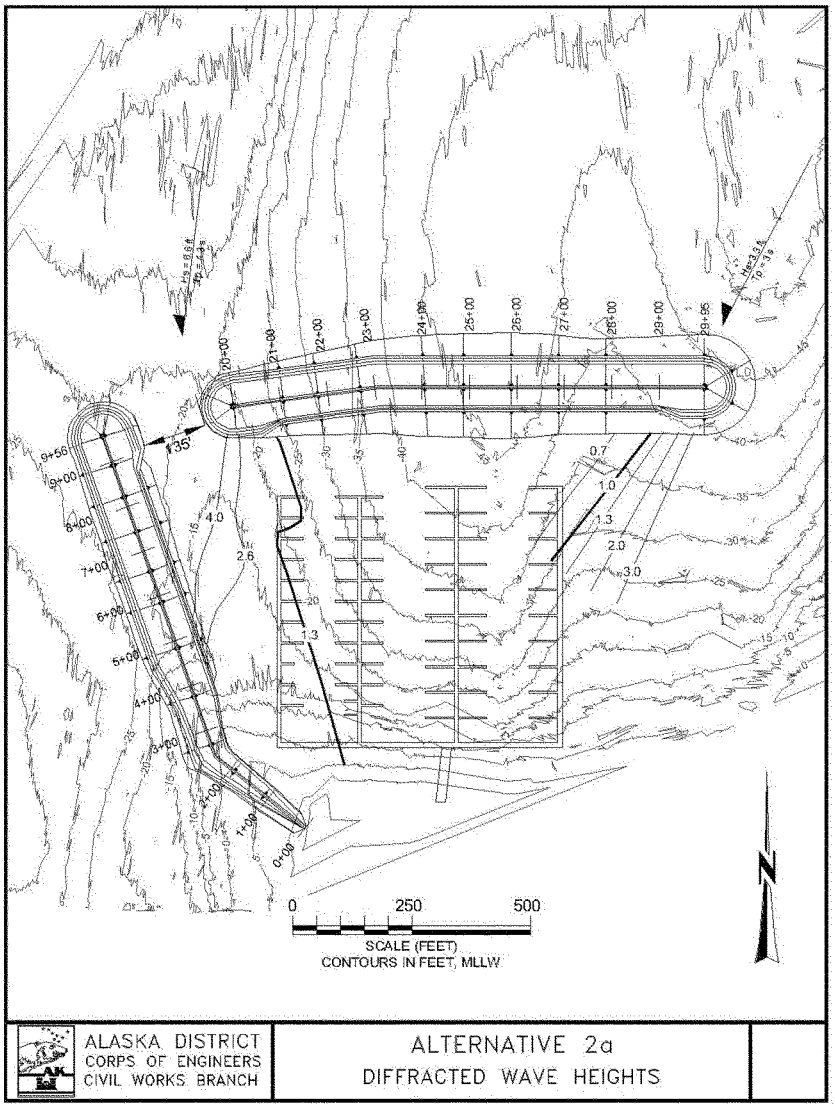


**Figure 16 Diffracted wave heights for Alternative 2a. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.**

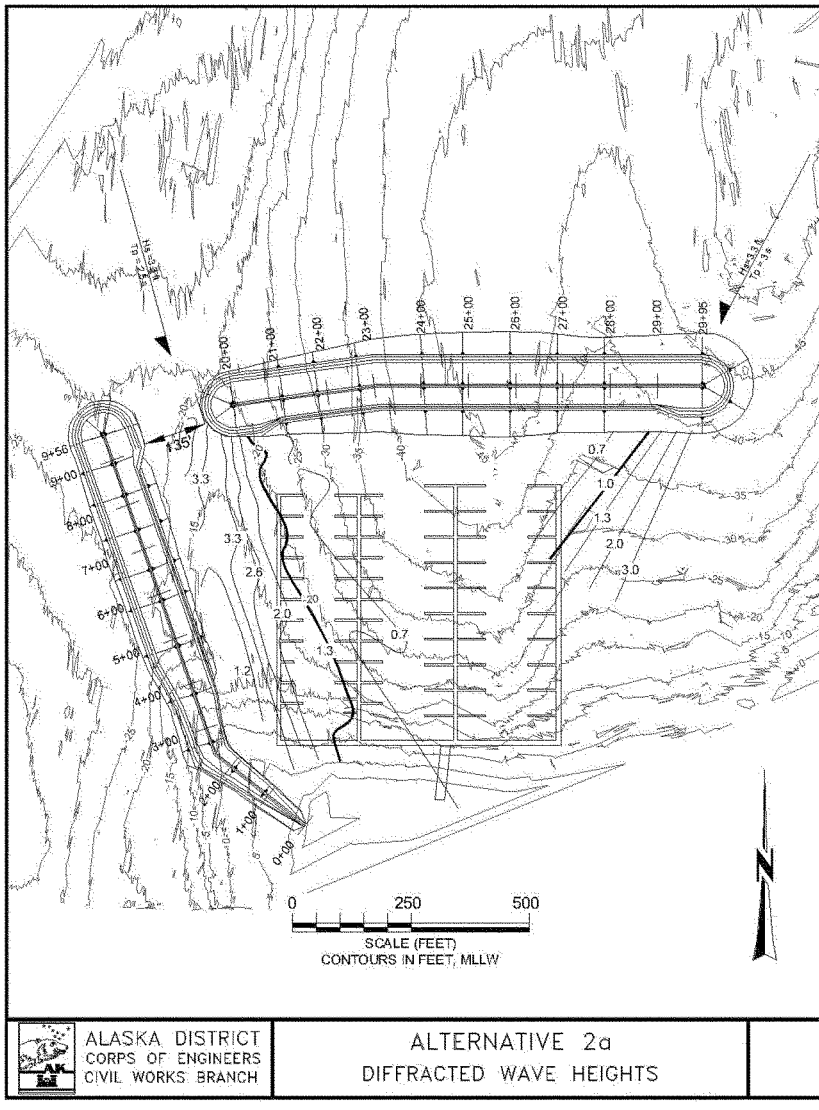


**Figure 17 Diffracted wave heights for Alternative 2a. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.**

## 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). 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. The maximum wave height in the proposed basin would typically be one foot or less in the mooring area. To accommodate the infrequent occurrence of the 72.6 year return interval wave, the outer float should be reinforced to with stand a wave climate greater than one foot.

**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.

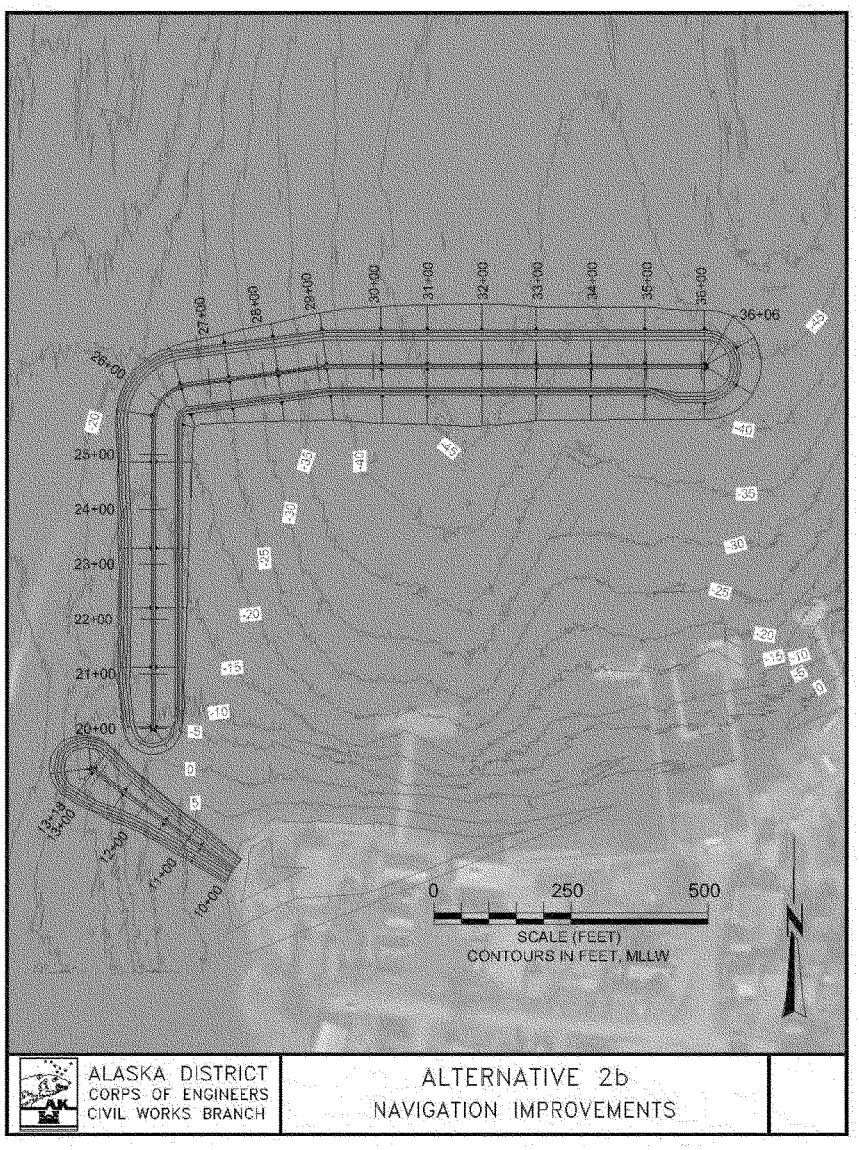


**Figure 18 Plan view of Alternative 2b**

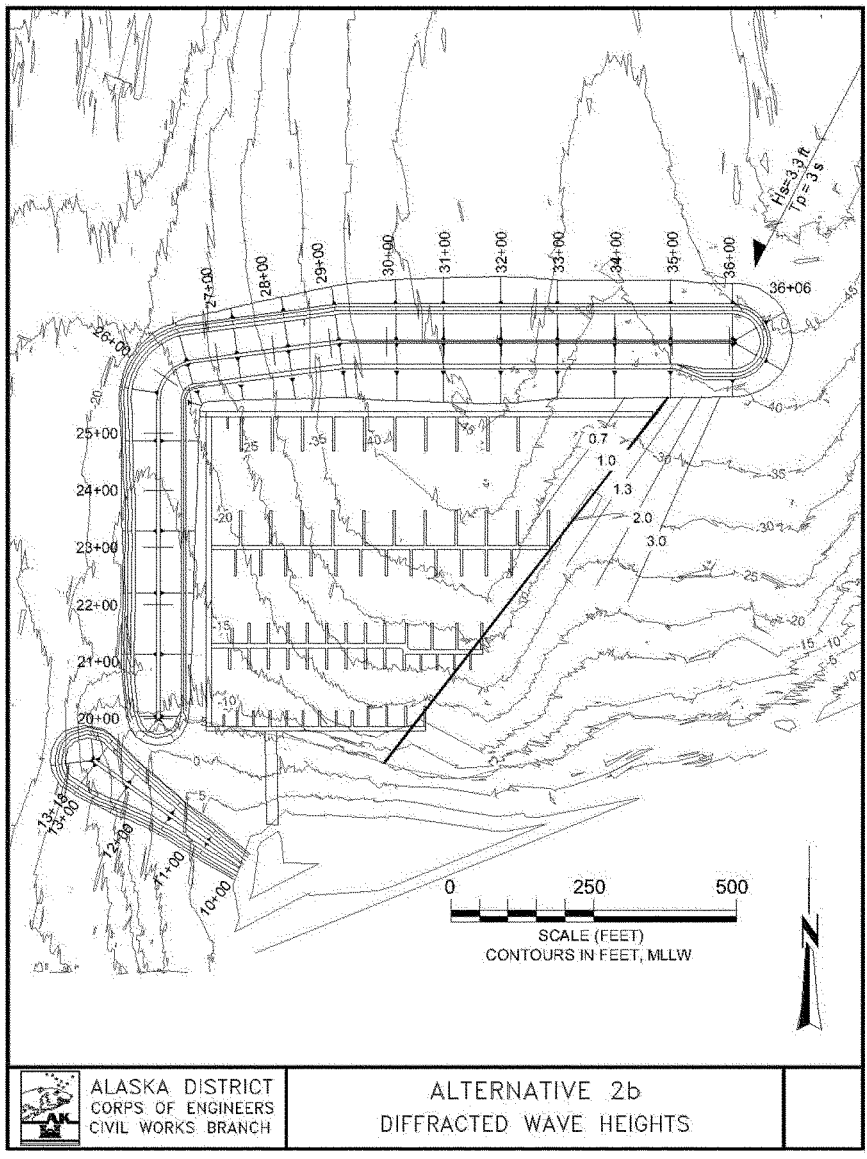


**Figure 19 Diffracted wave heights for Alternative 2b. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.**

## 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.

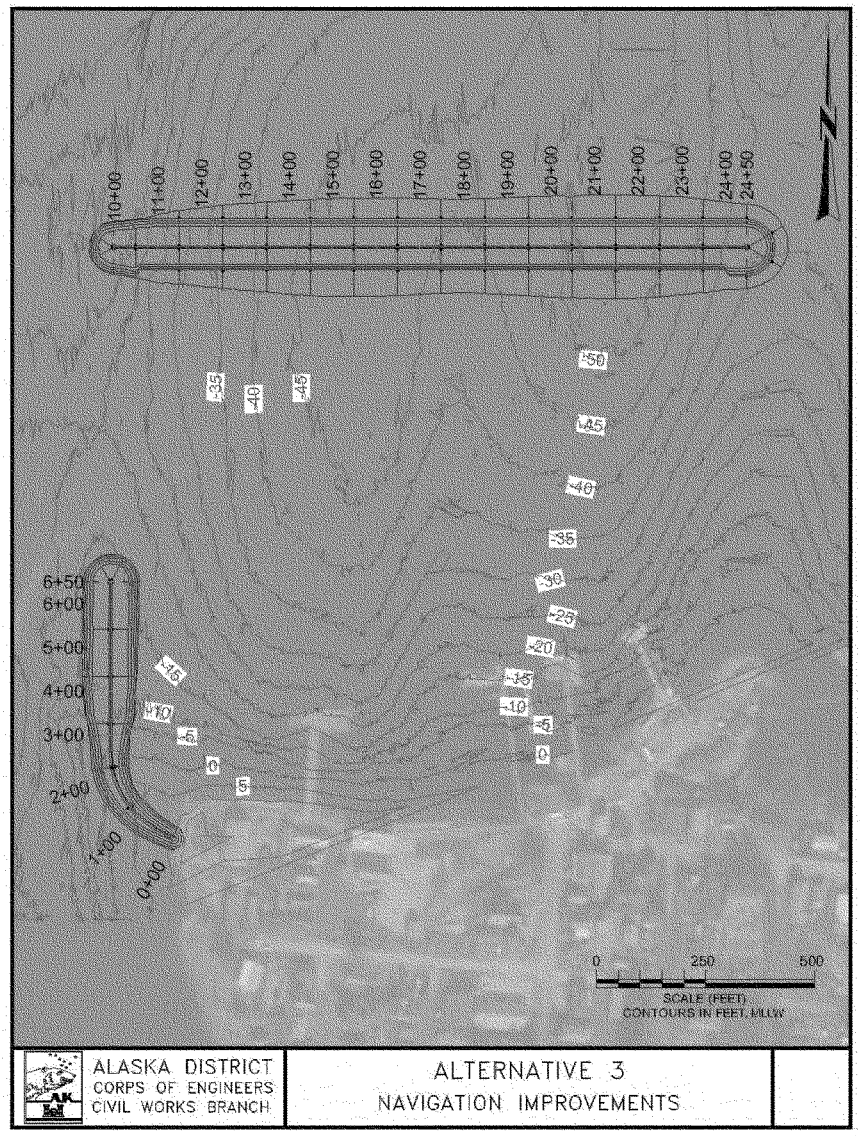


**Figure 20 Plan view of Alternative 3**

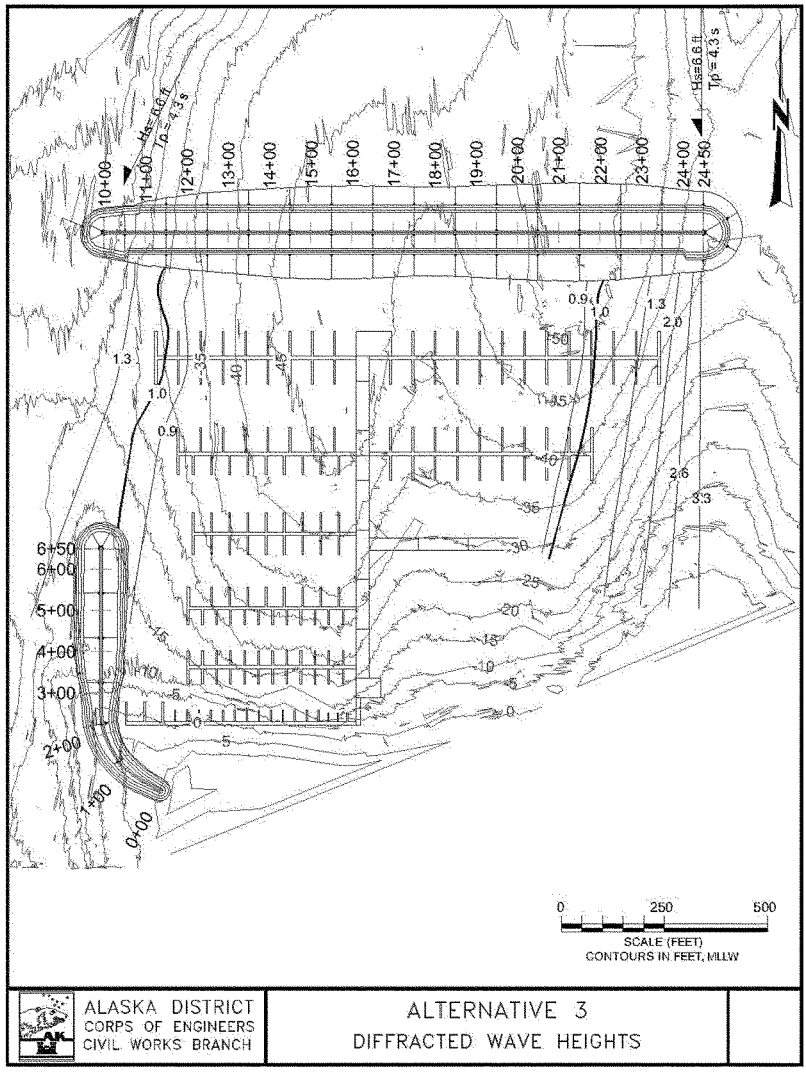


**Figure 21 Diffracted wave heights for Alternative 3. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.**

## 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.

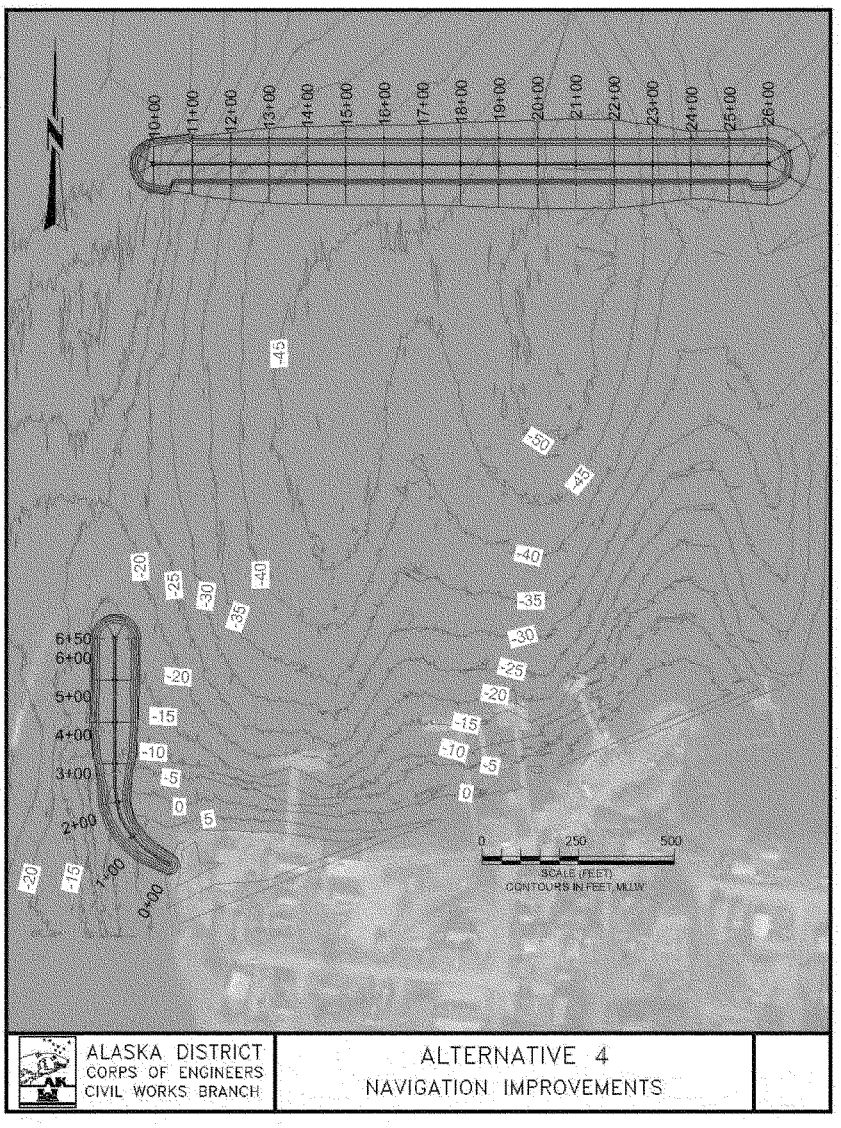


**Figure 22 Plan view of Alternative 4**

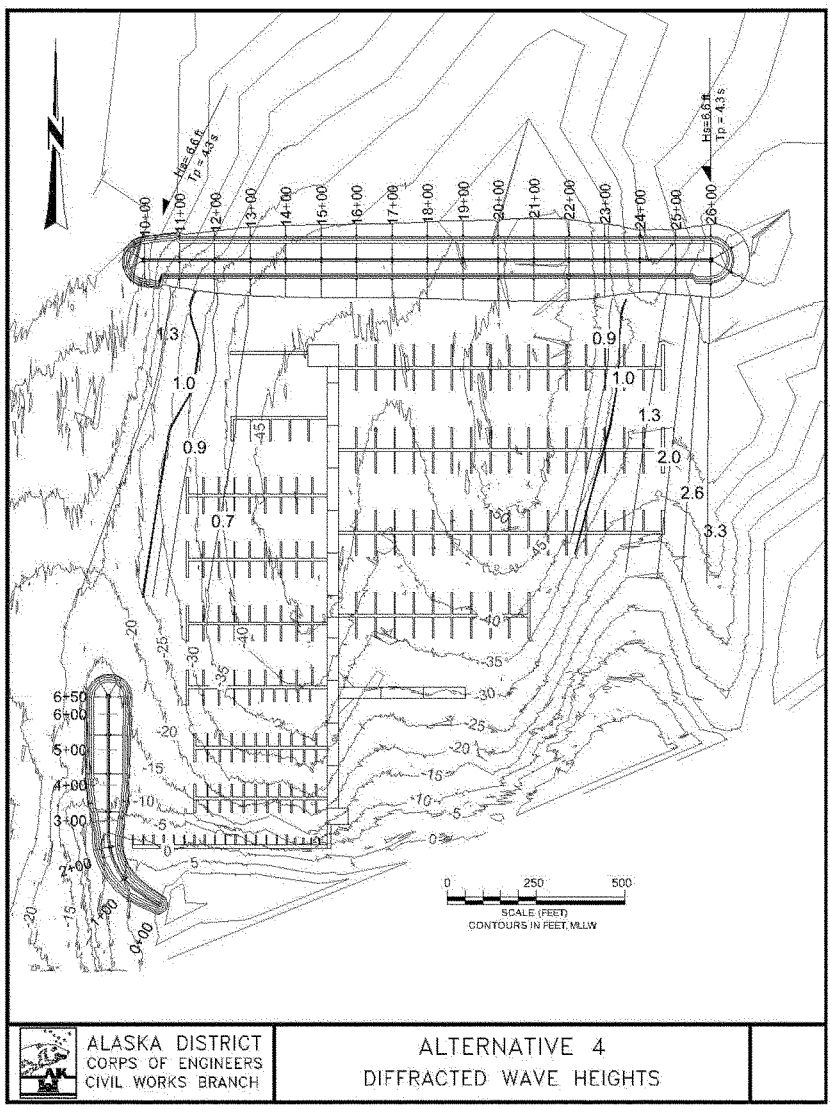


**Figure 23 Diffracted wave heights for Alternative 4. Note that harbor floats are shown for illustrative purposes only. Float construction is responsibility of local sponsor.**

## 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. 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.

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# Appendix D

# Economics

# Craig Small Boat Harbor Navigation Improvements Economics Appendix D

## Craig, Alaska

November 2015

U.S. Army Corps
of Engineers
Alaska District

**CRAIG SMALL BOAT HARBOR NAVIGATION IMPROVEMENTS**
**ECONOMICS APPENDIX D**
**CRAIG, ALASKA**

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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 D-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

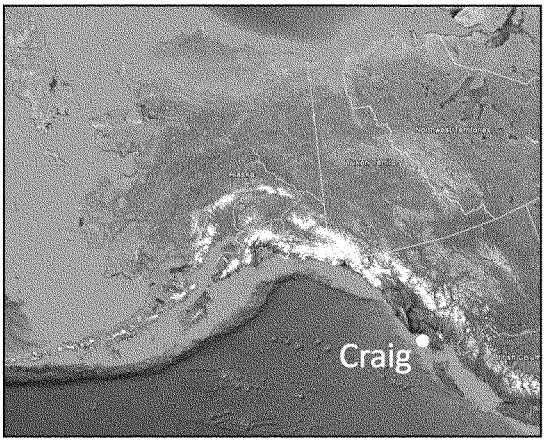


**Figure D-1. Location of Craig in Alaska**

***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 D-2 shows the population of the City of Craig for the years 2000 through 2013.

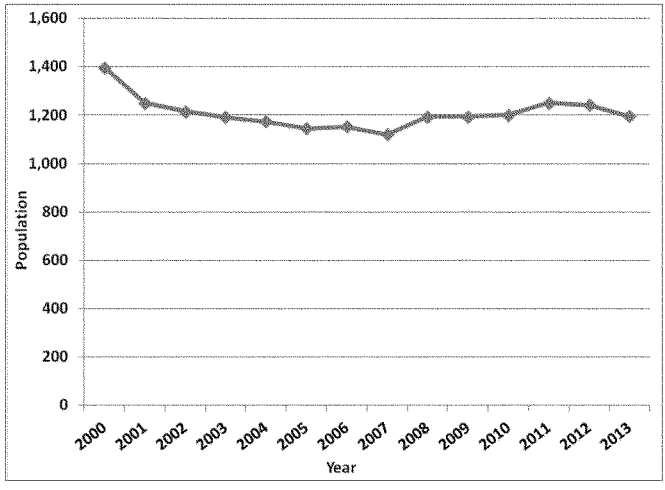


**Figure D-2. Craig Population, 2000 through 2013**
***Source:*** State of Alaska Department of Labor and Workforce Development, Research and Analysis Section.

[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 D-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]

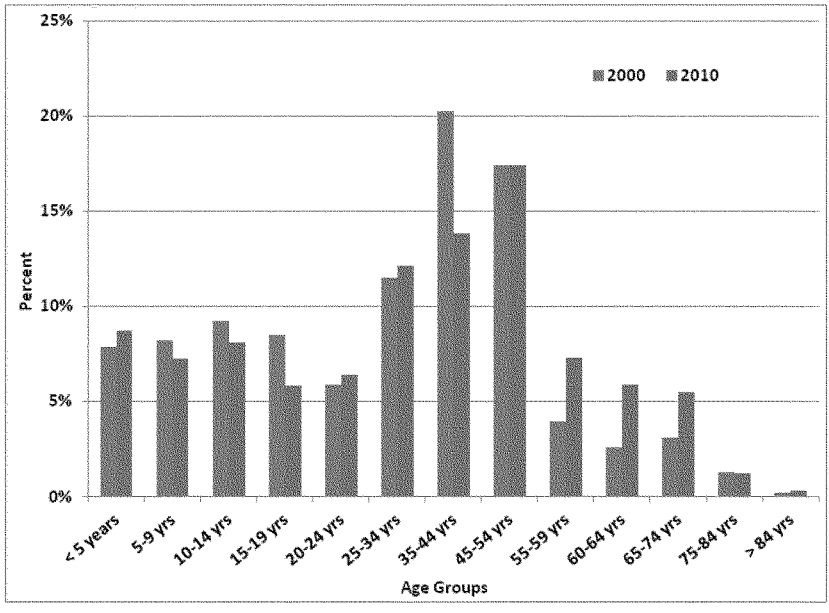


**Figure D-3. Craig, Percent of Population by age group, 2000 and 2010 comparison**
***Source:*** US Census, 2000 and 2010

[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.

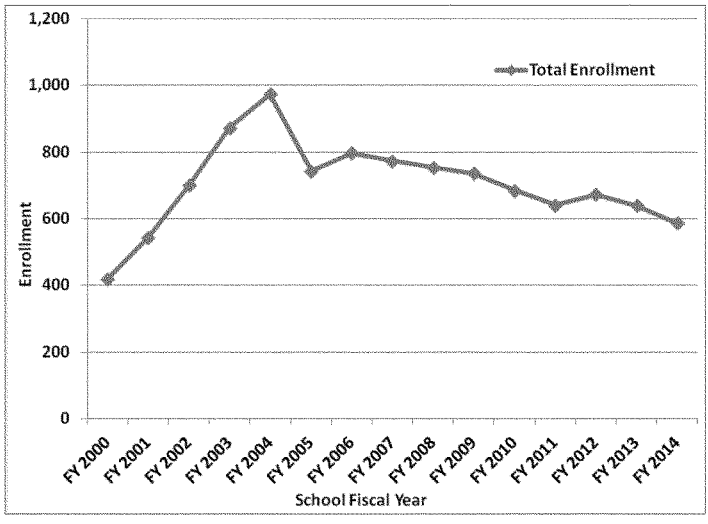


**Figure D-4. Craig City School District Total Enrollment, 1999-2014**
***Source:*** State of Alaska Department of Education and Early Development

### 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 D-5 shows the composition of Craig employment by industry. According to data from the State of Alaska Department of Labor and Workforce Development

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[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.

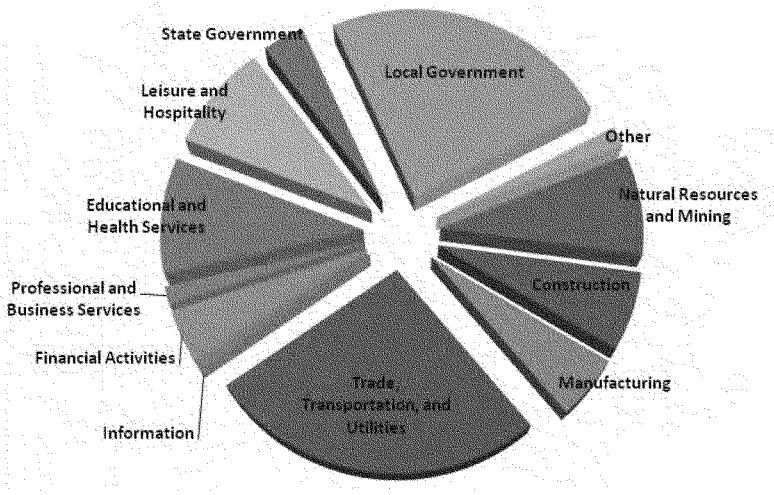


**Figure D-5. 2012 Craig Employment by Industry**
***Source:*** State of Alaska Department of Labor and Workforce Development, Research and Analysis Section, Alaska Local and Regional Information

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 D-1 summarizes the ADOL&WD employment data for Craig.

[9] Ibid.

**Table D-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 D-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

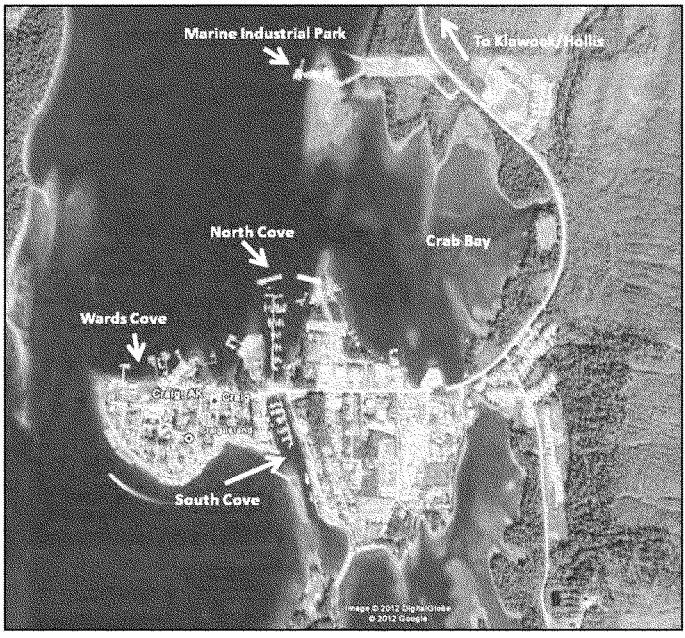


**Figure D-6. Existing Craig Marine Infrastructure**
***Source:*** ©Google Earth. Citations added by USACE.

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 D-7. South Cove Harbor**

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

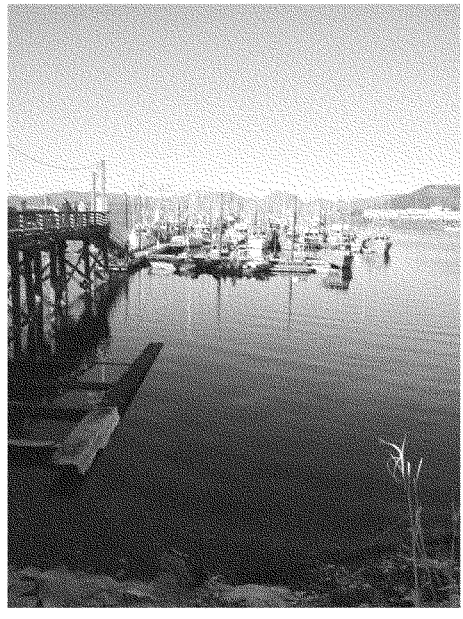

**Figure D-8. North Cove Harbor**

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)

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[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.

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[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 Region 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

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[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.

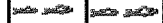
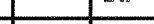
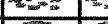
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| king salmon |  | | | | | | | | | | | |
| coho salmon | | | | | |  |  |  |  |  | | |
| sockeye salmon | | | | | |  |  |  | | | | |
| chum salmon | | | | | |  |  |  |  | | | |
| pink salmon | | | | | |  |  |  | | | | |
| Dolly Varden |  |  |  |  |  |  |  |  |  |  |  |  |
| cutthroat trout | | | | |  |  |  |  |  | | | |
| smelt |  |  |  |  |  |  |  |  |  |  |  |  |
| halibut |  |  |  |  |  |  |  |  |  |  |  |  |
| rockfish |  |  |  |  |  |  |  |  |  |  |  |  |
| lingcod |  |  |  |  |  |  |  |  |  |  |  |  |

**Figure D-9. Saltwater Fish Runtime Tables**

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

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| king salmon | | | | | | | | | | | | |
| coho salmon | | | | | | | | | | | | |
| sockeye salmon | | | | | | | | | | | | |
| chum salmon | | | | | | | | | | | | |
| pink salmon | | | | | | | | | | | | |
| Dolly Varden | | | | | | | | | | | | |
| steelhead trout | | | | | | | | | | | | |
| rainbow trout | | | | | | | | | | | | |
| cutthroat trout | | | | | | | | | | | | |
| brook trout | | | | | | | | | | | | |
| grayling | | | | | | | | | | | | |
| smelt | | | | | | | | | | | | |
| kokanee | | | | | | | | | | | | |

**Figure D-10. Freshwater Fish Runtime Tables**

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

## E. Commercial Fisheries

### 1. Types of vessels

According to CFEC data, there were 337 commercial fishing vessels registered to Prince of Wales Island residents in 2013 (the most recent year for which complete data is available). Craig residents totaled 148 commercial fishing vessels for that same year or about 44 percent of all the fishing vessels 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 D-2 provides additional details on vessels owned by Craig residents.

**Table D-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.

Additional information on the fleet which utilizes Craig harbor facilities is determined through survey response data. The table below summarizes the survey results related to vessel beam and draft. Further analysis of survey results show that 92 percent of respondents have vessels which draft 10-feet or less.

**Table D-3. Additional Vessel Characteristics for Craig Harbor Users**

| Length Categories (ft) | 0-20' | 21-27' | 28-36' | 37-45' | 46-60' | >60' |
|---|---|---|---|---|---|---|
| Beam, average (ft) | 6.25 | 7.99 | 10.48 | 12.90 | 16.45 | 21.94 |
| Draft (unloaded), average (ft) | 1.28 | 2.24 | 3.80 | 5.22 | 6.74 | 7.40 |
| Draft (loaded), average (ft) | 1.76 | 2.65 | 4.60 | 5.79 | 8.00 | 8.46 |
| Max Loaded Draft reported (ft) | 3.0 | 4.0 | 8.0 | 9.0 | 15.0 | 14.0 |

*Source:* Craig Small Boat Harbor Survey response data.
*Note:* One vessel in the 28-36-foot size class reported a loaded draft of 18-feet. Based on the size of this vessel, this is believed to be a data error, or at least an outlier and is not included as the Max Loaded Draft for this vessel size class in the table above. Regardless, a vessel drafting 18-feet could still be accommodated at the Ward's Cove harbor site, given natural depths.

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 D-4.

**Table D-4. 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 D-5.

**Table D-5. Prince of Wales Island – All fisheries combined**

| Year | Number of fishermen who fished | Total pounds landed | Estimated gross earnings | Earnings per fishermen | Earnings in 2015 dollars |
|---|---|---|---|---|---|
| 2000 | 246 | 8,646,745 | $6,454,848 | $26,239 | $37,752 |
| 2001 | 246 | 13,579,049 | $6,822,300 | $27,733 | $38,796 |
| 2002 | 237 | 9,700,222 | $5,438,840 | $22,949 | $31,494 |
| 2003 | 254 | 10,591,222 | $6,999,064 | $27,555 | $36,816 |
| 2004 | 251 | 13,098,655 | $9,261,664 | $36,899 | $48,058 |
| 2005 | 243 | 13,105,924 | $9,006,401 | $37,063 | $46,839 |
| 2006 | 242 | 8,889,527 | $9,982,272 | $41,249 | $50,511 |
| 2007 | 240 | 14,547,800 | $12,175,268 | $50,730 | $60,772 |
| 2008 | 254 | 11,452,073 | $14,470,378 | $56,970 | $65,272 |
| 2009 | 255 | 15,023,471 | $11,441,805 | $44,870 | $50,806 |
| 2010 | 246 | 15,843,299 | $14,318,540 | $58,205 | $64,758 |
| 2011 | 227 | 19,392,630 | $17,080,457 | $75,244 | $81,103 |
| 2012 | 231 | 16,676,578 | $17,090,831 | $73,986 | $78,009 |
| 2013 | 245 | 27,079,337 | $20,054,585 | $81,855 | $83,678 |

*Note:* Earnings adjusted to 2015 dollars using the Consumer Price Index Anchorage Municipality – All items – Urban Consumers – the most recent year available.

Figure D-11 shows the Prince of Wales Island historical fishing activity for all species from 2000 through 2013. Gross earnings are displayed in 2015 dollars.

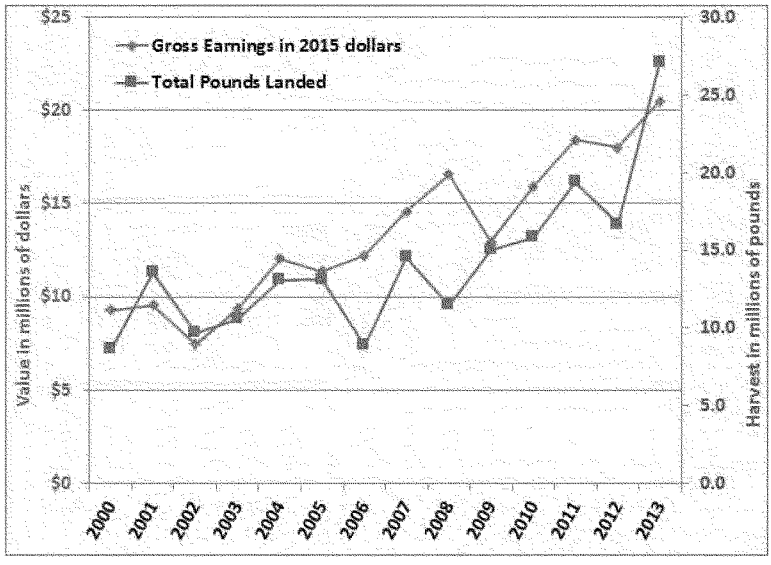



**Figure D-11. Prince of Wales Island Historical Harvest**

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 $86,307 in 2013 which is slightly higher (about 5 percent) than the earnings by all Prince of Wales Islanders. See Table D-6.

**Table D-6. Craig Residents – All fisheries combined**

| Year | Number of fishermen who fished | Total pounds landed | Estimated gross earnings | Earnings per fishermen | Earnings in 2015 dollars |
|---|---|---|---|---|---|
| 2000 | 124 | 3,344,382 | $3,396,094 | $27,388 | $39,405 |
| 2001 | 116 | 4,795,555 | $3,374,881 | $29,094 | $40,700 |
| 2002 | 115 | 3,918,228 | $2,951,369 | $25,664 | $35,221 |
| 2003 | 113 | 4,212,357 | $3,627,786 | $32,104 | $42,894 |
| 2004 | 122 | 6,513,013 | $5,373,341 | $44,044 | $57,363 |
| 2005 | 115 | 4,095,305 | $4,958,380 | $43,116 | $54,488 |
| 2006 | 116 | 3,297,933 | $5,711,628 | $49,238 | $60,294 |
| 2007 | 106 | 4,436,204 | $6,110,615 | $57,647 | $69,058 |
| 2008 | 119 | 4,771,762 | $7,824,845 | $65,755 | $75,337 |
| 2009 | 121 | 5,388,789 | $5,773,321 | $47,713 | $54,026 |
| 2010 | 115 | 5,573,720 | $7,409,382 | $64,429 | $71,682 |
| 2011 | 108 | 7,175,298 | $8,930,243 | $82,687 | $89,126 |
| 2012 | 120 | 6,103,817 | $8,871,945 | $73,933 | $77,952 |
| 2013 | 121 | 11,412,585 | $10,443,123 | $86,307 | $88,229 |

*Note:* Earnings adjusted to 2015 dollars using the Consumer Price Index Anchorage Municipality – All items – Urban Consumers – the most recent year available.

Figure D-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.

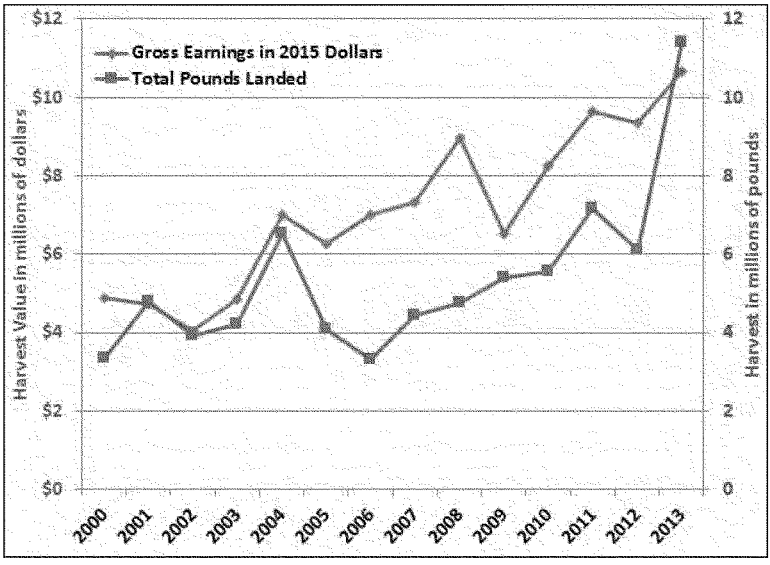



**Figure D-12. Craig Residents Historical Harvest**

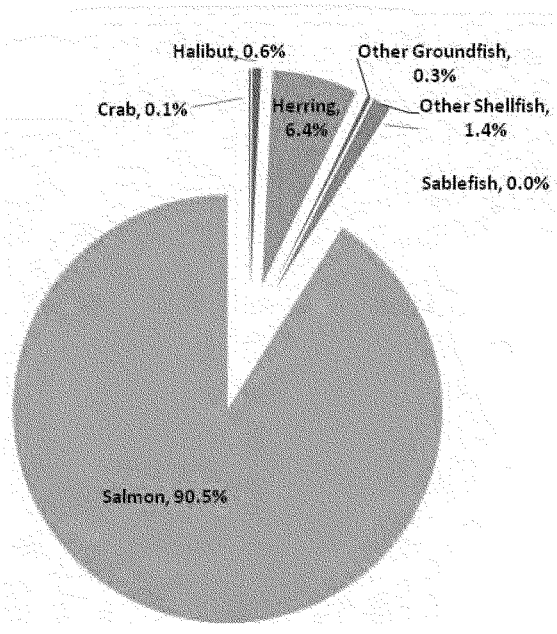



**Figure D-13. Species Harvest Percentages (total pounds landed) 2013 for Prince of Wales Island Residents**

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.

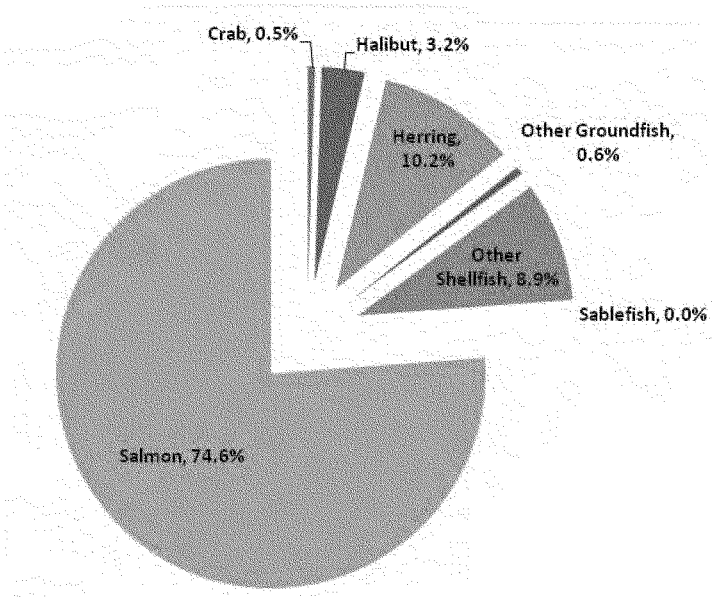



**Figure D-14. Species Value Percentages (total value) 2013 for Prince of Wales Island Residents**

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 D-7. 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 boats and less than 3 percent of all harvests. 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 D-8 shows the most recent published data for commercial harvests of shellfish in Southeast waters. About 20 percent of the Craig vessel owners participate in shellfish fisheries using pot gear.

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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.

**Table D-8. 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

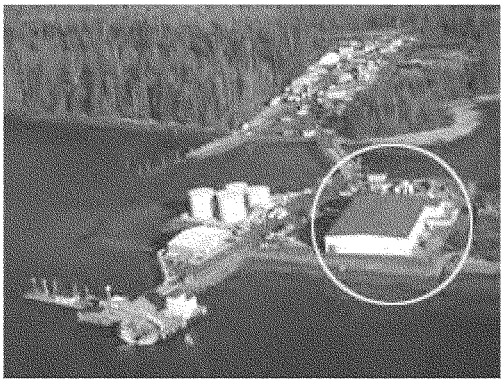

**Figure D-15. Silver Bay Seafoods processing plant**
*Source:* Silver Bay Seafoods website: http://www.silverbayseafoods.com/facilities.html

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 D-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 D-9. 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 D-10. 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 2016 discount rate of 3.125 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 2020. 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 (FWP) conditions. 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 D-11 summarizes the amount of moorage at Craig.

**Table D-11. Existing Craig moorage capacity**

| Facility | Number of slips | Feet of transient moorage |
|---|---|---|
| North Cove Harbor | 99 | 700 |
| South Cove Harbor | 119 | 125 |
| City Dock | | 350 |
| False Is. Dock | | 223 |
| **Total** | **218** | **1,398** |

***Source:*** City of Craig Harbor Use Data.

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 D-12.

**Table D-12. 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 D-13 shows the slip availability and usage for the South Cove Harbor.

**Table D-13. 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 D-14. 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 D-15 presents a summary of the Craig waiting list.

Data on current use of Craig harbors and waitlisted vessels are presented here as provided by the City of Craig. Boaters' preferences for particular slips at a particular harbor may explain why there are vessels on waitlist while there are open slips listed in North or South Cove harbors in the tables above.

**Table D-15. 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 D-16. 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 D-16. 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 D-12 and Table D-13. 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

[39] City of Craig, Moorage Waiting List Application and Contract.

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 required by some commercial fishermen, transient moorage represents a significant component of overall use of the facilities.

Table D-17 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 D-17. 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 D-18 presents the responses to this question.

**Table D-18. 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 D-19.

**Table D-19. 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 D-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 D-20 summarizes the capacities of these harbors.

**Table D-20. 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 D-21 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 D-21. 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 D-22 describes the capacity of small boat harbor facilities in Petersburg.

**Table D-22. 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 D-23 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 D-23. 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 categories, but indicated they currently use 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.[40] 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 D-24 summarizes the total demand for moorage at Craig utilizing extrapolation of survey results.

[40] Note that this number does not include surveys which were returned as undeliverable. Of the total 1,527 surveys mailed, 117 were returned as undeliverable, resulting in a total of 1,410 deliverable surveys.

**Table D-24. 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 D-25 presents the expected Craig moorage demand, summarized by type of moorage; 35 percent of vessels demand permanent moorage compared to 61 percent transient.

**Table D-25. 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 D-26 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 D-26. 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 D-27 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 D-27. 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 D-28 summarizes the total moorage demand calculated in the previous section.

**Table D-28. 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 D-29.

**Table D-29. 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 182 respondents to this question, 22 (12.1 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 D-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 D-30 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 D-30. 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 D-31 shows the responses to this question.

**Table D-31. 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 D-32. 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 D-18 shows these existing docks.

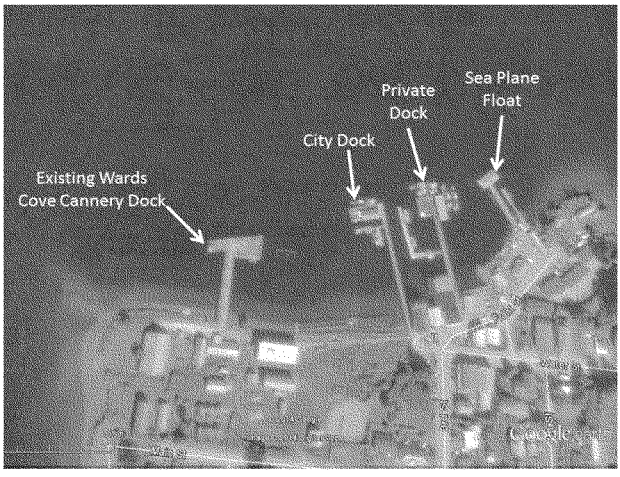


**Figure D-18. Existing Docks in the area of proposed navigation improvements**

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 2020. 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.

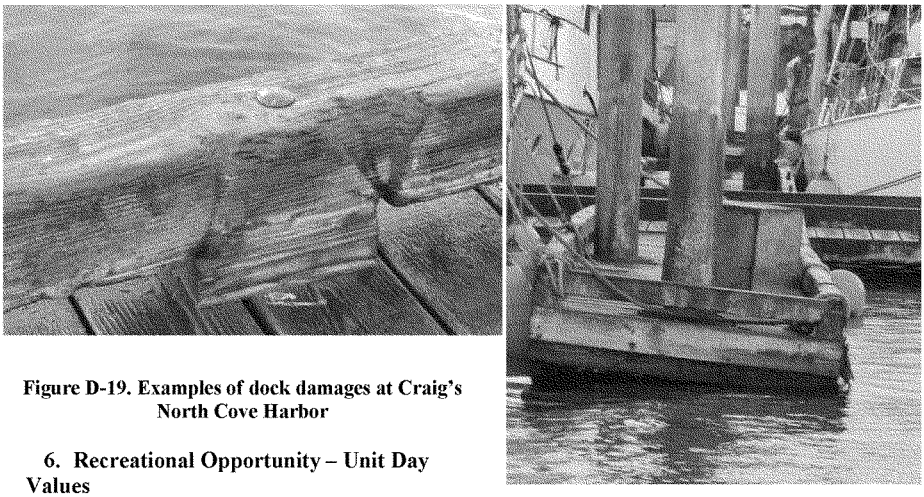

**Figure D-19. Examples of dock damages at Craig's North Cove Harbor**

### 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 D-33 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 D-33. 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.

## 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 2016 discount rate of 3.125 percent and an October 2015 price level is used. The analysis also utilizes a 50-year project period of analysis with a base year of 2020.[41]

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.[42]

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 D-34.

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[41] 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.

[42] Recreation is another key component of harbor use, and operational costs and potential benefits for recreational vessels will be examined in subsequent sections.

**Table D-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 D-35.

**Table D-35. Craig Moorage Facilities, Future Without-Project Condition**

| Facility | Number of slips | Feet of transient moorage |
|---|---|---|
| North Cove Harbor | 99 | 700 |
| South Cove Harbor | 119 | 125 |
| City Dock | | 350 |
| False Is. Dock | | 223 |
| **Total** | **218** | **1,398** |
| ***Source:*** City of Craig Comprehensive Plan and harbor use data. | | |

## 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 12.09 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 88 vessels damaged per year (730 vessels * 12.09 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 D-36 summarizes these calculations.

**Table D-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 current dollars). Table D-37 summarizes the number of damages and repair costs per year.

**Table D-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 (current 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 |
| **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 D-20 shows the distribution of costs per vessel damage.

Triangular distributions are used to represent vessel damages given the relatively small amount of annual vessel cost data.

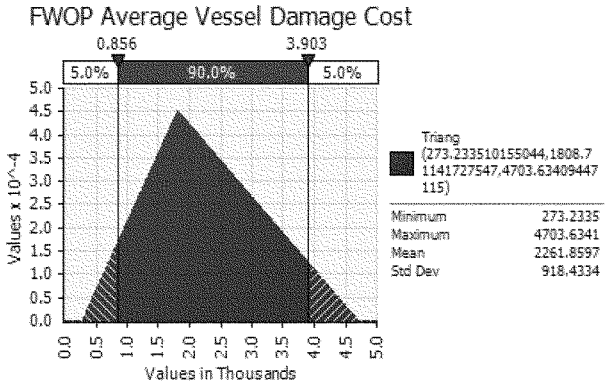


**Figure D-20. Future Without-Project Condition Average Cost per Vessel Damage, @Risk distribution**

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: 88 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 D-21 shows the results of this simulation, with annual vessel damage costs ranging from a minimum of $26,782 to a maximum of $411,855, with a mean of $199,044. This analysis utilizes the mean value for further calculations.

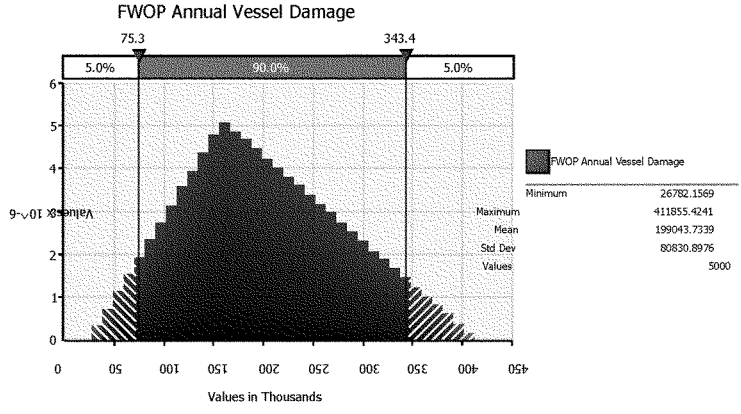


**Figure D-21. Future Without-Project Annual Vessel Damage Costs, @Risk simulation results**

This analysis then again categorizes expected vessel damage costs by moorage type. Table D-38 summarizes these calculations.

**Table D-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% | 31 | $70,472 |
| Transient | 61% | 54 | $121,032 |
| Boat Launch | 4% | 3 | $7,540 |
| **Total** | | **88** | **$199,044** |

***The present value of vessel damages over the 50-year project period of analysis is $5.0 million with an average annual value of $199,000.***

## 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 D-39 provides an example of this table for the "Wait for Tide Change" delay.

**Table D-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 D-40 summarizes the total delay hours by type of vessel, type of moorage, and length category.

**Table D-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 D-41 presents the average vessel investment cost by size category and other pertinent characteristics.

**Table D-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 D-42 summarizes the assumptions related to the hours in operation per fishing season.

**Table D-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. The length of the fishing season is supported by the run timing of the various fisheries, as presented in the Marine Resource Assessment section. The season lengths represent general averages without considering weather delays or other issues of individual operators, as this type of empirical data is not available.

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.

| ***Notes (continued):*** |
|---|
| 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 discount rate of 3.125 percent for fiscal year 2016 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 D-43 summarizes the annual fixed costs for the Craig fleet, by vessel size category.

**Table D-43. Annual Fixed Operating Costs for the Craig Fleet**

| Description | Annual Operating Data - Fixed Costs | | | | | |
|---|---|---|---|---|---|---|
| | 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 @ 3.125% over 30 years[4] | $2,385 | $2,333 | $5,185 | $7,622 | $21,205 | $18,665 |
| 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] | $66,828 | $66,576 | $150,930 | $298,932 | $375,702 | $482,873 |

***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 (3.125 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 current year dollars).

Table D-44 summarizes the annual variable operating costs by vessel size category.

**Table D-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 D-45 and Table D-46 show the hourly variable costs for commercial and charter vessels.

**Table D-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 D-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. Lacking study-specific data informing the preferences of Craig fishermen, this analysis conservatively 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 calculated based on data 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, Alaska District 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 hourly wage rate for salmon fishermen is $83.88 for the captain and $67.34 for crew members, updated to current year dollars. Economic theory states that OCT or "leisure" rates are equal to 1/3 of wage rates for paid activities. This means that the hourly OCT rate for commercial fishermen is $27.96 for captains and $22.44 for crew members.

For charter captain and crew, wage rates from the ADOL&WD are utilized. Again, OCT rates are equal to 1/3 of wage rates. Table D-47 presents these calculations.

**Table D-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 (most recent available). | | | |
| 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 D-48 summarizes the total annual delay costs in the FWOP at Craig.

**Table D-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 | $3,545 | $26,850 | $56,437 | $215,661 | $169,500 | $0 | $471,994 |
| Transient | $0 | $0 | $18,894 | $57,871 | $150,853 | $16,289 | $243,907 |
| Boat Launch | $840 | $0 | $0 | $0 | $0 | $0 | $840 |
| Other | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| **Total** | **$4,385** | **$26,850** | **$75,331** | **$273,532** | **$320,354** | **$16,289** | **$716,742** |

***The present value of vessel delays over the 50-year project period of analysis is $18.0 million with an average annual value of $717,000.***

## 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.

Variations in subsistence catch rates between Prince of Wales Island communities are undoubtedly based on more than the availability of navigation improvements. However, this method of comparison among communities is used as representative given a lack of alternate empirical data source. The comparison of Craig harvest levels to that of other communities on Prince of Wales Island is intended to show that Craig harvest are less than the average and therefore have room for some improvement.

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[43] level. Table D-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.

[43] A borough is similar to a county.

**Table D-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

Table D-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 D-50. Craig population and estimated future without-project subsistence harvest, for selected project years**

| Year | Craig Population | Total Harvest, lbs. |
|---|---|---|
| 2020 | 1,185 | 273,236 |
| 2030 | 1,157 | 266,815 |
| 2040 | 1,129 | 260,486 |
| 2050 | 1,103 | 254,504 |
| 2060 | 1,078 | 248,571 |
| 2069 | 1,055 | 243,350 |

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 D-51 presents the estimated subsistence harvest by moorage type.

**Table D-51. Craig future without-project subsistence harvest, by moorage type**

| Year | FWOP Harvest (lbs.), by moorage type | | |
|---|---|---|---|
| | Permanent | Transient | Boat Launch |
| 2020 | 139,717 | 104,789 | 28,730 |
| 2030 | 136,434 | 102,327 | 28,054 |
| 2040 | 133,197 | 99,900 | 27,389 |
| 2050 | 130,139 | 97,606 | 26,760 |
| 2060 | 127,105 | 95,330 | 26,136 |
| 2069 | 124,435 | 93,328 | 25,587 |

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 current dollars.[44] 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 current dollars.[45] 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 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 intent of this method is to attempt to quantify the value of subsistence beyond a simple replacement value of protein.

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. The method utilized for the Little Diomede feasibility study is a production cost method which considers that subsistence resources are worth at least as much as the harvesters invest in them through expenditures of cash and labor. This is believed to be a more comprehensive approach than simply considering the grocery story (or equivalent) replacement value of these resources. Subsistence food products are nutritionally and culturally preferred to the substitute food products, but there is no functioning market to purchase subsistence products in Alaska.

The subsistence data presented in the Little Diomede feasibility study is based on comprehensive surveys to estimate subsistence production time and costs. The level of data needed to conduct a detailed update of this method is not available for Craig. As such, updating the value using an economic index is the most appropriate method to utilize this data for Craig. This value is used as one point on the distribution of subsistence values to represent the uncertainty in quantifying these resources.

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 D-52.

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[44] 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.

[45] Economic Value of Subsistence Activity, Little Diomede, Alaska, 2011. Survey by Tetra Tech, Inc. Updated to current dollars using the Anchorage CPI.

**Table D-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).

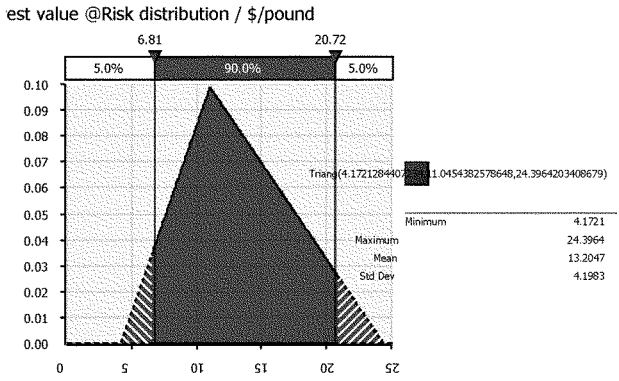



**Figure D-22. Subsistence harvest value @Risk distribution**

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 D-23. This analysis utilizes the mean value of $13.20 per pound for future calculations.

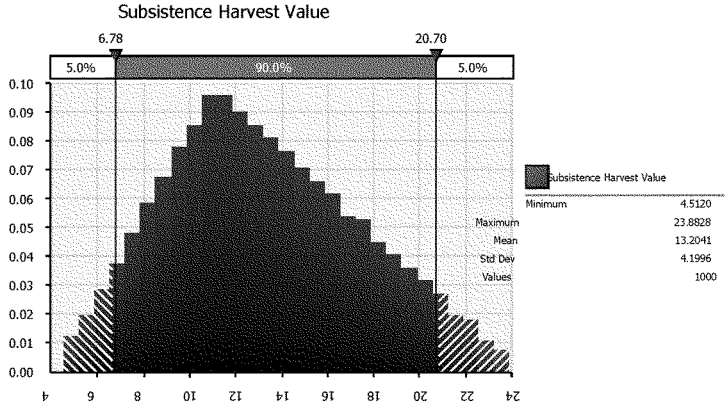



**Figure D-23. Subsistence harvest value, @Risk simulation results**

The total value of subsistence harvests is equal to the total expected harvest (see Table D-50) multiplied by the mean value per pound of $13.20. Table D-53 summarizes these calculations for selected project years.

**Table D-53. Future Without-Project Subsistence Harvest Values, for selected project years**

| Year | FWOP Harvest Value | | | |
|---|---|---|---|---|
| | Permanent | Transient | Boat Launch | Total |
| 2020 | $1,844,828 | $1,383,646 | $379,346 | $3,607,821 |
| 2030 | $1,801,479 | $1,351,134 | $370,433 | $3,523,046 |
| 2040 | $1,758,749 | $1,319,085 | $361,646 | $3,439,480 |
| 2050 | $1,718,360 | $1,288,793 | $353,341 | $3,360,494 |
| 2060 | $1,678,301 | $1,258,748 | $345,104 | $3,282,153 |
| 2069 | $1,643,047 | $1,232,307 | $337,855 | $3,213,208 |

***The present value of subsistence harvests over the 50-year project period of analysis is $86.9 million with an average annual value of $3.5 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 D-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 D-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 D-55 shows the average distance between each region and Craig.

**Table D-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 D-56 summarizes the results of these calculations.

**Table D-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 D-57 shows vessel speeds by length category.

**Table D-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 D-58 summarizes the total travel costs per round-trip for vessels without Craig home addresses.

**Table D-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 - Captain | Hourly Leisure Rate - Captain | Number of Crew | Roundtrip Cost |
|---|---|---|---|---|---|---|---|---|
| Pacific Northwest | | | | | | | | |
| 0-20 ft | 0 | 1,432 | 72 | $53.73 | $27.96 | $22.45 | 2 | $0 |
| 21-27 ft | 0 | 1,432 | 69 | $53.60 | $27.96 | $22.45 | 2 | $0 |
| 28-36 ft | 0 | 1,432 | 169 | $58.02 | $27.96 | $22.45 | 3 | $0 |
| 37-45 ft | 0 | 1,432 | 183 | $111.82 | $27.96 | $22.45 | 4 | $0 |
| 46-60 ft | 5 | 1,432 | 179 | $127.66 | $27.96 | $22.45 | 4 | $206,864 |
| >60 ft | 0 | 1,432 | 170 | $174.91 | $27.96 | $22.45 | 4 | $0 |
| Prince of Wales Island | | | | | | | | |
| 0-20 ft | 0 | 160 | 8 | $53.73 | $27.96 | $22.45 | 2 | $0 |
| 21-27 ft | 0 | 160 | 8 | $53.60 | $27.96 | $22.45 | 2 | $0 |
| 28-36 ft | 5 | 160 | 19 | $58.02 | $27.96 | $22.45 | 3 | $12,794 |
| 37-45 ft | 0 | 160 | 20 | $111.82 | $27.96 | $22.45 | 4 | $0 |
| 46-60 ft | 0 | 160 | 20 | $127.66 | $27.96 | $22.45 | 4 | $0 |
| >60 ft | 0 | 160 | 19 | $174.91 | $27.96 | $22.45 | 4 | $0 |
| Other SE AK | | | | | | | | |
| 0-20 ft | 0 | 245 | 12 | $53.73 | $27.96 | $22.45 | 2 | $0 |
| 21-27 ft | 0 | 245 | 12 | $53.60 | $27.96 | $22.45 | 2 | $0 |
| 28-36 ft | 3 | 245 | 29 | $58.02 | $27.96 | $22.45 | 3 | $9,775 |
| 37-45 ft | 13 | 245 | 31 | $111.82 | $27.96 | $22.45 | 4 | $83,779 |
| 46-60 ft | 10 | 245 | 31 | $127.66 | $27.96 | $22.45 | 4 | $70,640 |
| >60 ft | 0 | 245 | 29 | $174.91 | $27.96 | $22.45 | 4 | $0 |
| **TOTAL** | 36 | | | | | | | **$383,853** |

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 D-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 D-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 - Captain | Hrly Leisure Rate - Crew | Number of Crew | Roundtrip Cost |
|---|---|---|---|---|---|---|---|---|
| Pacific Northwest | | | | | | | | |
| 0-20 ft | 1 | 1432 | 72 | $53.73 | $27.96 | $22.45 | 2 | $6,656 |
| 21-27 ft | 2 | 1432 | 69 | $53.60 | $27.96 | $22.45 | 2 | $12,798 |
| 28-36 ft | 1 | 1432 | 169 | $58.02 | $27.96 | $22.45 | 3 | $29,621 |
| 37-45 ft | 0 | 1432 | 183 | $111.82 | $27.96 | $22.45 | 4 | $0 |
| 46-60 ft | 0 | 1432 | 179 | $127.66 | $27.96 | $22.45 | 4 | $0 |
| >60 ft | 0 | 1432 | 170 | $174.91 | $27.96 | $22.45 | 4 | $0 |
| Prince of Wales Island | | | | | | | | |
| 0-20 ft | 4 | 160 | 8 | $53.73 | $27.96 | $22.45 | 2 | $2,975 |
| 21-27 ft | 7 | 160 | 8 | $53.60 | $27.96 | $22.45 | 2 | $5,720 |
| 28-36 ft | 5 | 160 | 19 | $58.02 | $27.96 | $22.45 | 3 | $13,238 |
| 37-45 ft | 0 | 160 | 20 | $111.82 | $27.96 | $22.45 | 4 | $0 |
| 46-60 ft | 4 | 160 | 20 | $127.66 | $27.96 | $22.45 | 4 | $15,944 |
| >60 ft | 0 | 160 | 19 | $174.91 | $27.96 | $22.45 | 4 | $0 |
| Other SE AK | | | | | | | | |
| 0-20 ft | 1 | 245 | 12 | $53.73 | $27.96 | $22.45 | 2 | $1,136 |
| 21-27 ft | 2 | 245 | 12 | $53.60 | $27.96 | $22.45 | 2 | $2,185 |
| 28-36 ft | 1 | 245 | 29 | $58.02 | $27.96 | $22.45 | 3 | $5,057 |
| 37-45 ft | 0 | 245 | 31 | $111.82 | $27.96 | $22.45 | 4 | $0 |
| 46-60 ft | 1 | 245 | 31 | $127.66 | $27.96 | $22.45 | 4 | $6,091 |
| >60 ft | 0 | 245 | 29 | $174.91 | $27.96 | $22.45 | 4 | $0 |
| **TOTAL** | 29 | | | | | | | **$101,422** |

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 $7.4 million with an average annual value of $296,000.***

### 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 D-60 presents information on the small boat harbor infrastructure at Seldovia, and the alternative plans for replacement identified in a 2011 technical report.

**Table D-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 D-61

shows the estimated float replacement costs for Craig infrastructure utilizing equivalent Seldovia facilities. The costs are updated to 2014 dollars.

**Table D-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 (current $) |
|---|---|---|---|
| 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 2020.

***The present value of infrastructure replacement over the 50-year project period of analysis is $21.0 million with an average annual value of $834,000.***

## I. Recreational Opportunity

This analysis uses the unit day value (UDV) method as described in Corps Economic Guidance Memorandum (EGM 16-03) for fiscal year 2016 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.[46] 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

[46] The focus group consisted of six Craig residents who were also recreational boaters. The focus group meeting was conducted during a team trip to Craig. The size of the focus group was coordinated with the City of Craig prior to the trip to ensure adherence with USACE and OMB surveying procedures. In this case, a smaller focus group was appropriate for the expert elicitation conducted for this benefit category.

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 D-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 D-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 and $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 16-03, Unit Day Values for Recreation for Fiscal Year 2016 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 16-03 provides an accepted, reliable, and valid way to translate points into dollar values. Table D-63 shows the conversion of assigned points to representative unit day values.

**Table D-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 | $32.66 | 65 | $36.97 |
| Specialized Recreation other than Fishing & Hunting | 49 | $23.16 | 65 | $28.56 |

*Source:* Points from Craig focus group responses, September 2014. UDVs from USACE EGM 16-03.

#### 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 D-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.

While it is unlikely that all recreational boaters would base out of Craig for all sport fishing trips, based on the size of Prince of Wales Island and Craig's status as a hub for the island, it is likely that nearly all sport fishing activity will include Craig. So it is likely that sport fishermen may travel to many areas of the island for each trip, including the vicinity of Craig. Also based on the very limited alternate small boat harbor facilities on Prince of Wales Island, it is very likely that relieving overcrowding at Craig will impact all sport fishermen in the area through increased access to facilities and reduced congestion. Sport fishermen are likely to utilize Craig based on the landside services available which are lacking elsewhere on the island, including grocery stores, restaurants, hotels, fish packing and processing, and shipping facilities.

**Table D-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 D-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 D-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.[47] 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 D-66 presents these values as reported by the State of 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 D-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 D-67 presents the expected number of recreational visits to Craig, by type of recreational user, for selected years.

[47] Source: Alaska Visitor Statistics Program VI: Summer 2011. McDowell Group, Inc. for the State of Alaska Department of Commerce, Community, and Economic Development.

**Table D-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 |
| 2020 | 58,871 | 0 | 7,003 | 180 | 0 | 226 |
| 2030 | 57,488 | 0 | 6,838 | 175 | 0 | 221 |
| 2040 | 56,124 | 0 | 6,676 | 171 | 0 | 215 |
| 2050 | 54,836 | 0 | 6,523 | 167 | 0 | 210 |
| 2060 | 53,557 | 0 | 6,371 | 163 | 0 | 205 |
| 2069 | 52,432 | 0 | 6,237 | 160 | 0 | 201 |

### 6. Future Without-Project Unit Day Values

Table D-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 D-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 |
| 2020 | $1,922,561 | $0 | $228,687 | $4,159 | $0 | $5,231 |
| 2030 | $1,877,386 | $0 | $223,313 | $4,061 | $0 | $5,108 |
| 2040 | $1,832,855 | $0 | $218,016 | $3,965 | $0 | $4,987 |
| 2050 | $1,790,764 | $0 | $213,010 | $3,874 | $0 | $4,873 |
| 2060 | $1,749,017 | $0 | $208,044 | $3,783 | $0 | $4,759 |
| 2069 | $1,712,802 | $0 | $203,736 | $3,705 | $0 | $4,661 |

***The present value of the recreational experience in Craig over the 50-year project period of analysis is $52.0 million with an average annual value of $2.1 million.***

## J. Summary of Future Without-Project Conditions

Table D-69 summarizes the future without-project condition at Craig and forms the basis for comparison for the future with-project alternatives.

**Table D-69. Summary of Future Without-Project Conditions**

| Category: | Net Present Value | Average Annual |
|---|---|---|
| Vessel damages | $5,002,000 | $199,000 |
| Vessel delays | $18,012,000 | $717,000 |
| Subsistence | $86,862,000 | $3,456,000 |
| Travel Cost | $7,446,000 | $296,000 |
| Infrastructure Damage | $20,964,000 | $834,000 |
| Recreation UDV | $52,020,000 | $2,070,000 |
| **Total** | **$190,306,000** | **$7,572,000** |

*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 $190.3 million with an average annual value of $7.6 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

The following sections describe each alternative and the costs. Costs are at October 2015 price levels. Construction cost estimates include mobilization and demobilization, 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 2016 discount rate of 3.125 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, real estate, preliminary engineering and design (PED), construction supervision and administration, and contingency is $34.20 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 $947,000, or $38,000 annually. The average annual cost for Alternative 1 is $1.36 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.

This alternative has been eliminated from consideration due to the western opening of the breakwater and concerns regarding swell.

**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, real estate costs, PED, construction supervision and administration, and contingency is $40.74 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 $1.29 million, or $51,000 annually. The average annual cost for Alternative 2a is $1.66 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, real estate costs, PED, construction supervision and administration, and contingency is $37.61 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 $991,000, or $39,000 annually. The average annual cost for Alternative 2b is $1.54 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, real estate costs, PED, construction supervision and administration, and contingency is $53.08 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 $2.69 million, or $107,000 annually. The average annual cost for Alternative 3 is $2.22 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, real estate costs, PED, construction supervision and administration, and contingency is $58.94 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 $3.99 million, or $159,000 annually. The average annual cost for Alternative 4 is $2.50 million.

## C. Total Project Costs

Table D-70 presents a summary of the costs for each alternative.

**Table D-70. Total Project Costs, by Alternative**

| Alternative | First Cost | Interest During Construction | PV OMRR&R | Total PV Project Costs | Average Annual Cost |
|---|---|---|---|---|---|
| 1 | $33,165,000 | $1,041,000 | $947,000 | $35,152,000 | $1,399,000 |
| 2* | | | | | |
| 2a | $39,243,000 | $1,232,000 | $1,293,000 | $41,768,000 | $1,662,000 |
| 2b | $36,464,000 | $1,145,000 | $991,000 | $38,600,000 | $1,536,000 |
| 3** | $51,462,000 | $1,616,000 | $2,691,000 | $55,769,000 | $2,219,000 |
| 4** | $57,146,000 | $1,794,000 | $3,985,000 | $62,926,000 | $2,504,000 |

*Notes:*

- All costs rounded to the nearest thousand.
- Project costs assume a 2-year (24-month) construction window with construction beginning in 2018 and completed in 2020.
- Present value and average annual costs are calculated utilizing a 50-year project period of analysis and a Federal fiscal year 2016 discount rate of 3.125 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 D-71.

**Table D-71. 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 D-72 summarizes this moorage demand.

**Table D-72. 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 D-73.

**Table D-73. 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 Condition 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 D-74 shows the expected slip configurations by alternative.

**Table D-74. 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 D-75 presents the revised slip availability at the new Craig small boat harbor when considering the shift of vessels from existing harbors.

**Table D-75. 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 D-76 summarizes these calculations.

**Table D-76. 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 D-77 summarizes Craig moorage demand by moorage type.

**Table D-77. 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 D-78 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 D-78. 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 D-78 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 D-79 presents the level of transient moorage demand met, considering these assumptions.

**Table D-79. 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 current 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 12.09 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 3.89 percent. Applying this percent to the population of vessels subject to damages means that there will be an average of 28 vessels damaged per year (730 vessels * 3.89 percent). These vessel damages are split by vessel moorage type, as shown in Table D-80.

**Table D-80. Future With-Project, Vessels experiencing unavoidable damages**

| Moorage Types | Percent of moorage demand | Number of vessels damaged |
|---|---|---|
| Permanent | 35% | 10 |
| Transient | 61% | 17 |
| Boat Launch | 4% | 1 |
| **Total** | | **28** |

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 D-24 shows the distribution of costs per vessel damage.

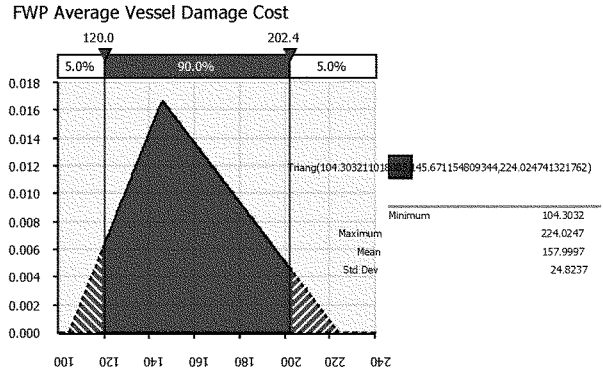



**Figure D-24. Future With-Project Condition Average Cost per unavoidable vessel damage, @Risk distribution**

The annual cost of these unavoidable vessel damages in the future with-project condition is equal to the number of vessels damaged multiplied by the expected cost per damage, or 28 vessels multiplied by the damage cost distribution provided above. To utilize the average damage cost distribution in calculations, this analysis uses an @Risk simulation with 5,000 iterations. Figure D-25 shows the results of this simulation with annual vessel damage costs ranging from a minimum of $2,932 to a maximum of $6,246 with a mean of $4,424. This analysis utilizes the mean value for further calculations.

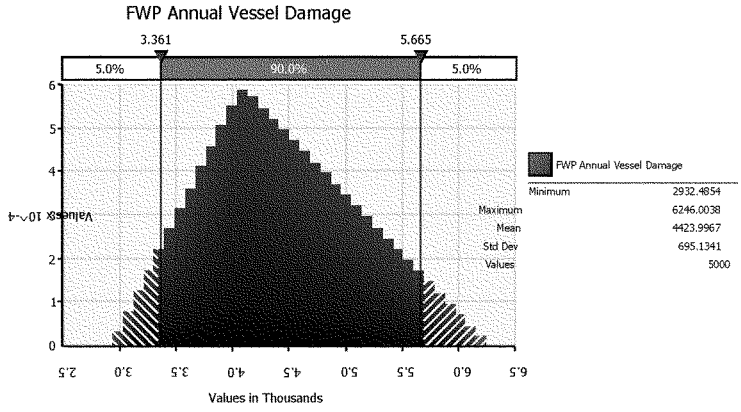



**Figure D-25. Future With-Project Annual Unavoidable Vessel Damage Costs, @Risk simulation results**

These vessel damage costs are then calculated by moorage type, see Table D-81.

**Table D-81. 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 | $1,566 |
| Transient | 61% | 17 | $2,690 |
| Boat Launch | 4% | 1 | $168 |
| **Total** | | **28** | **$4,424** |

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 D-82.

**Table D-82. Permanent moorage demand met and remaining vessel damage costs**

| Scenario | Permanent moorage | |
|---|---|---|
| | Demand Met | FWP Damage Costs |
| Alt. 1 | 100% | $1,566 |
| Alt. 2 | 100% | $1,566 |
| Alt. 2a | 100% | $1,566 |
| Alt. 2b | 100% | $1,566 |
| Alt. 3 | 100% | $1,566 |
| Alt. 4 | 100% | $1,566 |

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 D-83.

**Table D-83. Transient moorage demand met and remaining damage costs**

| Scenario | Transient moorage | |
|---|---|---|
| | Demand Met | FWP Damage Costs |
| Alt. 1 | 29% | $88,496 |
| Alt. 2 | 47% | $66,679 |
| Alt. 2a | 47% | $66,679 |
| Alt. 2b | 47% | $66,679 |
| Alt. 3 | 100% | $2,690 |
| Alt. 4 | 100% | $2,690 |

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 D-84.

**Table D-84. Boat Launch moorage demand met and remaining damage costs**

| Scenario | Boat Launch | |
|---|---|---|
| | Demand Met | FWP Damage Costs |
| Alt. 1 | 100% | $168 |
| Alt. 2 | 100% | $168 |
| Alt. 2a | 100% | $168 |
| Alt. 2b | 100% | $168 |
| Alt. 3 | 100% | $168 |
| Alt. 4 | 100% | $168 |

Total annual future with-project vessel damages are equal to the sum of permanent, transient, and boat launch, as show in Table D-85.

**Table D-85. Total Annual Future With-Project Vessel Damage Costs, by alternative**

| Alternative | Total Annual FWP Damage Cost |
|---|---|
| Alt. 1 | $90,230 |
| Alt. 2 | $68,413 |
| Alt. 2a | $68,413 |
| Alt. 2b | $68,413 |
| Alt. 3 | $4,424 |
| Alt. 4 | $4,424 |

Table D-86 presents the net present value and average annual future with-project vessel damage costs for each alternative.

**Table D-86. Future With-Project Vessel Damage Costs, by Alternative**

| Category: | Future With Project Costs | |
|---|---|---|
| Vessel Damages | Net Present Value | Average Annual |
| Alt. 1 | $2,267,000 | $90,000 |
| Alt. 2 | $1,719,000 | $68,000 |
| Alt. 2a | $1,719,000 | $68,000 |
| Alt. 2b | $1,719,000 | $68,000 |
| Alt. 3 | $111,000 | $4,000 |
| Alt. 4 | $111,000 | $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 D-87 summarizes the expected effects of navigation improvements on each of the vessel delay categories.

**Table D-87. 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 D-88 summarizes the total delay hours which will not be alleviated by navigation improvements.

**Table D-88. 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 D-89 summarizes these calculations.

**Table D-89. 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 | $1,114 | $7,883 | $15,638 | $66,398 | $53,282 | $0 | $144,315 |
| Transient | $0 | $0 | $2,494 | $7,914 | $20,216 | $2,000 | $32,624 |
| Boat Launch | $840 | $0 | $0 | $0 | $0 | $0 | $840 |
| Other | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| **Total** | **$1,954** | **$7,883** | **$18,131** | **$74,312** | **$73,499** | **$2,000** | **$177,779** |

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 D-90.

**Table D-90. Permanent Moorage Demand met and Future With-Project delay costs**

| Scenario | Permanent Moorage | |
|---|---|---|
| | Demand Met | FWP Delay Cost |
| Alt. 1 | 100% | $144,315 |
| Alt. 2 | 100% | $144,315 |
| Alt. 2a | 100% | $144,315 |
| Alt. 2b | 100% | $144,315 |
| Alt. 3 | 100% | $144,315 |
| Alt. 4 | 100% | $144,315 |

The amount of remaining transient moorage demand is related to the level of remaining vessel delay costs. See Table D-91.

**Table D-91. Transient Moorage Demand met and Future With-Project delay costs**

| Scenario | Transient Moorage | |
|---|---|---|
| | Demand Met | FWP Delay Cost |
| Alt. 1 | 29% | $205,543 |
| Alt. 2 | 47% | $161,577 |
| Alt. 2a | 47% | $161,577 |
| Alt. 2b | 47% | $161,577 |
| Alt. 3 | 100% | $32,624 |
| Alt. 4 | 100% | $32,624 |

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 D-92.

**Table D-92. Boat Launch Moorage Demand met and Future With-Project delay costs**

| Scenario | Boat launch | |
|---|---|---|
| | Demand Met | FWP Delay Cost |
| Alt. 1 | 100% | $840 |
| Alt. 2 | 100% | $840 |
| Alt. 2a | 100% | $840 |
| Alt. 2b | 100% | $840 |
| Alt. 3 | 100% | $840 |
| Alt. 4 | 100% | $840 |

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 D-93.

**Table D-93. Total Future With-Project Vessel Delay Costs**

| Scenario | Total FWP Cost |
|---|---|
| Alt. 1 | $350,698 |
| Alt. 2 | $306,732 |
| Alt. 2a | $306,732 |
| Alt. 2b | $306,732 |
| Alt. 3 | $177,779 |
| Alt. 4 | $177,779 |

Table D-94 presents the net present value and average annual future with-project vessel damage costs for each alternative.

**Table D-94. Future With-Project Vessel Delay Costs, by Alternative**

| Category: | Future With Project Costs | |
|---|---|---|
| Vessel Delays | Net Present Value | Average Annual |
| Alt. 1 | $8,813,000 | $351,000 |
| Alt. 2 | $7,708,000 | $307,000 |
| Alt. 2a | $7,708,000 | $307,000 |
| Alt. 2b | $7,708,000 | $307,000 |
| Alt. 3 | $4,468,000 | $178,000 |
| Alt. 4 | $4,468,000 | $178,000 |

*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 D-95.

**Table D-95. 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 D-96.

**Table D-96. 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 D-26.

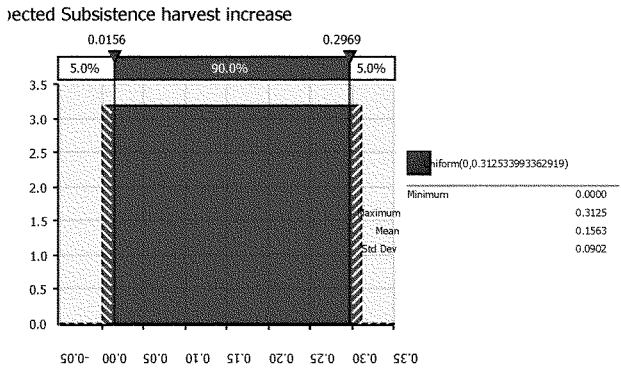



**Figure D-26. Subsistence harvest increase, @Risk distribution**

An @Risk simulation with 1,000 iterations was conducted to utilize this distribution of expected subsistence harvest increase, with results shown in Figure D-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.

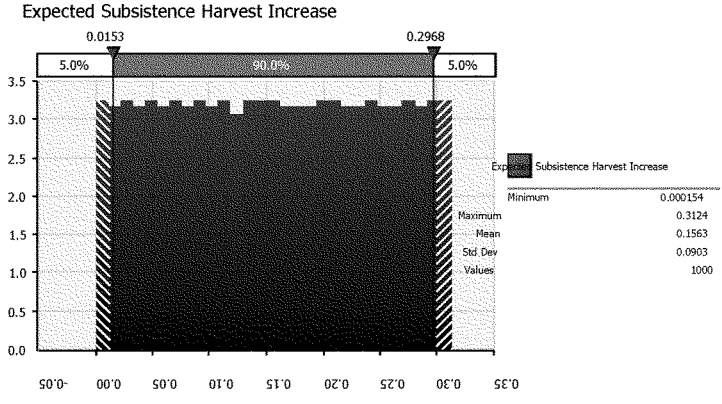



**Figure D-27. Subsistence harvest increase, @Risk simulation results**

As discussed in the future without-project conditions section, variations in subsistence catch rates between Prince of Wales Island communities are undoubtedly due to more than the availability of navigation improvements or navigation conditions in any one community. However, this method of comparison among communities is used as representative given a lack of alternate empirical data source and because detailed surveying of subsistence harvests

at Craig is beyond the scope of this analysis. The comparison of Craig harvest levels to that of other communities on Prince of Wales Island is intended to show that Craig harvests are less than average and therefore have room for some improvements. Comparing Craig to all other communities on Prince of Wales Island reduces the impacts to comparison of any one community; some communities already harvest less than Craig. In addition, an @Risk distribution is used to represent the potential harvest increases which addresses some of the uncertainty in this assumption.

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 D-97 summarizes the moorage demand met for these vessels.

**Table D-97. 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 D-98.

**Table D-98. 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 |
| 2020 | 309,007 | 315,933 | 315,933 | 315,933 | 315,933 | 315,933 |
| 2030 | 301,746 | 308,510 | 308,510 | 308,510 | 308,510 | 308,510 |
| 2040 | 294,589 | 301,192 | 301,192 | 301,192 | 301,192 | 301,192 |
| 2050 | 287,823 | 294,275 | 294,275 | 294,275 | 294,275 | 294,275 |
| 2060 | 281,114 | 287,415 | 287,415 | 287,415 | 287,415 | 287,415 |
| 2069 | 275,209 | 281,378 | 281,378 | 281,378 | 281,378 | 281,378 |

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 D-99 summarizes these calculations for selected project years.

**Table D-99. 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 |
| 2020 | $4,080,148 | $4,171,606 | $4,171,606 | $4,171,606 | $4,171,606 | $4,171,606 |
| 2030 | $3,984,274 | $4,073,583 | $4,073,583 | $4,073,583 | $4,073,583 | $4,073,583 |
| 2040 | $3,889,768 | $3,976,959 | $3,976,959 | $3,976,959 | $3,976,959 | $3,976,959 |
| 2050 | $3,800,441 | $3,885,630 | $3,885,630 | $3,885,630 | $3,885,630 | $3,885,630 |
| 2060 | $3,711,844 | $3,795,047 | $3,795,047 | $3,795,047 | $3,795,047 | $3,795,047 |
| 2069 | $3,633,874 | $3,715,329 | $3,715,329 | $3,715,329 | $3,715,329 | $3,715,329 |

Table D-100 presents the net present value and average annual future with-project subsistence harvest values for each alternative.

**Table D-100. Future With-Project Value of Craig Subsistence Harvests, by alternative**

| Category: | Future With Project Costs | |
|---|---|---|
| Subsistence | Net Present Value | Average Annual |
| Alt. 1 | $98,234,000 | $3,909,000 |
| Alt. 2 | $100,436,000 | $3,997,000 |
| Alt. 2a | $100,436,000 | $3,997,000 |
| Alt. 2b | $100,436,000 | $3,997,000 |
| Alt. 3 | $100,436,000 | $3,997,000 |
| Alt. 4 | $100,436,000 | $3,997,000 |

*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 D-101 summarizes these calculations.

**Table D-101. 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 D-102 presents the net present value and average annual future with-project vessel travel costs for each alternative.

**Table D-102. 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 D-103 presents the net present value and average annual future with-project infrastructure damage costs for each alternative.

**Table D-103. Future With-Project Infrastructure Damage Costs, by alternative**

| Category: | Future With Project Costs | |
|---|---|---|
| Infrastructure Damage | Net Present Value | Average Annual |
| Alt. 1 | $14,782,000 | $588,000 |
| Alt. 2 | $14,782,000 | $588,000 |
| Alt. 2a | $14,782,000 | $588,000 |
| Alt. 2b | $14,782,000 | $588,000 |
| Alt. 3 | $14,782,000 | $588,000 |
| Alt. 4 | $14,782,000 | $588,000 |

*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 D-104 presents the assigned point values for Craig in the future without- and future with-project condition, as reported by focus group respondents.

**Table D-104. 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 and $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 16-03, Unit Day Values for Recreation for Fiscal year 2016, and average of responses for Craig focus group, September 2014.

Table D-105 shows the conversion of assigned points to unit day values.

**Table D-105. 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 | $32.66 | 65 | $36.97 |
| Specialized Recreation other than Fishing & Hunting | 49 | $23.16 | 65 | $28.56 |

*Source:* Points from Craig focus group responses, September 2014. UDVs from USACE EGM 16-03.

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 D-106 summarizes the expected recreational use at Craig.

**Table D-106. 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 |
| 2020 | 58,871 | 0 | 7,003 | 180 | 0 | 226 |
| 2030 | 57,488 | 0 | 6,838 | 175 | 0 | 221 |
| 2040 | 56,124 | 0 | 6,676 | 171 | 0 | 215 |
| 2050 | 54,836 | 0 | 6,523 | 167 | 0 | 210 |
| 2060 | 53,557 | 0 | 6,371 | 163 | 0 | 205 |
| 2069 | 52,432 | 0 | 6,237 | 160 | 0 | 201 |

Table D-107 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 D-107. 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 |
| 2020 | $2,176,473 | $0 | $258,890 | $5,127 | $0 | $6,450 |
| 2030 | $2,125,331 | $0 | $252,806 | $5,007 | $0 | $6,298 |
| 2040 | $2,074,919 | $0 | $246,810 | $4,888 | $0 | $6,149 |
| 2050 | $2,027,270 | $0 | $241,142 | $4,776 | $0 | $6,007 |
| 2060 | $1,980,009 | $0 | $235,520 | $4,664 | $0 | $5,867 |
| 2069 | $1,938,417 | $0 | $230,573 | $4,566 | $0 | $5,744 |

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 D-108 presents the net present value and average annual future with-project recreation unit day values for each alternative.

**Table D-108. Future With-Project Recreation Unit Day Values for each alternative**

| Category: | Future With Project Costs | |
|---|---|---|
| Recreation UDV | Net Present Value | Average Annual |
| Alt. 1 | $58,913,000 | $2,344,000 |
| Alt. 2 | $58,913,000 | $2,344,000 |
| Alt. 2a | $58,913,000 | $2,344,000 |
| Alt. 2b | $58,913,000 | $2,344,000 |
| Alt. 3 | $58,913,000 | $2,344,000 |
| Alt. 4 | $58,913,000 | $2,344,000 |

*Note:* Values are rounded to the nearest thousand.

## H. Summary of Future With-Project Conditions

Table D-109 summarizes the future with-project conditions at Craig.

**Table D-109. Summary of Future With-Project Costs**

| Alternative Number | Net Present Value | Average Annual Value |
|---|---|---|
| 1 | $183,009,000 | $7,282,000 |
| 2* | $183,558,000 | $7,304,000 |
| 2a | $183,558,000 | $7,304,000 |
| 2b | $183,558,000 | $7,304,000 |
| 3** | $178,710,000 | $7,111,000 |
| 4** | $178,710,000 | $7,111,000 |

*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 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 D-110. Vessel Damages, Average Annual Values**

| Scenario | Average Annual Values | | |
|---|---|---|---|
| | FWOP | FWP | Benefit |
| FWOP | $199,000 | | |
| Alt. 1 | | $90,000 | $109,000 |
| Alt. 2 | | $68,000 | $131,000 |
| Alt. 2a | | $68,000 | $131,000 |
| Alt. 2b | | $68,000 | $131,000 |
| Alt. 3 | | $4,000 | $195,000 |
| Alt. 4 | | $4,000 | $195,000 |

#### 2. Vessel Delays

**Table D-111. Vessel Delays, Average Annual Values**

| Scenario | Average Annual Values | | |
|---|---|---|---|
| | FWOP | FWP | Benefit |
| FWOP | $717,000 | | |
| Alt. 1 | | $351,000 | $366,000 |
| Alt. 2 | | $307,000 | $410,000 |
| Alt. 2a | | $307,000 | $410,000 |
| Alt. 2b | | $307,000 | $410,000 |
| Alt. 3 | | $178,000 | $539,000 |
| Alt. 4 | | $178,000 | $539,000 |

### 3. Subsistence

**Table D-112. Subsistence, Average Annual Values**

| Scenario | Average Annual Values | | |
|---|---|---|---|
| | FWOP | FWP | Benefit |
| FWOP | $3,456,000 | | |
| Alt. 1 | | $3,909,000 | $453,000 |
| Alt. 2 | | $3,997,000 | $540,000 |
| Alt. 2a | | $3,997,000 | $540,000 |
| Alt. 2b | | $3,997,000 | $540,000 |
| Alt. 3 | | $3,997,000 | $540,000 |
| Alt. 4 | | $3,997,000 | $540,000 |

### 4. Travel Costs

**Table D-113. Travel Costs, Average Annual Values**

| Scenario | Average Annual Values | | |
|---|---|---|---|
| | FWOP | FWP | Benefit |
| FWOP | $296,000 | | |
| Alt. 1 | | $0 | $296,000 |
| Alt. 2 | | $0 | $296,000 |
| Alt. 2a | | $0 | $296,000 |
| Alt. 2b | | $0 | $296,000 |
| Alt. 3 | | $0 | $296,000 |
| Alt. 4 | | $0 | $296,000 |

### 5. Infrastructure Damage

**Table D-114. Infrastructure Damage, Average Annual Values**

| Scenario | Average Annual Values | | |
|---|---|---|---|
| | FWOP | FWP | Benefit |
| FWOP | $834,000 | | |
| Alt. 1 | | $588,000 | $246,000 |
| Alt. 2 | | $588,000 | $246,000 |
| Alt. 2a | | $588,000 | $246,000 |
| Alt. 2b | | $588,000 | $246,000 |
| Alt. 3 | | $588,000 | $246,000 |
| Alt. 4 | | $588,000 | $246,000 |

## 6. Recreation – Unit Day Values

**Table D-115. Recreation UDV, Average Annual Values**

| Scenario | Average Annual Values | | |
|---|---|---|---|
| | FWOP | FWP | Benefit |
| FWOP | $2,070,000 | | |
| Alt. 1 | | $2,344,000 | $274,000 |
| Alt. 2 | | $2,344,000 | $274,000 |
| Alt. 2a | | $2,344,000 | $274,000 |
| Alt. 2b | | $2,344,000 | $274,000 |
| Alt. 3 | | $2,344,000 | $274,000 |
| Alt. 4 | | $2,344,000 | $274,000 |

## 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 Federal fiscal year 2016 discount rate of 3.125 percent.

**Table D-116. 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 | $5,002,000 | $199,000 | $2,267,000 | $90,000 | $2,735,000 | $109,000 |
| Vessel delays | $18,012,000 | $717,000 | $8,813,000 | $351,000 | $9,199,000 | $366,000 |
| Subsistence | $86,862,000 | $3,456,000 | $98,234,000 | $3,909,000 | $11,372,000 | $453,000 |
| Travel Cost | $7,446,000 | $296,000 | $0 | $0 | $7,446,000 | $296,000 |
| Infrastructure Damage | $20,964,000 | $834,000 | $14,782,000 | $588,000 | $6,183,000 | $246,000 |
| Recreation UDV | $52,020,000 | $2,070,000 | $58,913,000 | $2,344,000 | $6,893,000 | $274,000 |
| **Total** | **$190,306,000** | **$7,572,000** | **$183,009,000** | **$7,282,000** | **$43,828,000** | **$1,744,000** |

**Table D-117. 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 | $5,002,000 | $199,000 | $1,719,000 | $68,000 | $3,283,000 | $131,000 |
| Vessel delays | $18,012,000 | $717,000 | $7,708,000 | $307,000 | $10,304,000 | $410,000 |
| Subsistence | $86,862,000 | $3,456,000 | $100,436,000 | $3,997,000 | $13,574,000 | $540,000 |
| Travel Cost | $7,446,000 | $296,000 | $0 | $0 | $7,446,000 | $296,000 |
| Infrastructure Damage | $20,964,000 | $834,000 | $14,782,000 | $588,000 | $6,183,000 | $246,000 |
| Recreation UDV | $52,020,000 | $2,070,000 | $58,913,000 | $2,344,000 | $6,893,000 | $274,000 |
| **Total** | **$190,306,000** | **$7,572,000** | **$183,558,000** | **$7,304,000** | **$47,683,000** | **$1,897,000** |

**Table D-118. 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 | $5,002,000 | $199,000 | $1,719,000 | $68,000 | $3,283,000 | $131,000 |
| Vessel delays | $18,012,000 | $717,000 | $7,708,000 | $307,000 | $10,304,000 | $410,000 |
| Subsistence | $86,862,000 | $3,456,000 | $100,436,000 | $3,997,000 | $13,574,000 | $540,000 |
| Travel Cost | $7,446,000 | $296,000 | $0 | $0 | $7,446,000 | $296,000 |
| Infrastructure Damage | $20,964,000 | $834,000 | $14,782,000 | $588,000 | $6,183,000 | $246,000 |
| Recreation UDV | $52,020,000 | $2,070,000 | $58,913,000 | $2,344,000 | $6,893,000 | $274,000 |
| **Total** | **$190,306,000** | **$7,572,000** | **$183,558,000** | **$7,304,000** | **$47,683,000** | **$1,897,000** |

**Table D-119. 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 | $5,002,000 | $199,000 | $1,719,000 | $68,000 | $3,283,000 | $131,000 |
| Vessel delays | $18,012,000 | $717,000 | $7,708,000 | $307,000 | $10,304,000 | $410,000 |
| Subsistence | $86,862,000 | $3,456,000 | $100,436,000 | $3,997,000 | $13,574,000 | $540,000 |
| Travel Cost | $7,446,000 | $296,000 | $0 | $0 | $7,446,000 | $296,000 |
| Infrastructure Damage | $20,964,000 | $834,000 | $14,782,000 | $588,000 | $6,183,000 | $246,000 |
| Recreation UDV | $52,020,000 | $2,070,000 | $58,913,000 | $2,344,000 | $6,893,000 | $274,000 |
| **Total** | **$190,306,000** | **$7,572,000** | **$183,558,000** | **$7,304,000** | **$47,683,000** | **$1,897,000** |

**Table D-120. 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 | $5,002,000 | $199,000 | $111,000 | $4,000 | $4,891,000 | $195,000 |
| Vessel delays | $18,012,000 | $717,000 | $4,468,000 | $178,000 | $13,544,000 | $539,000 |
| Subsistence | $86,862,000 | $3,456,000 | $100,436,000 | $3,997,000 | $13,574,000 | $540,000 |
| Travel Cost | $7,446,000 | $296,000 | $0 | $0 | $7,446,000 | $296,000 |
| Infrastructure Damage | $20,964,000 | $834,000 | $14,782,000 | $588,000 | $6,183,000 | $246,000 |
| Recreation UDV | $52,020,000 | $2,070,000 | $58,913,000 | $2,344,000 | $6,893,000 | $274,000 |
| **Total** | **$190,306,000** | **$7,572,000** | **$178,710,000** | **$7,111,000** | **$52,531,000** | **$2,090,000** |

**Table D-121. 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 | $5,002,000 | $199,000 | $111,000 | $4,000 | $4,891,000 | $195,000 |
| Vessel delays | $18,012,000 | $717,000 | $4,468,000 | $178,000 | $13,544,000 | $539,000 |
| Subsistence | $86,862,000 | $3,456,000 | $100,436,000 | $3,997,000 | $13,574,000 | $540,000 |
| Travel Cost | $7,446,000 | $296,000 | $0 | $0 | $7,446,000 | $296,000 |
| Infrastructure Damage | $20,964,000 | $834,000 | $14,782,000 | $588,000 | $6,183,000 | $246,000 |
| Recreation UDV | $52,020,000 | $2,070,000 | $58,913,000 | $2,344,000 | $6,893,000 | $274,000 |
| **Total** | **$190,306,000** | **$7,572,000** | **$178,710,000** | **$7,111,000** | **$52,531,000** | **$2,090,000** |

## 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 D-122.

**Table D-122. 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 | $190,306,000 | $183,009,000 | $43,828,000 | $146,478,000 | $1,744,000 |
| 2 | | | | | |
| 2a | $190,306,000 | $183,558,000 | $47,683,000 | $142,623,000 | $1,897,000 |
| 2b | $190,306,000 | $183,558,000 | $47,683,000 | $142,623,000 | $1,897,000 |
| 3 | $190,306,000 | $178,710,000 | $52,531,000 | $137,775,000 | $2,090,000 |
| 4 | $190,306,000 | $178,710,000 | $52,531,000 | $137,775,000 | $2,090,000 |

Table D-123 summarizes project first costs, interest during construction, operations, maintenance and repair along with the present value of costs and the average annual equivalents.

**Table D-123. 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 | $33,165,000 | $1,041,000 | $947,000 | $35,152,000 | $1,399,000 |
| 2 | | | | | |
| 2a | $39,243,000 | $1,232,000 | $1,293,000 | $41,768,000 | $1,662,000 |
| 2b | $36,464,000 | $1,145,000 | $991,000 | $38,600,000 | $1,536,000 |
| 3 | $51,462,000 | $1,616,000 | $2,691,000 | $55,769,000 | $2,219,000 |
| 4 | $57,146,000 | $1,794,000 | $3,985,000 | $62,926,000 | $2,504,000 |

*Notes to table:*

1. First costs estimates at an October 2015 price level.
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 D-124 summarizes the benefits and costs for each alternative. The NED plan is highlighted in yellow.

**Table D-124. 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 | $43,828,000 | $1,744,000 | $35,152,000 | $1,399,000 | 1.25 | $345,000 | 2 |
| 2* | | | | | | | |
| 2a | $47,683,000 | $1,897,000 | $41,768,000 | $1,662,000 | 1.14 | $235,000 | 3 |
| 2b | $47,683,000 | $1,897,000 | $38,600,000 | $1,536,000 | 1.24 | $361,000 | 1 |
| 3** | $52,531,000 | $2,090,000 | $55,769,000 | $2,219,000 | 0.94 | -$129,000 | 4 |
| 4** | $52,531,000 | $2,090,000 | $62,926,000 | $2,504,000 | 0.83 | -$414,000 | 5 |

*Notes:*

- *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 1.24 with net annual NED benefits of $361,000.

## X. SENSITIVITY ANALYSIS

As in any planning process, some of the assumptions and input data used in this report are subject to complex social, economics, and natural variables. These assumptions and data are also prone to risk and uncertainty. The intent of this section is to test the sensitivity of project justification to changes in the major variables to compute project benefits. The value of this test is to reveal how the economic analysis results might vary if inputs selected for the benefit evaluation are selected or applied differently; thereby providing insight to the amount of confidence in the economic analysis. Issues that deal with variations in data and methods are sometimes referred to as risk and uncertainty issues, and one of the techniques of revealing their significance is referred to as Sensitivity Analysis.

Methodology used in this analysis is often based on more than one available choice and selection may be influenced by time and budget or by the anticipated significance of a variable in the overall study. Even in cases where data is based on a 100 percent sample, the results can be distorted by being out of date or being inappropriately applied or misinterpreted. There is rarely such a thing as perfect certainty, zero risk, or strictly up-to-date information.

Taken to the extreme one would need to examine and test the risk and uncertainty of every concept, assumption, bit of data, analysis, and conclusion separately and in combination to satisfy all possible outcomes. This effort would be impractical, so the scope and intent in this discussion is oriented toward identification of the degree to which changes in some of the major aspects of this analysis would have material effect on the outcome. Sensitivity analysis is only conducted for the NED plan: Alternative 2b.

Table D-125 summarizes the benefits of Alternative 2b, and presents the breakdown of each benefit category as a percent of total average annual benefits. The benefit categories are relatively evenly distributed, with no individual category comprising more than 30 percent of total benefits. The largest benefit categories are subsistence and vessel delays, followed by travel cost and recreation unit day values.

**Table D-125. Alternative 2b Benefits Summary and Percent of Total**

| | Alternative 2b | | |
|---|---|---|---|
| **Benefit Categories:** | **Net Present Value** | **Average Annual** | **Percent of Total Average Annual Benefits** |
| Vessel damages | $3,283,000 | $131,000 | 6.91% |
| Vessel delays | $10,304,000 | $410,000 | 21.61% |
| Subsistence | $13,574,000 | $540,000 | 28.47% |
| Travel Cost | $7,446,000 | $296,000 | 15.60% |
| Infrastructure Damage | $6,183,000 | $246,000 | 12.97% |
| Recreation UDV | $6,893,000 | $274,000 | 14.44% |
| **Total** | **$47,683,000** | **$1,897,000** | |

Both project benefits and costs might change in the time from study completion to construction. Table D-126, Table D-127, and Table D-128 present the results of sensitivity testing. This analysis tests each benefit category, total benefits, and total costs with a 20 percent change for the NED plan. In all cases, the resulting BCR is greater than unity, except for a 20 percent decrease in total benefits, which results in a BCR of 0.99.

**Table D-126. Sensitivity Analysis – Alternative 2b Considering 20 percent increase in benefits**

| Benefit Category | Average Annual Benefits Claimed | 20% Increase | Net Benefits After Increase | BCR |
|---|---|---|---|---|
| Vessel damages | $131,000 | $157,000 | $387,000 | 1.25 |
| Vessel delays | $410,000 | $492,000 | $443,000 | 1.29 |
| Subsistence | $540,000 | $648,000 | $469,000 | 1.31 |
| Travel Cost | $296,000 | $355,000 | $420,000 | 1.27 |
| Infrastructure Damage | $246,000 | $295,000 | $410,000 | 1.27 |
| Recreation UDV | $274,000 | $329,000 | $416,000 | 1.27 |
| Total Benefits | $1,897,000 | $2,276,000 | $740,000 | 1.48 |

**Table D-127. Sensitivity Analysis – Alternative 2b Considering 20 percent decrease in benefits**

| Benefit Category | Average Annual Benefits Claimed | 20% Decrease | Net Benefits After Decrease | BCR |
|---|---|---|---|---|
| Vessel damages | $131,000 | $105,000 | $335,000 | 1.22 |
| Vessel delays | $410,000 | $328,000 | $279,000 | 1.18 |
| Subsistence | $540,000 | $432,000 | $253,000 | 1.16 |
| Travel Cost | $296,000 | $237,000 | $302,000 | 1.20 |
| Infrastructure Damage | $246,000 | $197,000 | $312,000 | 1.20 |
| Recreation UDV | $274,000 | $219,000 | $306,000 | 1.20 |
| Total Benefits | $1,897,000 | $1,518,000 | -$18,000 | 0.99 |

**Table D-128. Sensitivity Analysis – Alternative 2b Considering 20 percent increase and decrease in cost**

| Project Cost Increase | Average Annual Cost Claimed | 20% Increase | Net Benefits After Increase | BCR |
|---|---|---|---|---|
| Total Cost | $1,536,000 | $1,843,000 | $54,000 | 1.03 |
| **Project Cost Decrease** | **Average Annual Cost Claimed** | **20% Decrease** | **Net Benefits After Decrease** | **BCR** |
| Total Cost | $1,536,000 | $1,229,000 | $668,000 | 1.54 |

In the worst case scenario, with a 20 percent increase in costs and a 20 percent decrease in benefits, the BCR drops to 0.82 with net annual benefits of -$325,000. In the best case scenario, a 20 percent increase in benefits and a 20 percent decrease in costs, the BCR increases to 1.85 with net annual benefits of $1.05 million.

The previous tables make adjustments to benefits and costs to test the sensitivity of the net benefits to reasonable increases and decreases to particular categories. Were the project to

drop to just parity (BCR of 1.0), the benefits would have to decrease by 19 percent or the costs would have to increase by 24 percent.

## XI. REGIONAL ECONOMY

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.

## XII. OTHER SOCIAL EFFECTS

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.

Construction of this project in Craig 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.

## XIII. FOUR ACCOUNTS SUMMARY

USACE planning guidance establishes four accounts to facilitate and display effects of alternative plans. Previous studies have relied primarily on the use of the National Economic Development (NED) account showing the changes in the economic value of the national output of goods and services. A benefit/cost ratio and an indication of the change in net benefits is the output of the NED evaluation and for this study forms the basis for the selected plan.

Included as part of this study are also evaluations of the Environmental Quality (EQ), the Regional Economic Development (RED) effects, and the Other Social Effects (OSE). Environmental Quality displays the non-monetary effects of the alternatives and natural and cultural resources and is described more fully in the Environmental Assessment. The RED benefits result in increased employment and income for the region and the state, and the OSE are generally positive and beneficial.

The Recommended Plan for the Craig Navigation Improvements Feasibility Study is Alternative 2b which provides a 10.1-acre mooring basin protected by dual rubblemound breakwaters totaling approximately 1,933 feet in length. Table D-129 shows a summary of the four accounts for all alternatives, with the Recommended Plan highlighted in yellow.

**Table D-129. Four Accounts Evaluation Summary**

| Alternative | Net Annual NED Benefits (B/C Ratio) | EQ | RED | OSE |
|---|---|---|---|---|
| 1 | $345,000 (1.25) | Positive | Increased employment and income for the region and state | Beneficial |
| 2* | | | | |
| 2a | $235,000 (1.14) | Positive | Increased employment and income for the region and state | Beneficial |
| 2b | $361,000 (1.24) | Positive | Increased employment and income for the region and state | Beneficial |
| 3** | -$129,000 (0.94) | Positive | Increased employment and income for the region and state | Beneficial |
| 4** | -$414,000 (0.83) | Positive | Increased employment and income for the region and state | Beneficial |

*Notes:*

- Alternative 2b is the Recommended Plan.
- *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.

# XIV. ATTACHMENT – CRAIG SMALL BOAT HARBOR SURVEY INSTRUMENT AND SURVEY RESULTS ANALYSIS

# Craig Small Boat Harbor Survey Results – April 2014

## Introduction

This document presents a summary of the City of Craig Small Boat Harbor vessel survey conducted in March 2013. In conjunction with the U.S. Army Corps of Engineers (USACE), Alaska District, the City of Craig mailed 1,527 surveys to current or potential users of the Craig harbor. One hundred and seventeen surveys were returned as undeliverable. USACE received a total of 338 completed surveys for a response rate of 24 percent. At a 95 percent confidence level, the margin of error for general questions asked of all survey respondents is within plus/minus 5 percent.

USACE prepared an Excel spreadsheet to use in recording the responses received. Survey respondents were instructed to answer all questions as they pertain to one vessel only and for activities that occurred in calendar year 2012. Additional copies of the survey were available from the City of Craig offices and from USACE.

Survey questions were categorized two ways; general and commercial fishing/tenders. The following discussion summarizes responses to each question in the order which they were asked. A copy of the survey instrument follows this summary.

## Vessel Characteristics

### Length, Beam, and Draft

The first survey question asked existing and potential harbor users about their vessel characteristics. Approximately 25 percent of survey respondents had vessels greater than 50-feet length overall, followed by 27 percent of vessels between 41- and 50-feet, 20 percent each of vessels between 21- and 30-feet and between 31- and 40-feet, and 7 percent less than 20-feet. Table 1 shows a summary of responses to this question broken down by vessel length.

**Table 1. Vessel Size and Draft (measured in feet)**

| Length Overall (ft) | 0-20 ft | 21-30 ft | 31-40 ft | 41-50 ft | >50 ft | n (sample size) |
|---|---|---|---|---|---|---|
| Number of Vessels | 22 | 66 | 66 | 89 | 82 | 325 |
| Beam, average (ft) | 6.25 | 8.42 | 11.45 | 13.74 | 18.41 | 294 |
| Draft (unloaded), average (ft) | 1.28 | 2.49 | 4.48 | 5.42 | 7.38 | 271 |
| Draft (loaded), average (ft) | 1.76 | 2.98 | 5.27 | 6.05 | 8.89 | 252 |

*Note:* Thirteen survey respondents did not answer the question regarding vessel length overall, 44 did not respond to beam, 67 did not respond to unloaded vessel draft, and 86 did not respond to loaded draft so sample size does not equal total responses to the survey.

## Vessel Speed

Respondents were asked about vessel speeds while cruising, fishing, and maneuvering in the harbor. The average cruising speed for all responses was 11.7 knots, the average speed while fishing was 2.5 knots, and the average speed in the harbor was 1.9 knots. Table 2 shows the responses to these questions broken down by vessel length.

**Table 2. Average Vessel Speed (Knots)**

| Length Overall (ft) | 0-20 ft | 20-30 ft | 30-40 ft | 40-50 ft | >50 ft | n (sample size) |
|---|---|---|---|---|---|---|
| Number of Vessels | 22 | 66 | 66 | 89 | 82 | 325 |
| Average Cruising Speed | 20.50 | 19.84 | 9.89 | 8.00 | 8.45 | 315 |
| Average Fishing Speed | 3.22 | 2.34 | 1.87 | 2.24 | 3.10 | 270 |
| Min Maneuvering Speed, average | 2.27 | 2.05 | 1.75 | 1.82 | 1.90 | 282 |

*Note:* Twenty-three survey respondents left the question regarding average vessel cruising speed blank, 68 did not respond to the average speed while fishing, and 56 did not respond to minimum maneuvering speed in the harbor so sample size does not equal total survey responses.

## Vessel Purpose

Respondents were then asked to identify the primary purpose of their vessel. The survey directed that only one response per vessel be chosen. In the instances where more than one response was chosen, the higher priority item was counted once – no survey was counted with more than one vessel purpose. Priority was given first to commercial operations (commercial fishing, tenders, charter/sightseeing/water taxi vessels), then to subsistence, and lastly to recreation, yachts, and 'other' vessels. The majority of respondents, 50 percent, indicated that they are primarily commercial fishing vessels.

**Table 3. Vessel Primary Purpose**
(n = 326)

| 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** | |

*Note:* Twelve respondents chose not to answer this question.

## Harbor Use

### Homeport in 2012

Survey responses revealed that 96 respondents (29.5 percent) homeported their vessel in Craig in 2012. Of the 229 respondents who indicated that they did not homeport their vessel in Craig, 155 provided the name of their current homeport. Juneau was the most popular response for homeport other than Craig.

**Table 4. Vessel Homeport**
(n = 251)

| Homeport | Number of Responses | Percent of Responses |
|---|---|---|
| Craig, AK | 96 | 38.25% |
| Cordova, AK | 1 | 0.40% |
| Hollis, AK | 1 | 0.40% |
| Hoonah, AK | 1 | 0.40% |
| Hydaburg, AK | 5 | 1.99% |
| Juneau, AK | 17 | 6.77% |
| Ketchikan, AK | 10 | 3.98% |
| Klawock, AK | 11 | 4.38% |
| Petersburg, AK | 12 | 4.78% |
| Point Baker, AK | 1 | 0.40% |
| Port Protection, AK | 1 | 0.40% |
| Sitka, AK | 8 | 3.19% |
| Thorne Bay, AK | 2 | 0.80% |
| Wrangell, AK | 1 | 0.40% |
| Other Alaska | 21 | 8.37% |
| ***Outside Alaska:*** | | |
| California | 2 | 0.80% |
| Oregon | 6 | 2.39% |
| Montana | 1 | 0.40% |
| Washington | 44 | 17.53% |
| British Columbia | 10 | 3.98% |

### Interest in future moorage at Craig

Survey respondents who indicated that Craig was not their current homeport were then asked if they would seek transient or permanent moorage at Craig if there was additional harbor space. Two hundred and thirty four boaters responded to this question regarding future Craig moorage. Approximately 60 percent of survey respondents (140 responses) indicated that they would use moorage at Craig with additional harbor space. Of those who indicated they would not seek moorage at Craig, 72 provided a reason. The most common reasons were that respondents lived or homeported in another community, or only required temporary space at Craig.

**Table 5. If there was additional harbor space, would you seek transient or permanent moorage at Craig?**
(n = 234)

| | Number of Responses | Percent of Responses |
|---|---|---|
| Yes | 140 | 59.8% |
| No | 94 | 40.2% |

Table 6 shows the most frequent responses provided as to why respondents would not seek moorage at Craig. This was an open-ended question. For this analysis, similar responses were aggregated into categories even if the text from the responses was not an exact match.

**Table 6. Explanations for no interest in moorage at Craig**
(n = 72)

| Explanations | Number of Responses | Percent of Responses |
|---|---|---|
| Live/Homeport Elsewhere | 22 | 30.6% |
| Infrequent User/Occasional Visitor | 8 | 11.1% |
| Have Permanent Moorage in Craig | 6 | 8.3% |
| Tourist | 7 | 9.7% |
| Former Vessel Owner/Permit Holder | 3 | 4.2% |
| Not my Homeport | 1 | 1.4% |
| Limited Stalls and Power | 1 | 1.4% |
| No Plans to Use Craig | 3 | 4.2% |
| Fish Elsewhere | 3 | 4.2% |
| Only Need Skiff Space/Transient Moorage/Seasonal Moorage | 13 | 18.1% |
| Always Space Available | 1 | 1.4% |
| Tie Up Elsewhere in Craig | 2 | 2.8% |
| Keep Boat on Trailer | 1 | 1.4% |
| Depends on if there was a real breakwater | 1 | 1.4% |

Respondents who would use moorage at Craig were asked to indicate the type of moorage they would prefer. All but two of the 140 respondents who stated they would use moorage at Craig provided an answer to the type of moorage they would use. Most, 64 percent, preferred transient moorage, while 13 percent preferred permanent moorage, and 1 percent preferred boat launch use.

**Table 7. Type of Moorage Preferred by those who indicated they would use Craig**
(n = 138)

| Response | Number of Responses | Percent of Responses |
|---|---|---|
| Permanent Slip | 23 | 13.1% |
| Transient Boat Slip | 113 | 64.2% |
| Boat Launch User | 2 | 1.1% |

## Current Moorage at Craig

Survey respondents were asked what type of moorage they currently use at Craig: permanent, transient, boat launch, or don't use Craig Harbor. The most popular response was transient parking, at 48 percent, followed by permanent slip at 23 percent.

**Table 8. Current moorage at Craig**
(n = 287)

| Current Moorage at Craig | Number | Percent |
|---|---|---|
| Permanent Slip | 67 | 23.3% |
| Transient Parking | 139 | 48.4% |
| Boat Launch User | 19 | 6.6% |
| Don't use Craig Harbor | 62 | 21.6% |

*Note*: Fifty-one respondents did not answer this question.

The survey then asked those who indicated transient, boat launch, or don't use Craig Harbor if they would seek permanent moorage if it was available. Table 9 shows the responses to this question.

**Table 9. Those who would seek permanent moorage if it was available**
(n = 201)

| Response | Number | Percent |
|---|---|---|
| Yes | 40 | 19.9% |
| No | 161 | 80.1% |

## Problems Encountered

Survey respondents were asked to indicate what problems they had personally encountered at the Craig harbor in the past five years. Respondents were provided with a list of possible problems and were asked to choose as many as applicable. There was also an open-ended section where respondents could describe their problems at Craig Harbor. The most frequent number of problem categories cited was 2 per respondent, while the highest number of problem categories sited on a single survey was 8.

The most frequently cited problem was overcrowding and congestion, at 25 percent of respondents. Other frequent issues include inadequate moorage and inadequate upland parking. Table 10 summarizes the responses to this question.

**Table 10. Problems Experienced at Craig Harbor**
(n = 511)

| Problem | Number of Responses | Percent of Responses |
|---|---|---|
| Inadequate Channel Depths | 44 | 8.61% |
| Inadequate depths at slips | 14 | 2.74% |
| Inadequate security at docks | 25 | 4.89% |
| Overcrowding/congestion | 127 | 24.85% |
| Inadequate moorage | 65 | 12.72% |
| Hull scratches or dents | 18 | 3.52% |
| Hull punctures | 0 | 0.00% |
| Slip rental costs too high | 21 | 4.11% |
| Ice in harbor | 12 | 2.35% |
| Damaged buoys | 0 | 0.00% |
| Inadequate upland parking | 62 | 12.13% |
| Inadequate storm protection | 23 | 4.50% |
| Poor water quality | 14 | 2.74% |
| Vandalism | 15 | 2.94% |
| Line breakage | 6 | 1.17% |
| Lack of haulouts for repairs | 21 | 4.11% |
| Swamped vessel | 0 | 0.00% |
| Inadequate boat storage | 16 | 3.13% |
| Other | 28 | 5.48% |

## Damage Assessment

Survey respondents were asked if their vessel sustained damages outside of normal wear and tear as a result of Craig Harbor conditions. Most respondents, 88 percent, indicated that they had not experienced unusual vessel damage at Craig Harbor.

**Table 11. Has your vessel sustained damages outside of normal wear and tear as a result of Craig Harbor conditions?**
(n = 182)

| Response | Number of Responses | Percent of Responses |
|---|---|---|
| Yes | 22 | 12.09% |
| No | 160 | 87.91% |

*Note:* One hundred and fifty six boaters did not answer this question.

## Cost of Repairs

If the respondents sustained damages outside of normal wear and tear in the last five years, they were asked to indicate the kind of damages and the cost for repairs. The years 2008, 2010, 2011, and 2012 received the highest number of reported damages, with 6 respondents indicating damage in each of those years. There were almost six annual repairs necessary from 2008 through 2012 with an average damage of about $1,600 per incident (in unadjusted dollars).

**Table 12. Annual Cost for Repairs**
(n = 22)

| Year | Number of Damages Reported | Average Repair Cost per Incident |
|---|---|---|
| 2008 | 6 | $ 4,150.00 |
| 2009 | 4 | $ 1,225.00 |
| 2010 | 6 | $ 287.50 |
| 2011 | 6 | $ 256.25 |
| 2012 | 6 | $ 2,280.00 |
| **Average** | **5.6** | **$ 1,639.75** |

## Delay Assessment

The survey asked respondents whether they experienced delays getting into or out of Craig Harbor during the 2012 season due to congestion or other harbor conditions. The survey provided a list of possible reasons for delays and also left room for respondents' own descriptions. The survey further asked how many times the boater was delayed in 2012 and the average length of each delay. Table 13 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 13. Craig Harbor Delays in 2012**
(n = 58)

| 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.

## Additional Facilities

The survey then addressed harbor users' interest in using new facilities at the Craig Cannery Property in the future. The survey first asked if respondents would use their boats more often than currently if there was additional moorage space at the Craig Cannery Property. Of the 194 responses to this question, 20 percent of respondents indicated that they would use their boat more.

**Table 14. Additional Boat Use with Moorage Space at Craig Cannery Property**
(n = 194)

| Response | Number of Responses | Percent of Responses |
|---|---|---|
| Yes | 38 | 19.6% |
| No | 156 | 80.4% |

Those who stated they would use their boat more were asked to estimate the additional days they would use their boats per year. The average for all respondents was 28 additional days of vessel use.

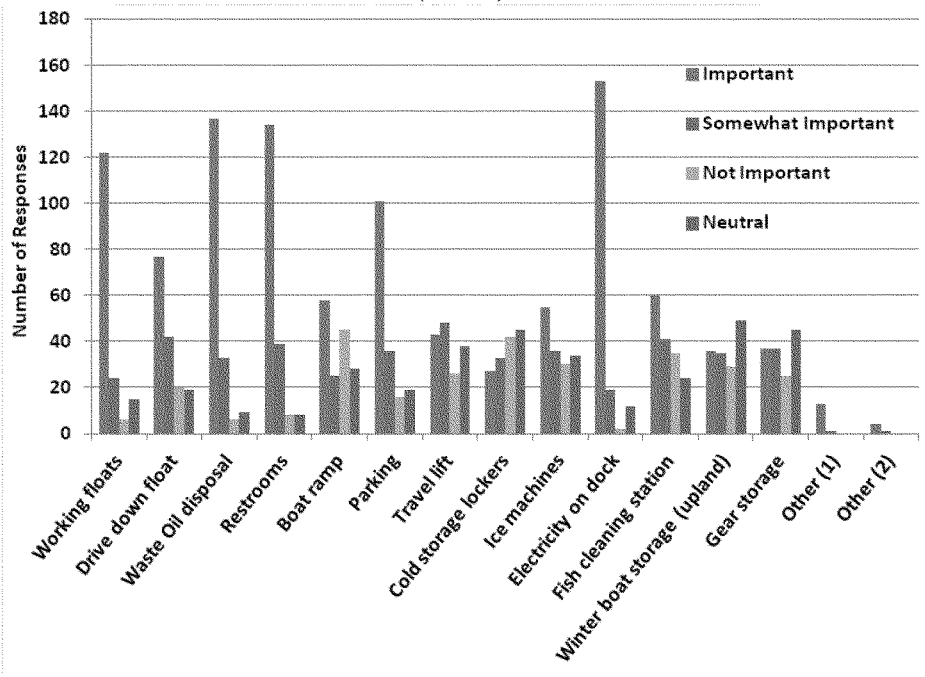
**Table 15. Additional Days of Boat Use with Additional Moorage Space**
(n = 33)

| Additional days per year | |
|---|---|
| **Average** | 27.9 |
| **Maximum** | 200 |
| **Minimum** | 3 |

## Upland Facility Assessment

The City of Craig is also planning additional facilities at the Downtown (Craig Cannery Property) harbor. The next question asked respondents to indicate the relative importance of a variety of additional upland facilities by selecting either Important, Somewhat Important, Not Important, or Neutral. Figure 1 shows the results of this question. Electricity on dock, waste oil disposal, and restrooms were the most frequently desired facilities (based on the frequency of respondents selecting 'Important').

**Figure 1. Summary of Importance of Additional Upland Facilities**
(n = 201)




*Note:* "Other" responses included the following items: breakwater, internet (3 responses), skiff tie up area, increased moorage, laundry, long term parking, transient moorage, long term affordable moorage, showers (2 responses), lighting, bad water disposal, carts, easy tie-up, deep draft moorage, Web Loft, float for trailers to work on, poles and rigging, multi-use hoses, clean up, dry winter boat storage, protection from wind, potable water, washdown water, skiff haulouts, and crane or hoist for loading vessels.

## Commercial Fishing/Tender Vessels

The Corps received 165 completed survey responses from boat owners who selected commercial fishing or tender as the primary purpose of their vessel. This equates to a response rate of 11.7 percent. At a 95 percent confidence level, the margin of error for questions asked of commercial fishing respondents is within plus/minus 7.6 percent.

The Craig Survey instrument directed respondents not currently homeported in Craig and with no future interest in moorage at Craig to skip the commercial fishing/tender boat questions. There were 118 responses that indicated commercial fishing or tender vessels and were homeported in Craig or had a future interest in using Craig. However, a total of 136 survey

respondents answered at least a portion of the commercial fishing/tender vessel questions. All of these responses are presented in this analysis.

## Employment - Crew Size

A total of 136 survey responses indicated the number of crew aboard their commercial fishing or tender vessel. The average crew size was 3, including the skipper, in 2012. The minimum crew size was 1, and the maximum was 6 on a single vessel. Table 17 shows the average crew size per vessel, by vessel size.

**Table 16. Average Crew Size (including skipper) of Craig Commercial Fishing/Tender Vessels, by vessel length**

(n = 136)

| Length Overall (ft) | 0-20 ft | 20-30 ft | 30-40 ft | 40-50 ft | >50 ft |
|---|---|---|---|---|---|
| Crew Size, average | n/a | 1.89 | 2.07 | 2.17 | 4.61 |

## Product Delivery

The survey then asked commercial fishing vessels and tenders to indicate where they currently deliver their commercial catch and the percent delivered to each location: shore-based plant in Craig, other shore-based plant not in Craig, at-sea processor, tender, or other (with a prompt to provide an explanation). One hundred and thirty commercial fishing/tender vessels provided responses to this question. Most respondents utilized one or two product delivery locations or methods, each with 40 percent of responses, while 18 percent of respondents utilized three delivery methods, and 2 percent utilized four. Table 18 summarizes the responses to this question.

**Table 17. Product Delivery Method for Commercial Fishing and Tender Vessels, 2012**

(n = 130)

| Facility Type | Number of Responses | Average Percent of Catch Delivered to that Facility |
|---|---|---|
| Shore-based plant in Craig | 92 | 57.7% |
| Other shore-based plant not in Craig | 44 | 36.4% |
| At-sea processor | 8 | 31.6% |
| Tender | 84 | 58.3% |
| Other | 9 | 65.6% |
| **Total** | **237** | |

## Anticipated Future Product Delivery

Commercial fishing and tender vessel owners were then asked if they would change where they deliver their catch with additional moorage available at Craig. A total of 131 vessel owners provided a response to this question. Most respondents, 87 percent, indicated that they would not change their deliveries.

**Table 18. Potential Changes to Product Delivery Method based on Additional Moorage at Craig**
(n = 131)

| Response | Number of Responses | Percent of Responses |
|---|---|---|
| Yes | 17 | 13.0% |
| No | 114 | 87.0% |

Survey respondents who indicated that they would change their commercial fishing deliveries based on additional moorage availability at Craig were asked to indicate how and where they would deliver their catch in the future with moorage at Craig.

In general, the respondents who indicated they would change their deliveries noted that they would deliver more to the shore-based plant in Craig, and less to either another shore-based plant or tender.

**Table 19. Product Delivery Method for Commercial Fishing and Tender Vessels, with Additional Moorage Availability at Craig Harbor**
(n = 16)

| Facility Type: | Number of Responses | Average Percent of Catch Delivered to that Facility |
|---|---|---|
| Shore-based plant in Craig | 12 | 55.4% |
| Other shore-based plant not in Craig | 7 | 29.3% |
| At-sea processor | 0 | n/a |
| Tender | 11 | 60.0% |
| Other | 0 | n/a |
| **Total** | **30** | |

## Other Comments

Survey respondents were given the opportunity to provide additional comments that they would like to make about the project, or comments to pass along to the city. Many of the survey respondents took this opportunity to provide their feedback. The following comments are summarized into categories; similar comments have been annotated parenthetically.

### 1. Praise for Craig (facilities & staff)

- Enjoyed the visit to Craig and hospitality
- New harbormaster much better than [previous harbormaster]. I didn't appreciate my boat spot being used without notification when I was out fishing for a day or two and then subsequent hassle when I came back in.
- Craig is my favorite harbor and town during my summer salmon fishery. Harbormaster is always very helpful.
- Harbor staff is always helpful and courteous; they go out of their way to help when needed.

- Harbor crew are exceptional. Always helpful, courteous, and responsive. No one steals off of boat or bothers in any way. Best harbor in Southeast Alaska.

- Told to move 3 times by other than harbor staff. Hostile attitude from live-aboards.

- Transient moorage on the main finger South Harbor has been as good as any harbor in SE Alaska. Power and water are great. Staff of harbor are outstanding in their past service to us. Minor improvement would be the ability to temporarily park (i.e. taxi) at the top of the ramp, unload purchased groceries and supplies and store them temporarily in a lean-to type shelter out of the rain while forwarding them to vessel. Wi-Fi connection would be appreciated. Thanks to the Craig Harbormaster and staff. Good luck with your much needed harbor expansion.

- Craig is not usually our destination. We cruise all over SE and only stop and spend a night or two in Craig to resupply. It's a really well managed harbor and nice town.

- Generally very pleased with harbor staff and facilities over the past 14 years.

- Even though there have been some delays in coming and going due to overcrowding, I feel the harbor department does an excellent job working with everybody.

- Craig is a wonderful place to visit. With improved facilities we would spend much more time there on our annual cruise north.

- We really enjoy our visits to Craig. We utilize the restaurants, fuel facility, hardware store, and more. Better more available transient facilities would encourage us to stay longer.

- Great harbor staff (3)

- The Craig harbormasters have always been able to accommodate us in the North Harbor – When cruising it is not possible to schedule arrivals due to distances and weather issues so the flexibility of the staff is greatly appreciated. During inclement weather the harbor is often crowded – fortunately we have avoided such times.

- Great, but limited harbor. Great harbormaster.

- I've always felt welcome in Craig. I'm only in that area during the roe on kelp fishery, late March early April.

- Enjoyed visit. Food and service. Good and convenient.

- I had no problems as a transient. (2)

- Craig is a great place to visit. We were very happily accommodated by harbor personnel and the town. We are hopeful that there is transient room for us for future visits.

- We have always found Craig to be friendly and willing to accommodate us.

- Well run, good harbormaster. I would consider permanent moorage if I were to leave my boat in Alaska. Easy to get to/from Ketchikan.

- Good docks. Good tourist information. Marina office very inaccessible. Good harbormaster.
- Craig is centrally located for changing nets: everything is correctly laid out.
- The harbormasters make your facilities work and work well. Please consider proper staffing levels as facilities are added. The harbor does a wonderful job of balancing and attending to commercial and pleasure craft. Support for commercial operations is a Craig strength.
- We travel to Craig from the Seattle area for pleasure. Craig is one of our favorite places to visit. People are great and we love dinner at Ruth Ann's. See you this summer.
- Restrooms nicely maintained; harbormaster always helpful and polite.
- We just moored in Craig overnight and did not notice any particular problems except we moored in a slip reserved for a fishing boat that was out fishing. We were treated quite hospitably in Craig.
- Very happy with current harbor facilities
- Craig Harbor has always treated me and my crew very well.
- I love my slip (next to the harbormaster skiff). I don't want to move.
- Craig is one of my very favorite towns in Southeast Alaska. A grass roots fishing community with all the trimmings. Craig rocks!
- The harbor staff was very helpful and we look forward to spending more time there.
- We have used Craig Harbor in 2013 and found the harbor very accommodating. The harbor is a great asset to Prince of Wales Island.
- Harbormaster very helpful

## 2. No interest in using Craig

- Happy in Klawock
- Have not been to Craig in many years.
- I was only there once for an emergency.
- I was cruising the waters on the west side of the island and spent two nights in Craig. Rented a car and explored the island. I think I used the last area at the end of the slips designated for transient moorage since I have seen the area. I have no plans to return.
- My rental boats are used near Petersburg
- I no longer own a boat or have moorage at Craig Harbor. (5)

- We just visit Craig occasionally.
- I berth my boat in Coffman Cove Harbor.
- Never used launch permit

### 3. Facility Needs at Craig/Current Issues with Craig

**Moorage:**

- Craig needs more transient and permanent moorage access. Rocks at low tide are a hazard.
- I have never had trouble finding a spot to tie up. The harbormaster is great at trying to accommodate as much as possible.
- Needs more moorage for seine vessels.
- Need more moorage to take care of demand.
- Needs additional transient moorage (4)
- Additional moorage space is desperately needed! (3)
- Very limited available transient moorage with electricity/power during summer months
- Both North and South Coves are in need of additional transient space with adequate power – minimum of 30 amps.
- Need more permanent slips with electricity for boats 32-45 feet
- More transient moorage for boats less than 30-feet. I would like to occasionally leave my boats in town during forecast storms.
- Craig does need more moorage, in the North Harbor
- Very busy harbor when fleet is in Area 4 (coastline outside of Craig). Additional moorage would be helpful and most likely profitable.
- More transient moorage needed on big pink years. Everybody lives with it like it is! (2)
- The slips for small boats are too small. It is difficult to get in and out with a boat right next to you.
- It would be great to have more space. I leave Craig to fish the summer months in Coffman Cove but have to share with a Washington resident in the off season. I think they should change the permanent stalls in Craig for only those who receive a state dividend. The harbor is managed well but more stalls and a ramp to drive gear to a boat would be nice (ramp to a float).

- Have appreciated being accommodated but at times the only moorage available has been challenging to safely maneuver. We have high skill level and a bow thruster and thanks to good harbor workers have always made it work.

- The time I visited Craig the moorage was unprotected from the surge and upon leaving the depth at the entrance was too low.

- Craig is a great town. During salmon season there's crumby moorage. Had to get around without seine skiff. Hard to tie up – find a spot. Facilities like laundry and showers would be great – pool is OK, but not handy. A haulout would be great, hard to justify. Work float is crowded and used as storage. Would love to see and support a better harbor.

- Craig harbor is a good place to keep my boat during dive season, but lately I've found that North Cove plugged with boats and unable to park. South Cove is less desirable because it is more exposed to south winds and prone to damaging my boat when I'm not on it.

- We with permanent moorage are OK. But the number of boats increases in the summer months causing severe overcrowding boats rafting six and seven deep at times. This is very unsafe and makes resupply difficult at best there is very little transient moorage available.

- Could always use more room for boats and cars

- I always use the North Harbor transient moorage. In a good blow it can get quite rough there.

- Love Craig but using tender all the time is a pain for the wife who loves to shop and eat out.

- It would be nice for pleasure boaters to know you have more slips. I think more would come visit.

- I have been to Craig with my boat only once, and stayed in the transient area. It was very stormy. The area we were on was not very protected with lots of swells and wind. I had to help another boat in docking. It was too rough for them to manage. You might consider extending the breakwater to provide more protection.

- My vessel participates in the Southeast Alaska dive fishery. We are in and out of the harbor several days a week at off hours. Our season starts in October, runs through winter month and ends in spring. The competition for moorage is extremely tough. It's a constant battle each week.

- Harbor shelter from west and north winds would help North Harbor. Deeper water along docks would be nice as well. Any upgrades to keep your local fleet and visitors happy will be appreciated.

- We have been waiting over 5 years for permanent slip. Is incredibly frustrating to be provided a slip that several boats have paid for – especially when they all want to dock at the same time.

- I've been waiting for full time stall assignment for 4 years. Through no fault of the harbormaster- just none available.

- We would use Craig Harbor as a seasonal transient moorage base off and on from May to September if moorage was available. Reliable Wi-Fi is another consideration, along with increased transient moorage. Harbor staff has been helpful in the past but the facilities need expansion and updating.

- Need more ample slips for the sportfishing/charter sized boats with ample cleaning stations and waste disposal.

- I fish for Geoducks in Craig during the winter it would be nice to have assigned transient slips to make it easier to moor your boat when it is windy when we come in at night.

- More float plane slips are needed.

- No slips available so 8 months a year my boat is docked in Klawock.

- Craig needs more adequate moorage. It's been that way for years. Started fishing out in Craig Area since 1996, always full in summer. I believe more stalls would be helpful. A new harbor is needed really bad. I believe more people would moor their boats permanently. This dock or float should be for all vessels (user groups).

- More available moorage will attract more yacht/recreational activity to the Craig area.

Launch Ramps:

- If putting new launch in, ensure that it can be utilized at low tide. I damaged both props at Thorne Bay's launch on a low tide.

- I only used the launch ramp a couple of times. It was adequate at all tide levels.

Depth:

- North Cove reef west side out to marker, very shallow boats hit bottom at low tide (boats of all sizes)

- The East side channel needs to be deeper all the way up to the grid

- A little dredging on north side of harbor would be nice. I have hit bottom more than once.

Congestion:

- Harbor can get congested at times making it difficult to get in and out. Slight wind causes challenges in docking.

- Harbor can be very busy with commercial fishing traffic. Sometimes moored 2-3 deep.

- Like Craig but each time there we are penned in by commercial vessels. No problem – fishing comes first but it would be nice if we didn't have to shuffle around.

- Craig Harbor too crowded. I try to skip Craig or go to Klawock instead.
- I avoid Craig as much as possible due to harbor congestion.
- Get rid of a bunch of charter boats owned by people who don't even live here and aren't Alaskan residents – that should give you plenty of berths at the harbor.

### Electrical Power:

- More shore power in North harbor.
- Craig Harbor needs slips with electricity or manage the slips with electric already available. Also needs better management of transient vessels during fish openings. So boats don't have to race to dock to get moorage. Assigned transient moorage worked really well years ago for dive fleet.
- For yachts my size or larger, a source of 50-amp, single phase power at least 208 volts or 240 volts is important. Also wired so that increased loads don't result in brown-outs.
- Slips with 50A 120/240V power would be ideal.
- Need more electrical hook ups

### Water:

- The water system (pipes and faucets) in North Cove need to be repaired – some faucets have been disabled when the lines under the dock broke and have never been repaired.

### Internet Access:

- No internet Wi-Fi limits how much I visit Craig Harbor. Ability to conduct business while in Craig is critical but not provided.
- Great rec centers needs free Wi-Fi at marina. Also be nice if you could turn off the rain during the summer.
- Need internet on docks along with electric

### Parking:

- Upland parking is inadequate in all harbors (2)
- Parking at the town boat dock is not adequate. Ramp is difficult to access/maneuver when lot is full. Need to extend the ramps so putting in or taking out can be accomplished even in low tide, especially if windy.
- Need adequate, low or no cost parking as I live remote.

Accessibility:

- Easy access transient slips close to hardware store and supermarket will make the community money.
- Some people in North Cove are a long way from where you enter. A facility that was closer to the entry spot would be nice. Many don't have permanent moorage which would be nice.
- Craig's dock is very nice but my boat is ¼ mile from the parking lot. The end of the dock gets heavy weather and is pretty worn. My vessel is like a breakwater for the rest of the dock. My finger is badly worn. Would use boat more often if it were closer to parking. I often get completely soaked walking down to boat. Dock water makes me sick; took years to figure that out.

Other Facilities:

- To be able to drive down to load and unload would be a great convenience. To add transient moorage and a place to park our vehicle would be very important to us. A drive down float where we would be obligated in all weather to walk several blocks to get and again to park a vehicle or to have to move the boat from one dock to another would negate much of the convenience. A drive-down float is an invaluable asset to the boating community.
- A drive down dock would be of well use for both commercial, charter, and sport fishing fleet. And be utilized year-round. (2)
- Drive down ramps are a must for the fishing fleet of Alaska. Cranes to load and unload are also required. However, they must be strong enough and be open to use 24/7. Just look at the setup in Petersburg Harbor and use that as a model to base off of.
- I would like to see a better video system put in. I was robbed multiple times in the past two years and even prior to that.
- I am surprised there are not more people falling off dock ladders at low tide climbing down to their seiners. It is very hard to find slip-side moorage. The harbor is very shallow and I have hit bottom often. Craig is a nice town but it is difficult and scary to tie up there.
- When heading north out of the harbor to the fuel dock, there is confusion on the rule: Red Right Return, you end up on the rocks if you follow the green cans leaving the harbor
- [Craig needs] not just restrooms but good clean shower facilities.
- The floating bridge was a nice addition – at first. But now it is just a MESS! A place to stretch out seines is great. Storage is great. But there must be rules and policy or the nicest facilities will soon resemble a garbage dump and be unusable.
- Dry winter boat storage would pay for itself.

- I think some kind of locker for skiff gas cans, oars, life jackets that cannot be left in an open skiff would be wonderful. We've had gas cans, etc. stolen several times.

- A large travel lift to handle 42-foot length and 16-foot wide and 36,000 pounds would be great.

- Not enough boat storage and haul out facilities for working on boats. Expanded boat storage would solve some of this. Having a drive down work float would make working on boats easier. Would keep more boats in Craig instead of having to go to Wrangell to have work done.

- Get rid of boats that haven't moved in 10 years

- Need more gear storage to get all the crap off the docks

- All four harbors and JT Brown Industrial Park should have skiff haulouts – sloped floats to run skiff up onto so you can pull the plug and our rain won't swamp or sink a skiff.

### Moorage Fees:

- Costs are very high for 3-4 week moorage. I pay for an annual slip. Then someone else rents the same slip. I should have a discount when someone else leases the slip too.

- The most important thing to consider is price. If you don't keep moorage affordable you will drive boats away. This is what is happening in Sitka. Price is going up and I am looking elsewhere for a homeport. Wrangell and Craig are high on the list. If I can't afford the moorage I will have to leave the fishing industry and Alaska maybe.

- Prices for moorage and haulouts should be kept reasonable. This can be a burden on commercial boats. And our fish tax should be used to keep cost down to the commercial fleet and for harbor improvements for the fleet. The City should give back to the harbor at least 50 – 75% of this revenue and not continue to use it elsewhere.

- Please keep moorage fees down

- Lower rates for transient (if possible)

### Docks:

- Many of the fastenings (nails) that hold the wood planks down on the dock are coming loose and sticking up. I feel this is dangerous to both the safety of the people on the dock and to personal property on the dock. I have seen repeated attempts to drive these nails back down, but after a short period of time they are sticking up again.

- Current docks are really in poor shape. Any improvement would be a great asset at Craig.

- The docks are presently very slick with algae, and there are a serious danger and should be dealt with. The harbormasters never seem to be around anymore. They had a much better presence under previous harbormaster.

- The bottom of the South Cove dock is in need of additional protection from bad south/west weather and the approach is in need of deepening.

- What is our harbormaster doing? Craig harbor looks awful. Docks listing, covered in algae, planks uneven, floats listing, broken hose outlets, broken or w/no working hose, no electricity near some areas – Klawock harbor looks clean and neat by comparison. Prioritizing work well is important in a job like that. Not sure if you picked the right person. Let's get it done! Clean it up, repair it, replace it.

Ice in harbor:

- Inner bay North Cove Harbor freezes up in winter and needs to be broken up when freezes so ice doesn't damage vessels. I would like to see more mid-size to large vessel moorage at the Ward Cove dock.

## 4. Use of new harbor site

- It would be nice to utilize that area. It's such a waste and is so well located.

- Ward Cove Cannery would be a good harbor for SE wind, but make sure you don't copy Sitka's design for the NW breakwater.

- I'm not convinced that the occasional delays during peak season at North/South Cove harbors justifies the development of the cannery property.

- The City cannot/does not maintain what we have. How will we take care of a bigger harbor? Better use for the money would be to dredge both sides of North Cove. I have hit bottom or had to wait several times.

- Even though we do not currently seek permanent moorage, it may be we would in the future if it were available.

- Please pursue harbor extensions. More space is needed.

- I would add water taxis and duck boat/whale watch trips/fish.

- Downtown moorage would be farther from the grocery store. More moorage would entice more transient boaters and overwinter transients.

- The west side of the island is growing with new residents. It would seem that enhanced facilities would be necessary. Hollis dock should be expanded as well.

- In 2012, the area of proposed development provided King Salmon fishing opportunities. Until the need becomes important, I think the City should hold off. My slip (permanent) continues to be used for transient when my boat is out of the water and there are slips available. That tells me we have space.

- The better the moorage situation in Craig, and the better the ice availability, and the better the fish delivery options to SPC, the more likely I would be to fish out of Craig.

- We love Craig harbor and hope to spend more time there. Most helpful would be permanent assigned slip availability and separate areas for large and small vessels (basically, harbor so congested during seiner openers it was difficult to get in/out, find slips and sleep at night). Also, if improving harbor facilities, more land-based housing (i.e. camper sites, weekly room rentals, showers/laundry, would be great for those of us there for the summer).

- Improvements at cannery site is an excellent plan to move the City into the 21st Century.

- I support expansion of the Craig facilities for commercial fisheries. Build it and business will come.

- Building a breakwater on Cannery Point would be the best thing for the entire north side docks in Craig since the floating breakwater was moored in its site.

- I would consider basing out of Craig instead of Wrangell or Ketchikan if I could get back to Ketchikan easier (ferry cost makes it worth my while to motor around a couple times a summer). I don't like leaving a truck unattended while fishing outside to get back and forth. To over winter, I'd want security for the boat in dry dock.

- My years of commercial fishing the City of Craig needs to expand its harbor facility to accept all permanent moorage with the ability to accommodate summer transient vessels.

- The new cannery location is much more suited for "storm" protection then "South Cove" my current location. I'm constantly changing lines and worried about my vessel in the gales of winter. This new harbor would open many more options for residents. I could sleep more comfortable knowing the boat is more secure.

- A new improved harbor is much needed. I also believe that city should expand city limits to include Point St. Nick to take advantage of the added tax base.

## 5. Current use of Craig Harbor

- I like to visit Craig in the summer and utilize their transient moorage for recreational boats.

- I use Craig Harbor for transient moorage/resupply several times during summers. I have/am considering dry land winter storage in Craig. If so my wet usage would still be occasional, but am interested in convenient in and out and dry land long term storage.

- Prefer transient moorage at North and South Harbors, closer to town for groceries, laundry, supplies, without car.

- Harbor use is highly variable depending on relative abundance of salmon in Area 4 purse seine fishery, however, I can see increased use in coming years.

- I own a seiner, fish around Craig usually in August. Additional moorage would be good for the overflow of seiners during closures. I usually tie up by JB Brown's Dock or the Old Fuel Dock.

- We make Craig our homeport June-September each year. Our groceries and supplies come from the town as does our recreation and leisure activity.

- For most of the time that I have been in the Craig area, I have been unable to tie to a dock but have anchored out in the harbor. I would be more inclined to be in the area if there were more facilities available.

- I use the Craig Harbor for the roe on kelp fishery. My harbor use is during the last half of March and first half of April.

- We have a dock at our house, but can't use it in winter due to exposure to wind and waves. We would likely just use the harbor in winter, or during storms. We are in the process of changing fisheries and more harbor space would help the process.

- Existing harbors could be MAINTAINED and UPGRADED truck ramp, electricity. This would meet the off season demand.

- The current harbor sizes might be inadequate, but that pales in comparison to the need for maintenance and infrastructure upgrades for our current facilities. Both North and South cove could really benefit from maintaining the current docks and as far as North cove where I moor my salmon-trolling vessel, the dock water supply has been failing for years as well as the electrical supply. Both systems are in dire need of upgrades. In addition North cove could benefits from dredging the existing channels to the east and west inside the harbor itself. During the summer months, when the seine fleet and a larger number of salmon-trollers are mooring here, it is sometimes not possible to enter and exit the harbor due to rafting-out vessels, low tides and shallows. Every year I've observed deeper draft vessels hitting bottom or running aground.

  It seems ludicrous for the City of Craig to request funding for a new harbor when they cannot adequately maintain their existing harbors. How do they expect to maintain a new facility? Furthermore the peak usage occurs in July and August only, so moorage revenue from transients would only be realized at that time. I've brought this up at the infrequent harbor advisory meetings we have. I see a new facility as a drain on the city's already inadequate revenues.

  On the other hand a harbor project would be good for employment (temporarily) in the community, but so would an infrastructure upgrade.

  So for what it's worth, save our federal tax dollars and spend them on something more worthwhile.

- The city should prioritize services for charter vessels because charter businesses generate tax revenue for the City of Craig.

- Craig is a good spot for me at times but would not be used in summer. Could look at winter moorage if it was larger and more updated and cost effective – occasionally there is not enough room even in the fall.

# Appendix E
# Geotechnical Evaluation

US Army Corps of Engineers

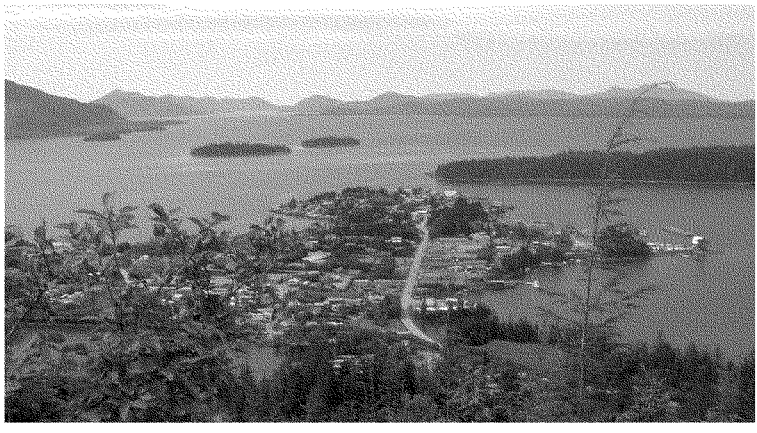
*Geotechnical Feasibility Report*

# *Craig Harbor Navigation Improvements*

**Craig, Alaska, Alaska District, Pacific Ocean Division**

August 2015

Status: FINAL



**Department of the Army**
**Alaska District, U.S. Army Corps of Engineers**
**P.O. Box 6898**
**JBER, AK 99506-0898**

CEPOA-EN-G-GM August 2015

MEMORANDUM FOR

Civil Works Project Management (CEPOA-PM-C-PL), Lorraine Cordova

SUBJECT: Geotechnical Feasibility Report for Craig Harbor Navigation Improvements, Craig, Alaska

1. This report was authorized and forwarded to Geotechnical and Materials Section by the Civil Works Project Management Branch via the Project Manager, Lorraine Cordova.

2. Enclosed is the Geotechnical Feasibility Report for the Craig Harbor Navigation Improvements, Craig, Alaska. Included with the report are the Project Location and Vicinity Map, the Potential Quarry Location Map, geologic conditions, a discussion of the quarry findings, and preliminary engineering design recommendation for the project with assumptions.

3. As a result of the site visit and knowledge of the area the project site is suitable for the construction of the proposed rubble-mound breakwater. There are several potential material sources in the area that are capable of providing rock for construction. This is only a feasibility level design and an in depth geotechnical investigation should be performed on the subsurface soils to verify assumptions made during the feasibility study.

4. The original Geotechnical Feasibility Report dated November 2014 was revised to reflect further analysis conducted in August 2015. The bearing capacity analysis was expanded and a preliminary settlement analysis was included.

5. Results and questions should be addressed to Robert Weakland at 907-753-2633 or John Rajek at 907-753-5695.

Robert Weakland, P.E.
Civil Engineer
CEPOA-G-GM

John Rajek, P.E.
Chief, Geotechnical and Materials Section
CEPOA-G-GM

Douglas Bliss, P.E., P.G.
Chief, Geotechnical and Engineering Services
CEPOA-G

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## APPENDIXES

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Project Layout Map ..... Sheet A-2

**Appendix B – Slope Stability**

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**Appendix C – Rock Quarry Trip Report**

# 1.0 Introduction

This report presents the findings of the Geotechnical Feasibility Study for the selected alternative from of the Navigation Improvements Feasibility Study for Craig, Alaska. This alternative involves dismantling an old dilapidated wood dock and constructing a rubble-mound breakwater in Wards Cove, Craig, Alaska.

The scope of the study was to perform a literature search, analyze the project site with available data, identify potential material sources, identify general surface and potential subsurface conditions, and address geotechnical concerns relevant to the project. There was no site specific investigation performed for this effort. This report presents a summary of the findings based on historical documents, site observations, and geotechnical assumptions to determine project feasibility with a geotechnical perspective. This report also includes a preliminary engineering analysis for assumed site conditions and preliminary geotechnical recommendations for the design and construction of the proposed rubble-mound breakwater system.

An extensive exploration program and a more detailed engineering analysis are needed before the final geotechnical recommendations for the design and construction of the proposed rubble-mound breakwater can be made.

# 2.0 Location and Project Description

The project site is on Prince of Wales Island in Southeast Alaska in the community of Craig located about 60 miles west of Ketchikan, Alaska. The location is shown on the enclosed Vicinity Map in Appendix A, Sheet A-1. A number of alternative were considered; the selected alternative would consist of a 10-acre basin protected by a 1,933-foot long rubble-mound breakwater configured in an "L-shape". The proposed breakwater layout has no western opening except for a 10-foot gap between the stub breakwater and the main breakwater 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. The breakwater configuration is shown on the enclosed Project Layout Map in Appendix A, Sheet A-2.

## 2.1. Site History

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. The Navigation Improvements Feasibility Study selected a project site that had been used by Wards Cove Packing Company. Many of the company's structures remain along the north shore of Wards Cove. The machinist shop, cannery, freezer house, seine net lofts and boilers are shown in Figure 1 and 2.

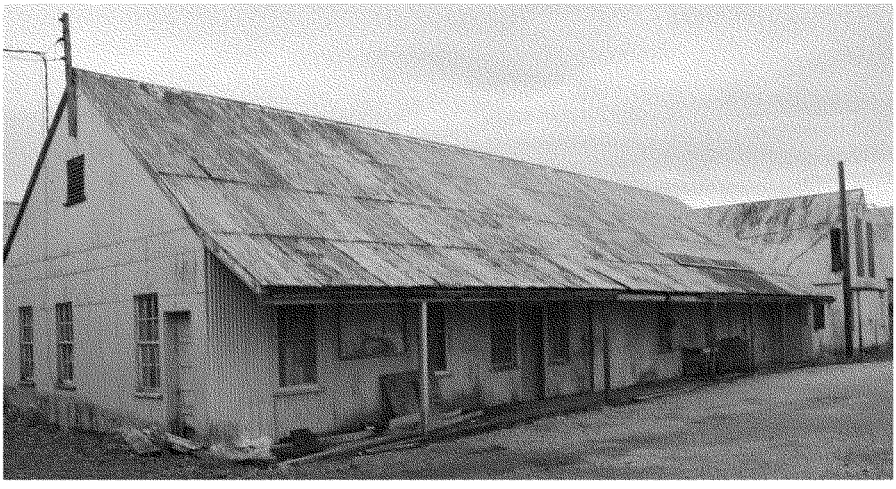

**Figure 1. Old machinists shop at the old Wards Cove Packing Company Cannery site. Building next to it was the freezer house and the seine net lofts.**



**Figure 2. Photograph is to the northeast of Words Cove Packing Company Cannery old boilers.**

The remains of a decaying timber dock and debris can be seen along the waterfront of the project site. Some steel rigging and machinery can be seen at low tide. Due to the sites past usage, marine related mechanical and structural debris is expected below the water in Wards Cove.

## 2.2. Literature Search

A literature search revealed mostly historical, environmental, and economical documentation, and very little geologic and geotechnical data.

### *2.2.1. Navigation and Harbor Improvement, 1979*

A study was conducted in the late 1979 to improve the Craig Harbor and overall navigation following major damage to their floating dock system in Craig's south harbor. This report had a record of soil probing and test pits from September 1956. The probes and test pits indicated medium hard to hard blue clay, sand, gravel, cobbles, and boulders. These probes and test pits were in the vicinity of the south harbor. Following this study the city constructed two rubble-mound breakwaters to an elevation of 20 feet MLLW (mean lower low water) for south harbor moorage protection.

### 2.2.2. Craig Small Boat Harbor Entrance Channel Improvements, 1992

A study was conducted in January 1992 for new dredging in the south small boat harbor in Craig, Alaska. This study incorporated two test pits along the southern edge of the small boat harbor. The surface was reported to be loose clayey sand with gravel, cobbles and boulders (SC). The test pits indicated the subsurface consisted of dense clayey sand with gravel, cobbles and boulders (SC) and dense clayey gravel with sand, cobbles and boulders (GC). The clay matrix was reported to be very hard. These two test pits are very similar to the test pits performed in 1956.

These soils appear to be in a loose state near the surface, but become very hard at about three feet below the mudline. The loose soils are wet and became soupy when disturbed while the very hard soils are moist and have liquid limits ranging from 28 to 31 and plastic indices range from 14 to 17 for the clay matrix. Moisture contents of 9 and 11 percent were measured from samples procured in the very hard stratum. The very hard clayey stratum is reported to be underlain by bedrock. The bedrock was not confirmed during this exploration.

### 2.2.3. Craig Coastal Management Program, 2006

This document is the amended 1984 Craig Coastal Management Plan, with the changes required to meet the standards of U.S. House Bill 191 and the resulting 11 AAC 110, 11 AAC 112 and 11 AAC 114. Along with inventories, conditions, policies, goals and objectives in this plan, a presentation of Craig's Geology and Soils is covered as well. The geology and soils remarks were prepared from seven test pits dotted about Craig Island. The test pits were conducted by Stragier Engineering Services for CH2M Hill for the 1984 Craig Coastal Management Plan. The soils Test Pit Logs report the subsurface was found to be predominately glacial till. The Stragier Engineering/CH2M Hill Report is unavailable. The Craig Coastal Management Plan Soils Map and Soils Test Pit Logs are included in Appendix A as Sheet A-3 and A-4.

### 2.2.4. Reconnaissance to Evaluate Material Sources Trip Report, 2014

Between 24 and 25 April 2014, Christine Morgan (Cost Engineering) and Coleman Chalup (Geotechnical and Materials Section) traveled to Craig Alaska to inspect the proposed harbor site and determine if any quarries in the area are capable of producing adequate rock for the proposed harbors breakwater. The team met with several local quarries owners during the two days to see if existing quarries are available and obtain information. This trip report is included in Appendix C.

# 3.0 Regional Geology

The Prince of Wales Mountains are underlain in part by well-consolidated slightly metamorphosed Paleozoic sedimentary and volcanic rocks and in part by crystalline schist and marble. Glaciations have been the most significant factor in modifying the land. Pleistocene glaciations by ice sheets and alpine glaciers had marked effects. Pre-glacial drainage lines were widened and deepened to form U-shaped valleys and deep fiords. Mountain peaks and ridges were rounded and probably only a feel of the highest peaks stood above the limits of glaciations. Also, as a result of the glaciations, much of the area is covered by glacial drift of varying thickness.

# 4.0 Site Conditions

No geotechnical information was available for the project site. Engineering assumptions, judgment, and visual observations were used to evaluate the probable site conditions. The assumptions and judgments within this report are based on past, nearby geotechnical related reports. Tidal data for the Craig local area is provided in Table 1. Saltwater density for calculations in this report is assumed to be 64.0 pounds per cubic foot. In order to obtain a more accurate understanding of the geotechnical site picture, a detailed site investigation will be needed.

**Table 1. Tidal data for the Craig, Alaska referenced to Mean Lower Low Water (MLLW). Water level data is from the National Oceanic and Atmospheric Administration (NOAA) online database, 15 October 2013.**

| Description | Elevation (feet) |
|---|---|
| Highest Astronomical Tide | 12.6 |
| Mean Higher-High Water | 10.2 |
| Mean High Water | 9.3 |
| Mean Tide Level | 5.4 |
| Mean Low Water | 1.4 |
| Mean Lower-Low Water (Datum) | 0.0 |
| Lowest Astronomical Tide | -2.9 |

## 4.1. Surface Conditions

The project site has an approximate 13 percent grade sloping down from plus five feet to minus 20 feet MLLW to the north and shallows to an approximate six percent grade to minus 45 feet MLLW. The surface is composed of sand with some fines, gravel, and an abundance of cobbles and boulders; Figure 3 and 4. Remains of the Wards Cove Packing Company timber dock are littered over a large portion of the project site. This includes remnants of the dilapidated timber dock; scattered timber piles are protruding out of the water as well as lying on the sea floor, and large iron rigging, equipment and/or machinery; Figure 4 though 6.

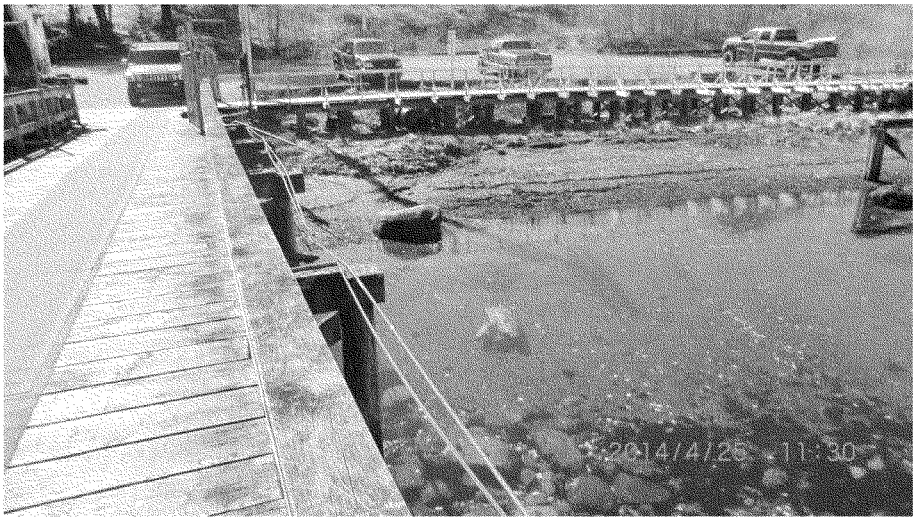


**Figure 3. Large boulders can be seen in the photograph near the eastern project limits.**



**Figure 4. Cobbles and boulders can be seen at the project site near the dilapidated timber dock.**




**Figure 5. Photograph is looking north; dilapidated wood dock of the Wards Cove Packing Company Cannery site.**




**Figure 6. Photograph shows a large unknown piece of iron equipment or machinery off the side of the old dock.**

### 4.2.Subsurface Conditions

Subsurface conditions are expected to be similar to the subsurface conditions encountered at the Craig South Boat Harbor. Historical explorations performed at the south boat harbor indicated the subsurface consisted of dense clayey sand with gravel, cobbles and boulders. Bedrock was encountered during the 1956 soil probing from six to ten feet below mudline. The 1956 probing data was limited. There wasn't sufficient data to construct a bedrock profile; however, it appears the bedrock dips to the southwest. The current project site is west of this location, so the bedrock is suspected to be deeper; however, without further exploration, it is impossible to predict its true depth.

# 5.0 Rock Source

Two local quarries have the potential to produce the required size, quality, and quantity of rock needed for the project. Seven quarries were inspected during a site visit 24 and 25 April 2014. A trip report documents the inspection and is provided in Appendix C. Of the seven quarries, St. Johns Quarry and Southeast Road Builders Quarry are believed to have the best chance at producing the required rock. St. Johns Quarry is located five miles southwest of Craig on San Juan Bautista Island and the rock would have to be barged to the site. South east Road Builder Quarry is accessible by road and is approximately six miles to the north. The rock could be trucked or barged. Details, comments, photographs, and maps regarding the quarry inspection are in Appendix C.

# 6.0 Geotechnical Engineering Analysis

A section profile near the midpoint between the bend and end of the breakwater footprint was selected for analysis. This profile was selected because it had the maximum height, even though the crest elevation of the proposed breakwater is 18 feet MLLW. Based on weight, this point in the breakwater would have the lowest factor of safety; therefore, it was considered the critical section profile.

## 6.1. Design Factors of Safety

Appropriate factors of safety were utilized to ensure adequate performance of the project throughout its design life. Two of the most important considerations that determine appropriate magnitudes for factor of safety are uncertainties in the conditions being analyzed, including assumptions and consequences of failure and acceptable performance. Table 2 is a list of applicable Factors of Safety that were use for analysis.

**Table 2. List of required factors of safety.**

| Reference | Analysis Condition | Required Minimum Factor of Safety |
|---|---|---|
| Engineering and Design Manual, EM 1110-1-1904 | Settlement Analysis | Conducted to design crest elevation |
| Engineering and Design Manual, EM 1110-1-1905 | Bearing Capacity | 2.5 |
| Engineering and Design Manual, EM 1110-2-1902 | Slope Stability, End-of-Construction | 1.3 |
| Engineering and Design Manual, EM 1110-2-1902 | Slope Stability, Long Term | 1.5 |
| Engineering and Design Manual, EM 1110-2-1902 | Slope Stability, Earthquake Loading | >1.0 |

## 6.2. Assumed Soil Properties

### *6.2.1. Insitu*

Geotechnical data available from existing reports, surveys, test pits, and test probes are insufficient to accurately describe the engineering properties of the insitu soil within the project vicinity. Therefore, the properties of the insitu soils were assumed based on available geotechnical data. The proposed rubble-mound breakwater will be constructed directly on the

insitu soil with no excavation or foundation preparation. The insitu soils were assumed to be one homogenous unit of poorly graded clayey gravel with sand, cobbles and boulders with a unit weight of 130 lb/ft$^3$ (pound per cubic foot) and an internal friction angle of 32 degrees (Cornell University, 1990). Soil cohesion and bedrock were neglected.

#### *6.2.2. Rubble-mound Breakwater Material*

The breakwater is composed of three different rock materials; armor rock (A Rock), intermediate rock (B Rock), and core rock. For estimating purposes we have assumed a porosity (n) value of 37 percent for all of the in-place large stone products for all three sites. A conservative estimate of specific gravity of the stone to be used for the project is 2.65. To calculate the estimated dry unit weight of in-place large stone the following relationship was used between specific gravity, porosity, and the unit weight of water:

$$\gamma_d = G_s(1-n)\gamma_w$$

$$\gamma_d = \text{Estimated Dry Unit Weight (lbs/ft}^3\text{)}$$

$$G_s = \text{Relative Density (Specific Gravity), (BSSD)}$$

$$n = \text{Porosity (assumed 37 percent) (USACE Shore Protection Manual)}$$

$$\gamma_w = \text{Unit Weight of water } \left(64.0\frac{\text{lb}}{\text{ft}^3}\right)$$

$$\gamma_d = 2.65(1-0.37)64.0\frac{lb}{ft^3} = 107\frac{lb}{ft^3}$$

This value was used for all rock material used for the design of the breakwater system.

### 6.3. Bearing Capacity

The loaded area is essentially flat with very little relief; therefore, no eccentric loading is assumed. To establish the most conservative embankment profile for analysis, the lowest estimated water level (-2.9 feet MLLW) was used when calculating the embankment loading. The waterline relative to the mudline is 42.1 feet, the embankment height relative to mudline is 63.0 feet and the embankment material is assumed to be 107 lb/ft$^3$. Calculation of the embankment load is:

$$Q_p = 107 \cdot (63.0 - 42.1) + 42.1 \cdot (107 - 64) = 4{,}100\ lb/ft^2$$

The preliminary allowable bearing capacity "$Q_p$" is the ultimate bearing capacity "$Q_u$" divided by an appropriate factor of safety "FS". A reasonable factor of safety is based on the available subsurface and surface information, variability of the soil, soil layering and strengths, type and

importance of the structure and past experience with like structures. The FS range for embankment is typically two to four; however for marine structures 2.5 is recommended.

Considering foundation soil capacity and in the absence of a full subsurface exploration, a presumptive value for the allowable bearing pressure was obtained from Engineer Manual 1110-1-1905, Table 4-8, *Presumptive Allowable Bearing Pressures Bearing Capacity of Soils*. Factors of safety are incorporated into the suggested table values. Referencing the described insitu material from section 6.2.1, a medium to compact gravel-sand mixtures with some boulders best describes the site soil conditions and yields a value of 10,000 $lb/ft^2$ for an estimated nominal allowable bearing pressure. This presumed value more than doubles preliminary calculated embankment load $Q_p$; therefore, it can be assumed the proposed embankment will not exceed the ultimate bearing capacity with factor of safety much larger than 2.5. The presumptive allowable bearing pressure values from Table 4-8 are based on maximum foundation settlements; therefore, settlement will govern the allowable foundation pressures.

## 6.4. Settlement Analysis

Total settlement is the combined effect of immediate and long-term settlements. The assumed foundation soil properties suggest all settlement will be immediate and will occur during construction. Two breakwaters have been constructed for the Craig South Boat Harbor and a 2003 survey shows they have experience little to no long term settlement. A preliminary analysis of the immediate settlement that will occur during construction was evaluated in accordance with Engineer Manual 1110-1-1904, Settlement Analysis.

Estimated engineering values required for the use of the Schmertmann method of analysis were assumed based on the insitu soils described in Section 6.2.1. A single homogenous medium dense soil unit with a thickness of two times the width of base of the breakwater was assumed; approximately 400 feet. Bedrock was ignored due to lack of information. The analysis indicated full settlement will range from four and a half to eight inches. This will likely occur rapidly during construction and before the final placement of armor rock.

This preliminary analysis and the performance of local like structures illustrate the feasibility of constructing the proposed breakwater with little to no residual settlement. A site subsurface investigation is required to perform a more detailed settlement analysis.

## 6.5. Slope Stability

Analytically there are three different conditions that must be evaluated for slope stability analyses; static, pseudo-static, and post earthquake. For this feasibility report, a post earthquake analysis was not performed.

The critical section identified in beginning of Section 6.0 was modeled and analyzed in Slope/W®; part of the GeoStudio 2012® software package. The conventional limit-equilibrium methodology (Spencer Method) was used for the primary analysis. The pore water pressure was

modeled with a static piezometric line set at the lowest astronomical tide. This method identified the most critical slip surface with the lowest factor of safety from numerous slip surfaces. To enhance the search process for the critical slip surface and because the slip surface typically is not circular, a Monte-Carlo type optimization technique, which is also known as the "random walking" method (Greco, 1996), was employed.

The required minimum factor of safety for "long term" slope stability is greater than the "end-of -construction" slope stability. The results concluded the end-of-construction factor of safety meets the minimum factor of safety for long term stability; therefore, long term slope stability was not analyzed. The results of this end-of-construction analysis are shown on Table 4 and the analysis can be found in Appendix B.

## 6.6. Earthquake Ground Motions Slope Stability

The project is in a seismic area where major earthquakes can and have occurred. Per ASCE/SEI 7-10, this breakwater system and location classifies as Seismic Design Category E, corresponds to Occupancy Groups I, II, and III; an area near major active faults and is a non-essential structure. Due to it classification and non-life safety status, seismic analysis is not required; however, some analysis was conducted to show this project will perform during a design level earthquake.

Two earthquake events were investigated to determine performance of the proposed rubble-mound breakwater based on general criteria provided in engineering regulation 1110-2-1806, Earthquake Design and Evaluation for Civil Works Projects and IBC 2012. The two levels of earthquakes evaluated were defined as the Maximum Design Basis Earthquake (MDE) defined by ground motions having a 10 percent probability of being exceeded in 50 years; the Maximum Credible Earthquake (MCE) defined by ground motions having a two percent probability of being exceeded in 50 years. The MDE is used to evaluate design level performance; whereas, the MCE illustrates the small safety margin for higher design earthquakes.

The peak horizontal ground acceleration for each design earthquake event was determined using time-independent probabilistic seismic hazard maps of Alaska provided by the U.S. Geological Survey (USGS). The USGS probabilistic seismic hazard deaggregation for peak ground acceleration for ten percent in 50 years is shown in Figure 7.

The horizontal seismic coefficient, Kh, used as a pseudostatic loading condition was assumed to be half of the peak horizontal ground acceleration based on recommendations provided in the AASHTO LRFD Bridge Design Manual (2012). The seismic coefficient values and the peak horizontal ground accelerations for the MDE and the MCE are provided in Table 3.

**Table 3. Seismic Coefficients for Design Earthquake Events**

| Design Earthquake Event | Probability of Exceedance | PHGA (g) | Kh (g) |
|---|---|---|---|
| Maximum Design Earthquake (MDE) | 10% in 50 years | 0.10 | 0.05 |
| Maximum Credible Earthquake (MCE | 2% in 50 years | 0.18 | 0.09 |

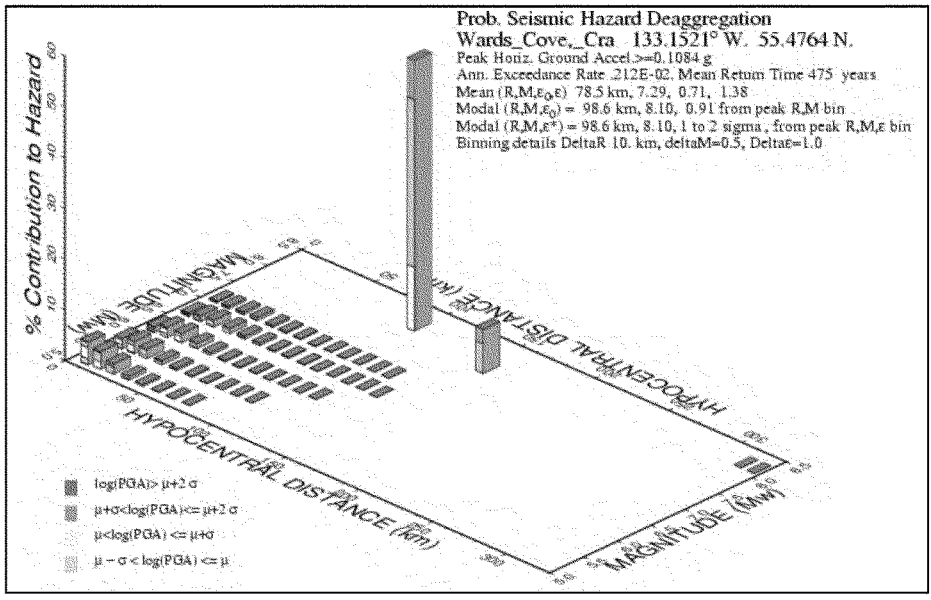


**Figure 7. USGS Probabilistic Seismic Hazard Deaggregation for Peak Ground Acceleration two percent in 50 years.**

The end-of-construction condition was evaluated for slope stability during earthquake loading for the critical profile for the maximum design earthquake and the maximum credible earthquake. The results are provided in Table 4 for both slip surfaces of the critical profile section.

**Table 4. Comparison of calculated and required minimum factors of safety based on EM 1110-2-1902.**

| Profile Section | | Factor of Safety | | | | | |
|---|---|---|---|---|---|---|---|
| | | *EOC | | **MDE | | ***MCE | |
| | | Minimum | Calculated | Minimum | Calculated | Minimum | Calculated |
| Slip Surface | Harborside | 1.3 | 1.71 | >1.0 | 1.37 | NA | 1.15 |
| | Seaside | 1.3 | 1.77 | >1.0 | 1.42 | NA | 1.21 |

* End of Construction

** Maximum Design Earthquake

*** Maximum Credible Earthquake

## 6.7. Liquefaction Analysis

Loose sandy coarse grained soil or soft fine soil are not expected at the project site. As the project requirements developed, the primary purpose of our slope stability and liquefaction analyses has been to assess the likelihood of slope movements that could result in slope failure of the rubble mound breakwaters. A more detailed site specific investigation is required to conduct a complete liquefaction analysis.

# 7.0 Engineering Recommendations

As a result of this geotechnical feasibility study, the project site is suitable for the construction of the proposed rubble-mound breakwater system. All calculate geotechnical engineering factors of safety within this report meet or exceed the USACE's minimums. Rock sources are available in the local area that can produce the required size, quality, and quantity for the proposed project. Any quarry selected must produce rock that meets rock quality specification outline in the USACE's Shore Protection Manual.

A project feasibility study is limited to identification of potential site uses. During the preconstruction, engineering, and design phase a geotechnical subsurface investigation should be conducted following the guidance provided in EM 1110-1-1804 Geotechnical Investigations. We anticipate this effort will include drilling approximately 8 to 12 test borings along the proposed breakwater alignment and collecting soil samples for laboratory testing. Data collected during the subsurface investigation should be used to develop engineering properties of the foundation soils below the proposed breakwaters. A Geotechnical Design Memorandum should be produced to support the development of project plans and specifications. A Geotechnical Data Report should be prepared and incorporated into the construction contract documents. The anticipated cost to conduct a geotechnical investigation and prepared reports is between $300,000 and $500,000.

Recommendations presented in this section are meant as preliminary engineering recommendations for the proposed rubble-mound breakwater system for the selected alternative. A more in-depth geotechnical evaluation should be prepared in the event that this project is brought to 100 percent design. Preliminary recommendations presented in this section can generally be applied to the all segments of breakwaters. No recommendations are given for dredging; whereas dredging was not included in the selected alternative.

# 8.0 References

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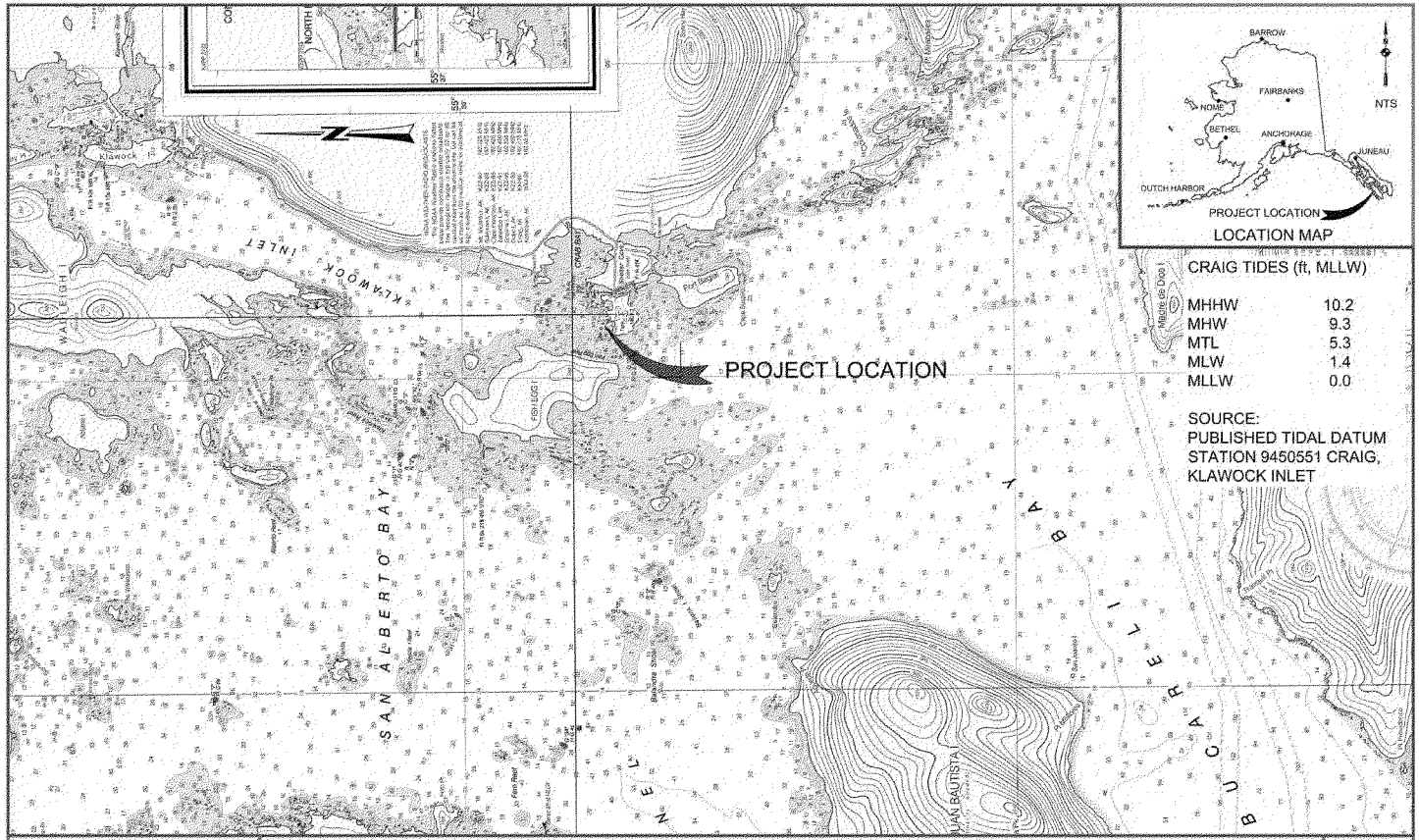
# APPENDIX A

# Project Maps

Location and Vicinity Map ..... Sheet A-1

Project Layout Map ..... Sheet A-2

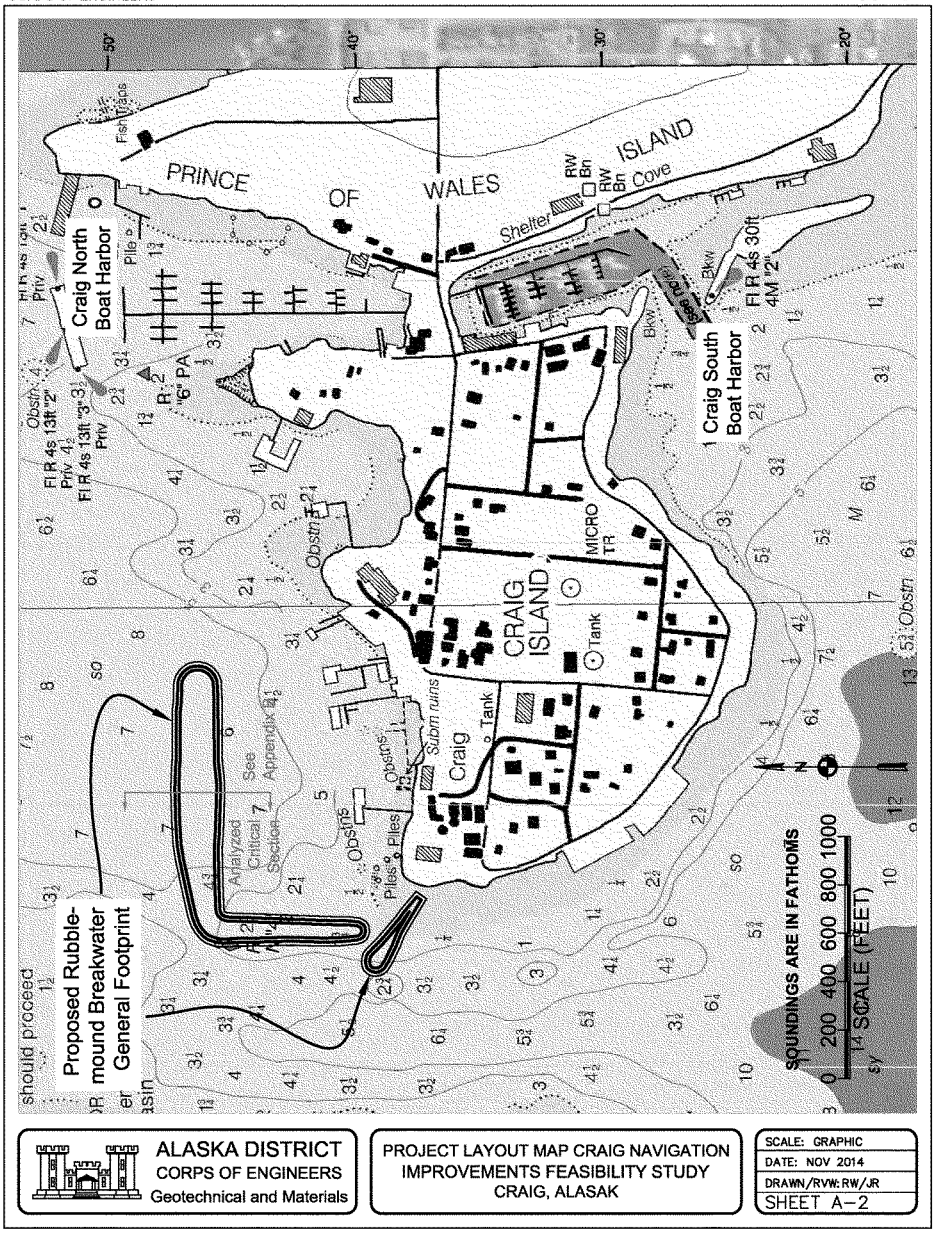



ALASKA DISTRICT
U.S. ARMY
CORPS OF ENGINEERS

LOCATION & VICINITY
CRAIG NAVIGATION IMPROVEMENTS FEASIBILITY STUDY

A-1

CORPS OF ENGINEERS U.S. ARMY

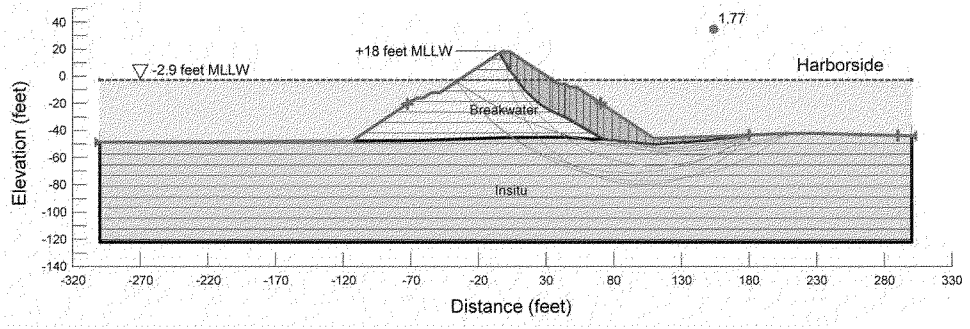


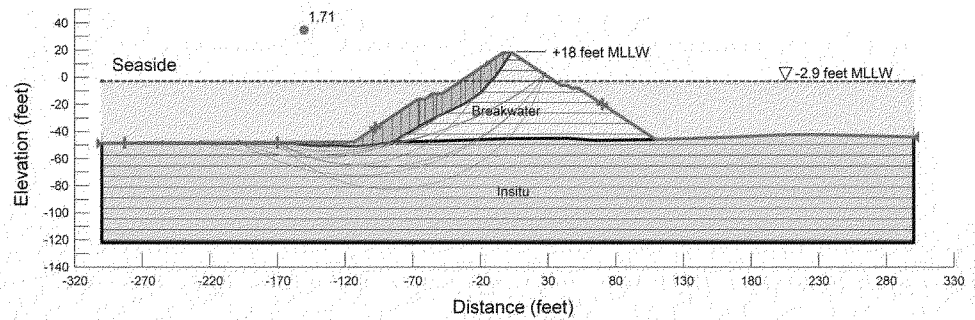
# APPENDIX B

## Slope Stability

Slope Stability Analysis Graphic ..... 1 Sheet

Slope Stability GeoStudio Data Output ..... 12 Sheets




BUILDING STRONG®

# SLOPE/W Analysis

Harborside

Report generated using GeoStudio 2012. Copyright © 1991-2013 GEO-SLOPE International Ltd.

## File Information

**Created By:** Weakland, Robert T POA
**Last Edited By:** Weakland, Robert T POA
**Revision Number:** 21
**File Version:** 8.2
**Tool Version:** 8.12.3.7901
**Date:** 11/20/2014
**Time:** 12:54:17 PM
**File Name:** SlopeStability 1500 Harborside.gsz
**Directory:** O:\EN\Private\ES\ES-SG\1 MAIN PROJECT FILES\3 Civil Works\Craig\Craig harbor Navigation Improvements\Project Data\Analysis\
**Last Solved Date:** 11/20/2014
**Last Solved Time:** 12:54:22 PM

## Project Settings

**Length(L) Units:** feet
**Time(t) Units:** Seconds
**Force(F) Units:** lbf
**Pressure(p) Units:** psf
**Strength Units:** psf
**Unit Weight of Water:** 64 pcf
**View:** 2D
**Element Thickness:** 1

## Analysis Settings

### SLOPE/W Analysis

**Kind:** SLOPE/W
**Method:** Spencer
**Settings**
**Lambda**
**Lambda 1:** -1
**Lambda 2:** -0.8
**Lambda 3:** -0.6
**Lambda 4:** -0.4
**Lambda 5:** -0.2
**Lambda 6:** 0
**Lambda 7:** 0.2
**Lambda 8:** 0.4
**Lambda 9:** 0.6
**Lambda 10:** 0.8
**Lambda 11:** 1

PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: No
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Left to Right
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

## Materials

### Breakwater

Model: Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion': 0 psf
Phi': 45 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Insitu

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-72.60831, -20.5722) ft

**Left-Zone Right Coordinate:** (70.25, -20) ft
**Left-Zone Increment:** 4
**Right Projection:** Range
**Right-Zone Left Coordinate:** (180, -43.5682) ft
**Right-Zone Right Coordinate:** (290, -43.75502) ft
**Right-Zone Increment:** 4
**Radius Increments:** 4

## Slip Surface Limits

**Left Coordinate:** (-300, -48.60337) ft
**Right Coordinate:** (300, -43.9825) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | -300 | -2.9 |
| Coordinate 2 | 300 | -2.9 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | -300 | -48.60337 |
| Point 2 | -113.56868 | -47.87912 |
| Point 3 | -64.12049 | -47.45269 |
| Point 4 | 0 | -45.40455 |
| Point 5 | 44.55991 | -45.11672 |
| Point 6 | 64.12932 | -46.59365 |
| Point 7 | 109.38485 | -46.0899 |
| Point 8 | 168.76117 | -44.09303 |
| Point 9 | 200.88919 | -42.59272 |
| Point 10 | 225.79381 | -42.29448 |
| Point 11 | 300 | -43.9825 |
| Point 12 | 300 | -122 |
| Point 13 | -300 | -122 |
| Point 14 | 52.25 | -8 |
| Point 15 | 47.25 | -8 |
| Point 16 | 44.25 | -6 |
| Point 17 | 39.25 | -6 |
| Point 18 | 3.25 | 18 |
| Point 19 | -3.25 | 18 |

| | | |
|---|---|---|
| Point 20 | -48.25 | -12 |
| Point 21 | -54.75 | -12 |
| Point 22 | -61.125 | -16.25 |
| Point 23 | -66.125 | -16.25 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Breakwater | 5,6,7,14,15,16,17,18,19,20,21,22,23,2,3,4 | 7,406.6 |
| Region 2 | Insitu | 1,13,12,11,10,9,8,7,6,5,4,3,2 | 45,533 |

## Current Slip Surface

**Slip Surface:** 126
**F of S:** 1.765
**Volume:** 2,388.0923 ft³
**Weight:** 261,363.68 lbs
**Resisting Moment:** 16,122,797 lbs-ft
**Activating Moment:** 9,134,052.8 lbs-ft
**Resisting Force:** 87,360.523 lbs
**Activating Force:** 49,653.494 lbs
**F of S Rank:** 1
**Exit:** (180, -43.568201) ft
**Entry:** (-4.4874419, 17.175039) ft
**Radius:** 99.475387 ft
**Center:** (126.82069, 97.484705) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | -3.8687209 | 16.137395 | -1,218.3933 | 73.950875 | 73.950875 | 0 |
| Slice 2 | 0 | 9.6492465 | -803.15178 | 425.85699 | 425.85699 | 0 |
| Slice 3 | 3.50907 | 3.7642607 | -426.51269 | 717.16139 | 717.16139 | 0 |
| Slice 4 | 6.0992665 | 0.21489 | -199.35296 | 914.06009 | 914.06009 | 0 |
| Slice 5 | 11.225901 | -6.635405 | 239.06592 | 1,199.0339 | 959.96802 | 0 |
| Slice 6 | 16.669442 | -12.821025 | 634.9456 | 1,669.9289 | 1,034.9833 | 0 |
| Slice 7 | 21.965508 | -17.721455 | 948.57312 | 1,852.5069 | 903.93378 | 0 |
| Slice 8 | 28.73864 | -22.703095 | 1,267.3981 | 2,128.2859 | 860.88779 | 0 |
| Slice | 33.73187 | - | 1,455.0429 | 2,216.4842 | 761.44133 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | | 25.635046 | | | | |
| Slice 10 | 36.925 | -27.108247 | 1,549.3278 | 2,260.8936 | 711.56578 | 0 |
| Slice 11 | 41.359125 | -29.154002 | 1,680.2561 | 2,395.3063 | 715.05015 | 0 |
| Slice 12 | 43.859125 | -30.349358 | 1,756.7589 | 2,447.3369 | 690.578 | 0 |
| Slice 13 | 45.75 | -31.42464 | 1,825.5769 | 2,532.3801 | 706.80319 | 0 |
| Slice 14 | 49.75 | -33.699314 | 1,971.1561 | 2,693.2706 | 722.1145 | 0 |
| Slice 15 | 54.842908 | -36.595492 | 2,156.5115 | 2,935.464 | 778.95252 | 0 |
| Slice 16 | 60.028725 | -39.544503 | 2,345.2482 | 3,111.7484 | 766.50021 | 0 |
| Slice 17 | 65.214542 | -42.493514 | 2,533.9849 | 3,288.0328 | 754.0479 | 0 |
| Slice 18 | 70.11245 | -45.23397 | 2,709.3741 | 3,463.484 | 754.10988 | 0 |
| Slice 19 | 75.503533 | -46.812029 | 2,810.3699 | 3,898.5361 | 679.96169 | 0 |
| Slice 20 | 81.66914 | -47.435585 | 2,850.2774 | 3,827.586 | 610.69019 | 0 |
| Slice 21 | 87.828186 | -48.058477 | 2,890.1425 | 3,756.7283 | 541.50293 | 0 |
| Slice 22 | 93.987233 | -48.681369 | 2,930.0076 | 3,685.8707 | 472.31568 | 0 |
| Slice 23 | 100.14628 | -49.30426 | 2,969.8727 | 3,615.013 | 403.12843 | 0 |
| Slice 24 | 106.30533 | -49.927152 | 3,009.7378 | 3,544.1554 | 333.94117 | 0 |
| Slice 25 | 109.40409 | -50.240544 | 3,029.7948 | 3,249.8316 | 137.49422 | 0 |
| Slice 26 | 112.01754 | -50.058267 | 3,018.1291 | 3,327.6618 | 193.4175 | 0 |
| Slice 27 | 117.20596 | -49.689822 | 2,994.5486 | 3,289.9425 | 184.58262 | 0 |
| Slice 28 | 121.79286 | -49.39563 | 2,975.7203 | 3,251.6974 | 172.44961 | 0 |
| Slice 29 | 127.55674 | -48.99101 | 2,949.8246 | 3,223.748 | 171.16631 | 0 |
| Slice 30 | 135.23651 | -48.41793 | 2,913.1475 | 3,160.1487 | 154.34349 | 0 |
| Slice 31 | 141.61152 | -47.973892 | 2,884.7291 | 3,112.7634 | 142.49165 | 0 |
| Slice 32 | 146.54436 | -47.642677 | 2,863.5314 | 3,079.545 | 134.9803 | 0 |
| | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 33 | 149.25567 | -47.459945 | 2,851.8365 | 3,062.6635 | 131.73934 | 0 |
| Slice 34 | 152.71066 | -47.035012 | 2,824.6408 | 3,043.2353 | 136.59303 | 0 |
| Slice 35 | 159.13087 | -46.219395 | 2,772.4413 | 2,945.6526 | 108.23442 | 0 |
| Slice 36 | 165.55107 | -45.403779 | 2,720.2419 | 2,848.0699 | 79.875801 | 0 |
| Slice 37 | 171.57088 | -44.639028 | 2,671.2978 | 2,754.1332 | 51.761291 | 0 |
| Slice 38 | 177.19029 | -43.925143 | 2,625.6092 | 2,674.222 | 30.376626 | 0 |

# SLOPE/W Analysis

Seaside

Report generated using GeoStudio 2012. Copyright © 1991-2013 GEO-SLOPE International Ltd.

## File Information

**Created By:** Weakland, Robert T POA
**Last Edited By:** Weakland, Robert T POA
**Revision Number:** 22
**File Version:** 8.2
**Tool Version:** 8.12.3.7901
**Date:** 11/5/2014
**Time:** 3:52:27 PM
**File Name:** SlopeStability 1500 Seaside.gsz
**Directory:** O:\EN\Private\ES\ES-SG\1 MAIN PROJECT FILES\3 Civil Works\Craig\Craig harbor Navigation Improvements\Project Data\Analysis\
**Last Solved Date:** 11/5/2014
**Last Solved Time:** 3:52:30 PM

## Project Settings

**Length(L) Units:** feet
**Time(t) Units:** Seconds
**Force(F) Units:** lbf
**Pressure(p) Units:** psf
**Strength Units:** psf
**Unit Weight of Water:** 64 pcf
**View:** 2D
**Element Thickness:** 1

## Analysis Settings

### SLOPE/W Analysis

**Kind:** SLOPE/W
**Method:** Spencer
**Settings**
Lambda
**Lambda 1:** -1
**Lambda 2:** -0.8
**Lambda 3:** -0.6
**Lambda 4:** -0.4
**Lambda 5:** -0.2
**Lambda 6:** 0
**Lambda 7:** 0.2
**Lambda 8:** 0.4
**Lambda 9:** 0.6
**Lambda 10:** 0.8
**Lambda 11:** 1

PWP Conditions Source: Piezometric Line
Apply Phreatic Correction: No
Use Staged Rapid Drawdown: No
Slip Surface
Direction of movement: Right to Left
Use Passive Mode: No
Slip Surface Option: Entry and Exit
Critical slip surfaces saved: 1
Optimize Critical Slip Surface Location: Yes
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2,000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

## Materials

### Breakwater

Model: Mohr-Coulomb
Unit Weight: 107 pcf
Cohesion': 0 psf
Phi': 45 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

### Insitu

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

## Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-283.02867, -48.53744) ft

**Left-Zone Right Coordinate:** (-170, -48.09834) ft
**Left-Zone Increment:** 4
**Right Projection:** Range
**Right-Zone Left Coordinate:** (-97.81049, -37.37366) ft
**Right-Zone Right Coordinate:** (70, -19.83333) ft
**Right-Zone Increment:** 4
**Radius Increments:** 4

## Slip Surface Limits

**Left Coordinate:** (-300, -48.60337) ft
**Right Coordinate:** (300, -43.9825) ft

## Piezometric Lines

### Piezometric Line 1

#### Coordinates

| | X (ft) | Y (ft) |
|---|---|---|
| Coordinate 1 | -300 | -2.9 |
| Coordinate 2 | 300 | -2.9 |

## Points

| | X (ft) | Y (ft) |
|---|---|---|
| Point 1 | -300 | -48.60337 |
| Point 2 | -113.56868 | -47.87912 |
| Point 3 | -64.12049 | -47.45269 |
| Point 4 | 0 | -45.40455 |
| Point 5 | 44.55991 | -45.11672 |
| Point 6 | 64.12932 | -46.59365 |
| Point 7 | 109.38485 | -46.0899 |
| Point 8 | 168.76117 | -44.09303 |
| Point 9 | 200.88919 | -42.59272 |
| Point 10 | 225.79381 | -42.29448 |
| Point 11 | 300 | -43.9825 |
| Point 12 | 300 | -122 |
| Point 13 | -300 | -122 |
| Point 14 | 52.25 | -8 |
| Point 15 | 47.25 | -8 |
| Point 16 | 44.25 | -6 |
| Point 17 | 39.25 | -6 |
| Point 18 | 3.25 | 18 |
| Point 19 | -3.25 | 18 |

| | | |
|---|---|---|
| Point 20 | -48.25 | -12 |
| Point 21 | -54.75 | -12 |
| Point 22 | -61.125 | -16.25 |
| Point 23 | -66.125 | -16.25 |

## Regions

| | Material | Points | Area (ft²) |
|---|---|---|---|
| Region 1 | Breakwater | 5,6,7,14,15,16,17,18,19,20,21,22,23,2,3,4 | 7,406.6 |
| Region 2 | Insitu | 1,13,12,11,10,9,8,7,6,5,4,3,2 | 45,533 |

## Current Slip Surface

**Slip Surface:** 126
**F of S:** 1.706
**Volume:** 1,885.5001 ft³
**Weight:** 205,593.15 lbs
**Resisting Moment:** 11,494,244 lbs-ft
**Activating Moment:** 6,737,966.7 lbs-ft
**Resisting Force:** 69,988.493 lbs
**Activating Force:** 41,135.487 lbs
**F of S Rank:** 1
**Exit:** (-170, -48.098345) ft
**Entry:** (2.7318496, 18) ft
**Radius:** 98.899384 ft
**Center:** (-129.53539, 80.348236) ft

### Slip Slices

| | X (ft) | Y (ft) | PWP (psf) | Base Normal Stress (psf) | Frictional Strength (psf) | Cohesive Strength (psf) |
|---|---|---|---|---|---|---|
| Slice 1 | -167.31163 | -48.344215 | 2,908.4298 | 2,966.2202 | 36.111468 | 0 |
| Slice 2 | -161.93488 | -48.835956 | 2,939.9012 | 3,035.3718 | 59.656644 | 0 |
| Slice 3 | -156.55814 | -49.327697 | 2,971.3726 | 3,104.5233 | 83.20182 | 0 |
| Slice 4 | -151.1814 | -49.819438 | 3,002.8441 | 3,173.675 | 106.747 | 0 |
| Slice 5 | -145.80465 | -50.311179 | 3,034.3155 | 3,242.8266 | 130.29217 | 0 |
| Slice 6 | -142.32494 | -50.60651 | 3,053.2166 | 3,268.5467 | 134.55318 | 0 |
| Slice 7 | -141.47553 | -50.65363 | 3,056.2323 | 3,222.3558 | 103.80548 | 0 |
| Slice 8 | -138.70487 | -50.50974 | 3,047.0234 | 3,198.4797 | 94.640366 | 0 |
| Slice | -133.13626 | - | 3,037.5672 | 3,204.7022 | 104.43755 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 9 | | 50.361987 | | | | |
| Slice 10 | -127.42425 | -50.349582 | 3,036.7733 | 3,204.5848 | 104.86025 | 0 |
| Slice 11 | -121.81835 | -50.538615 | 3,048.8713 | 3,269.6105 | 137.93314 | 0 |
| Slice 12 | -116.31857 | -50.929084 | 3,073.8614 | 3,324.4631 | 156.59332 | 0 |
| Slice 13 | -113.56649 | -51.124475 | 3,086.3664 | 3,618.456 | 332.4865 | 0 |
| Slice 14 | -110.28169 | -50.93415 | 3,074.1856 | 3,591.3832 | 323.18092 | 0 |
| Slice 15 | -103.22776 | -50.35933 | 3,037.3971 | 3,666.1466 | 392.8863 | 0 |
| Slice 16 | -95.918795 | -49.406655 | 2,976.4259 | 3,684.1909 | 442.26068 | 0 |
| Slice 17 | -88.843505 | -48.269985 | 2,903.679 | 3,713.0664 | 505.76136 | 0 |
| Slice 18 | -82.070061 | -45.840648 | 2,748.2014 | 3,305.2315 | 557.03011 | 0 |
| Slice 19 | -75.656947 | -42.152278 | 2,512.1458 | 3,083.6001 | 571.45433 | 0 |
| Slice 20 | -69.302316 | -38.497544 | 2,278.2428 | 2,863.9898 | 585.74702 | 0 |
| Slice 21 | -65.55314 | -36.341283 | 2,140.2421 | 2,669.0268 | 528.7847 | 0 |
| Slice 22 | -63.05314 | -34.954707 | 2,051.5012 | 2,552.8984 | 501.39721 | 0 |
| Slice 23 | -57.9375 | -32.148518 | 1,871.9051 | 2,407.2847 | 535.37956 | 0 |
| Slice 24 | -53.50634 | -29.717801 | 1,716.3393 | 2,203.4034 | 487.06408 | 0 |
| Slice 25 | -50.25634 | -28.116417 | 1,613.8507 | 2,091.7325 | 477.88183 | 0 |
| Slice 26 | -44.8375 | -25.633862 | 1,454.9672 | 1,962.9941 | 508.02686 | 0 |
| Slice 27 | -38.0125 | -22.507098 | 1,254.8543 | 1,801.2771 | 546.42283 | 0 |
| Slice 28 | -32.84088 | -20.137803 | 1,103.2194 | 1,743.8178 | 640.59839 | 0 |
| Slice 29 | -28.242217 | -17.30377 | 921.84128 | 1,610.8028 | 688.9615 | 0 |
| Slice 30 | -22.563132 | -13.24753 | 662.24192 | 1,528.5592 | 866.31725 | 0 |
| Slice 31 | -16.010559 | -7.059705 | 266.22112 | 1,116.5777 | 850.3566 | 0 |
| Slice 32 | -10.477469 | -0.86099 | -130.49664 | 871.16249 | 871.16249 | 0 |
| | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Slice 33 | -5.953705 | 5.1714026 | -516.56977 | 595.96293 | 595.96293 | 0 |
| Slice 34 | -0.25907519 | 13.582393 | -1,054.8731 | 238.77198 | 238.77198 | 0 |

# APPENDIX C

# Rock Quarry Trip Report 2014

**DEPARTMENT OF THE ARMY**
**ALASKA DISTRICT, U.S. ARMY CORPS OF ENGINEERS**
**P.O. BOX 6898**
**JBER, AK 99506-0898**

CEPOA-EN-G-GM

MEMORANDUM FOR THE RECORD

SUBJECT: Trip Report – Site reconnaissance to evaluate potential material sources for the Craig Harbor Navigational Improvements project.

DATE: 2 May 2014

1. Purpose: Between 24 and 25 April 2014, Christine Morgan (Cost Engineering) and Coleman Chalup (Geotechnical and Materials Section) traveled to Craig Alaska to look at the proposed harbor site and determine if any quarries in the area are capable of producing adequate rock for the proposed harbors breakwater. The team met with several local quarries owners during the two days in order to see if existing quarries are available and obtain information.
2. Schedule:
    a. 24 April, 2014
        i. Traveled to Craig, Alaska
        ii. Met with James Carl from Shaan Seet Inc.
    b. 25 April, 2014
        i. Traveled to St. Johns island
        ii. Met with Paul Thibodeau from Southeast Road Builders Inc.
        iii. Traveled to Anchorage, Alaska
3. Discussion
    a. Shaan Seet Quarries – Upon arrival in Craig the team met with James Carl from Shaan Seet Inc. and traveled to three (3) of their quarries near Craig. The first one visited was the Lower 62 Pit (Figure 2). There is an upper 62 pit, however it is unusable. They had stockpiles of rock consisting of 2 to 4 foot diameter stone that were dull when struck with a rock hammer indicating that the stone was elastic and strength was greater than 15,000 psi, had a more open composition than tight and small pieces would break away. The quarry face had veins of highly fractured rock with low fractured rock and could produce a large variety of stone sizes. However James commented that this pit had a hard time meeting some specs but was unaware of which ones they were. There was also a barge landing across the main road from the quarry that could be used during construction activities. If this quarry was to be used testing would have to be used to determine if the stone would be adequate which could make this quarry viable. The other two quarries that we traveled to were the 4.5 mile (Figure 3) and 5 mile quarries. These two quarries would be unable to produce B or A rock and were typically used for crushing the stone into gravel for road construction. The 5 mile quarry also had a locked gate and we were not able to see the actual quarry. James also said that they would have to improve the road before this quarry would be usable. We were also told about another quarry at 8-9 miles down the road called Wolf Lake that could produce A and B material but due to the distance and rough road it did not seem like a viable quarry. Another quarry on St. Johns Island (about 4 miles away to the southeast from the proposed harbor site) is planned on being developed and also had an existing quarry. He arranged for a boat ride the next morning for the team to investigate. The

St. Johns quarry (Figure 4) had some stockpiled material from the last project (15 to 20 years ago) that used the site for a Canadian breakwater. This site had stone from 2 to 5 feet in diameter stockpiled and the quarry face looked like it could produce similar sized stone. The stone made a sharp tone when struck with a rock hammer indicating that the stone was elastic and strength was greater than 15,000 psi, had a tight composition and did not break apart easily. This stone appeared to be competent and be a viable quarry for the breakwater project.

b. Southeast Road Builders – The team met with Paul Thibodeau from Southeast Road builders quarry (Figure 5) just outside of Klawock, Alaska. This quarry had all sizes of stone that ranged from 3 inch minus to A on site. The stone had dimensions of +4 feet (A), 1-2 feet (B), and 3 inch minus (Small Core). The rock made a sharp tone when struck with a rock hammer that indicated it was elastic and strength was greater than 15,000 psi, had a tight composition and did not break apart easily when struck. Paul also said that for his company to transport their material they would truck it to the site and stock pile the material on site since they do not have a barge landing adjacent to the quarry. He also indicated that they have passed DOT and highway specs that include LA Abrasion, Degradation, Fractures, and Sodium Sulfate tests that have been performed in the past. This quarry appears to be a viable option to produce materials for the breakwater although it would have to still undergo more testing. Paul also took us to the Black Rock Quarry (Figure 6) where they could produce B and Core material. The majority of the material produced at this site was core, due to the highly fractured faces of the quarry and occasionally made B rock. This quarry would only be viable for B and Core material and would not produce any A size material which would not make it a viable quarry unless it was needed for strictly core material.

c. Harbor location – The team walked the proposed harbor (Figure 7) location from wharfs, land, and also made a stop along the outside of the wharfs when returning from St. Johns quarry by boat. Below the water surface and on the beach cobbles and various boulders were noted that may cause issues while dredging although dredging may not be necessary for this project. During construction, and the demolition phase, it will be necessary to remove all of the old piling from the existing and past wharfs. Some of the wharfs are still intact and others are long gone but the creosote piling remains. There is also evidence of metal debris and trash along the bottom that will have to be removed during demolition but the extent and content is unknown at this time. It is recommended that the use of an underwater camera be used to get an understanding of the extent of the debris along the bottom. There are also several open places within 500 feet and directly upland of the proposed harbor that could be used to stock pile material during construction.

d. Representative photographs can be found in the attached figures and are also located at:

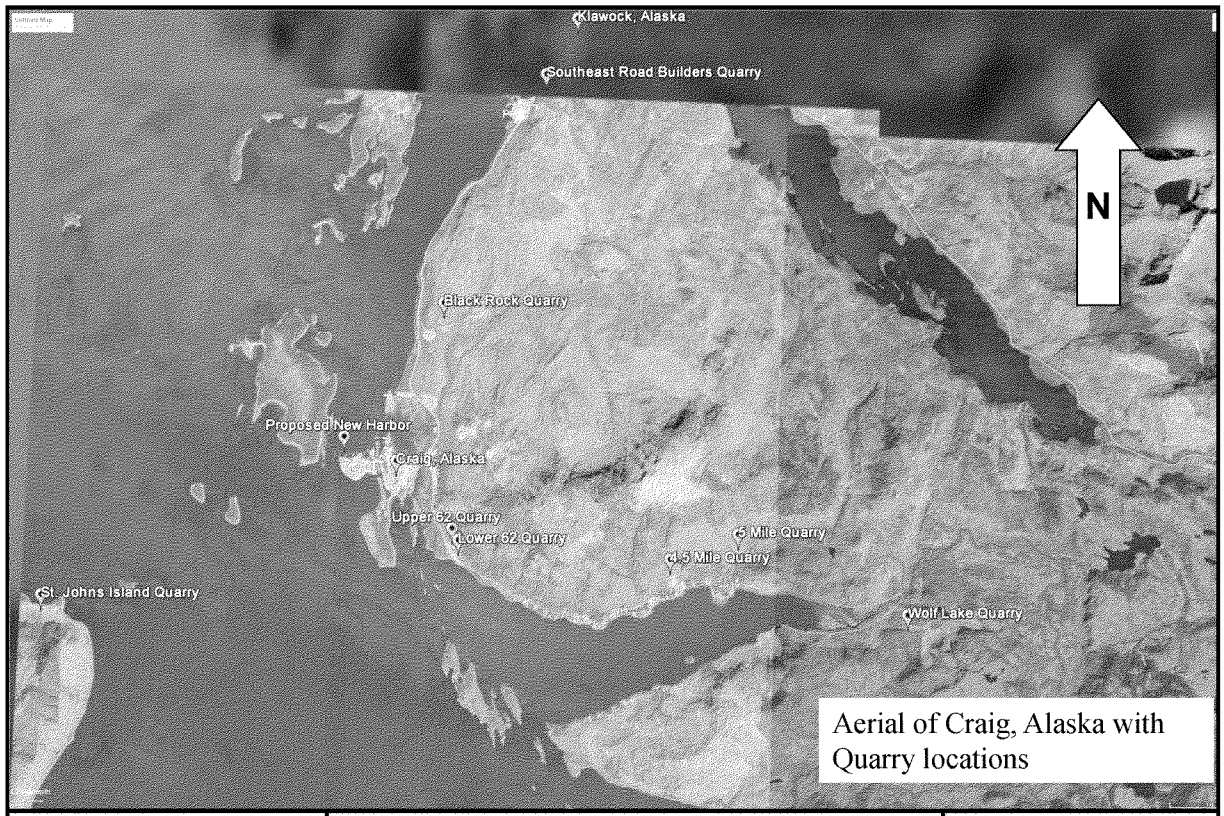
O:\EN\Private\ES\ES-SG\1 MAIN PROJECT FILES\3 Civil Works\Craig harbor Navigation Improvements\Photos\Craig site visit 4-25-14

Coleman Chalup, P.E.
Civil Engineer, CEPOA-EN-G-GM

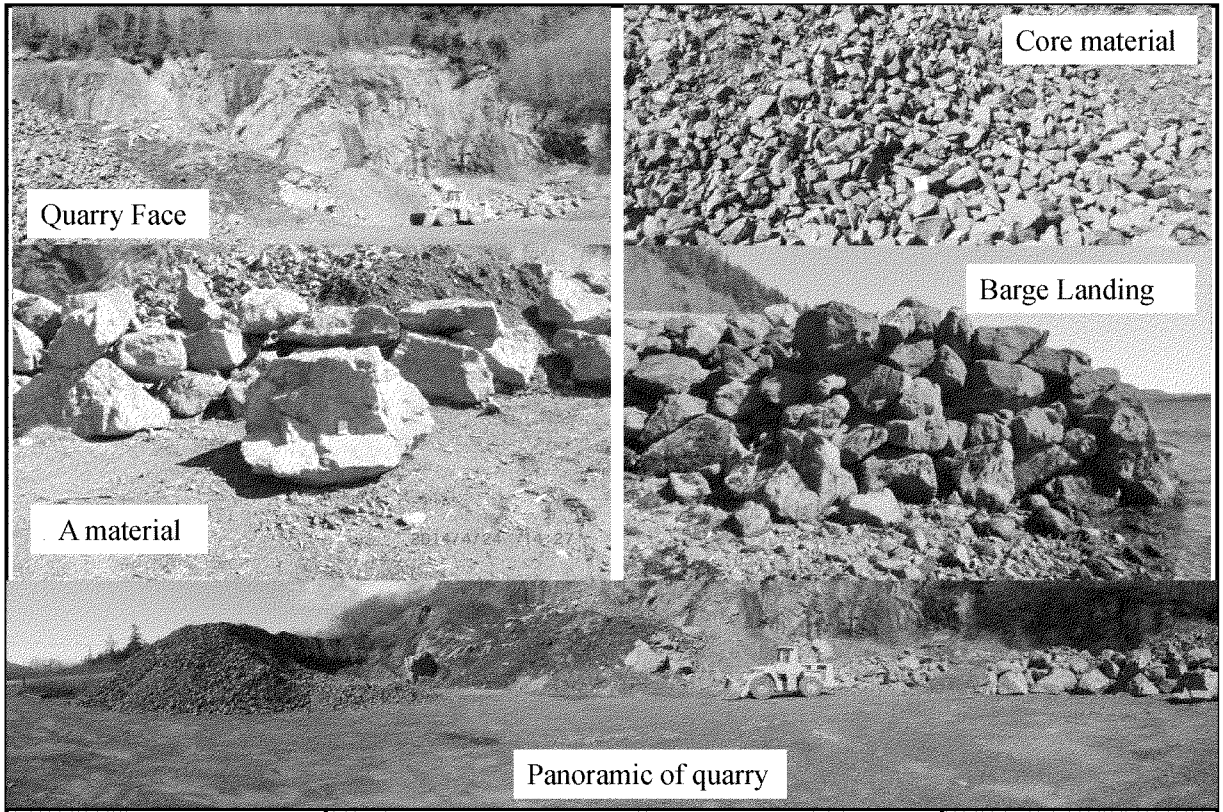
Attachments:
Figure 1: Craig Navigational Improvement site visit location map
Figure 2: Shaan Seet Quarry – Lower 62
Figure 3: Shaan Seet Quarry – 4.5 mile
Figure 4: St. John's Quarry
Figure 5: Southeast Road Builders Quarry – 7 mile
Figure 6: Southeast Road Builders Quarry – Black Rock Quarry
Figure 7: Proposed Harbor

References:

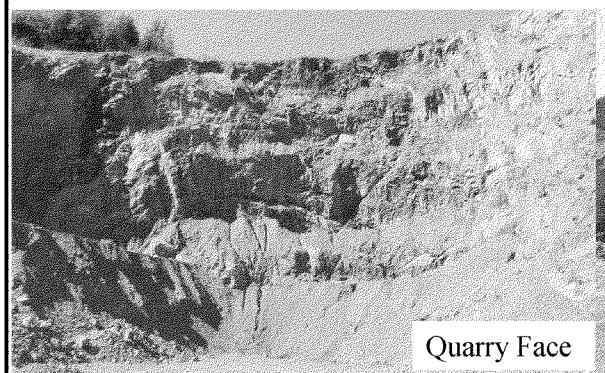

- ASTM International. (2005). Standard Guides for Using Rock-Mass Classification Systems for Engineering Purposes. In *ASTM D 5878 - 05.* West Conshohocken, PA: Author.
- US Army Corps of Engineers. (1985). Geotechnical Descriptions of Rock and Rock Masses. In *Technical Report GL-85-3.* Washington, DC: Department of the Army USACE.



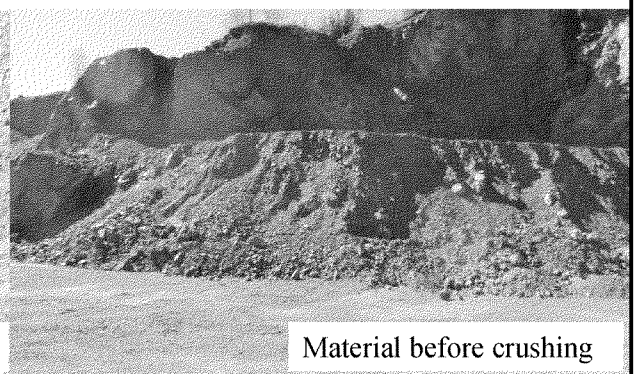

| | | |
|---|---|---|
| US Army Corps of Engineers<br>Alaska District | **Craig Navigational Improvement Site Visit**<br>**Craig, AK** | **Figure 1**<br>**2 May 2014** |



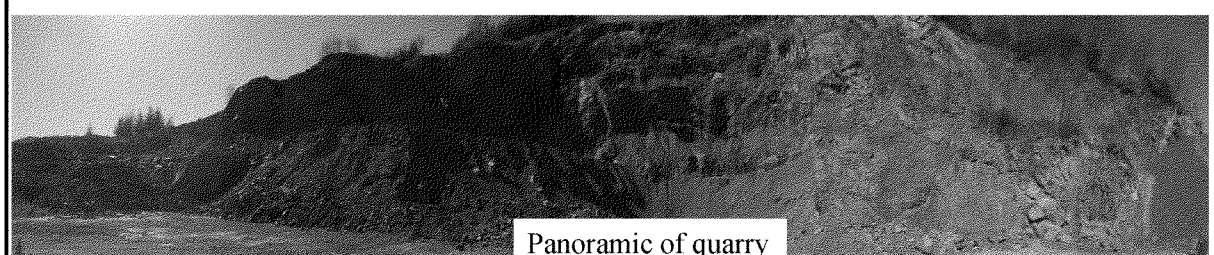

| | | |
|---|---|---|
| US Army Corps of Engineers<br>Alaska District | Craig Navigational Improvement Site Visit<br>Shaan Seet Quarry – Lower 62<br>Craig, AK | Figure 2<br>2 May 2014 |



Quarry Face

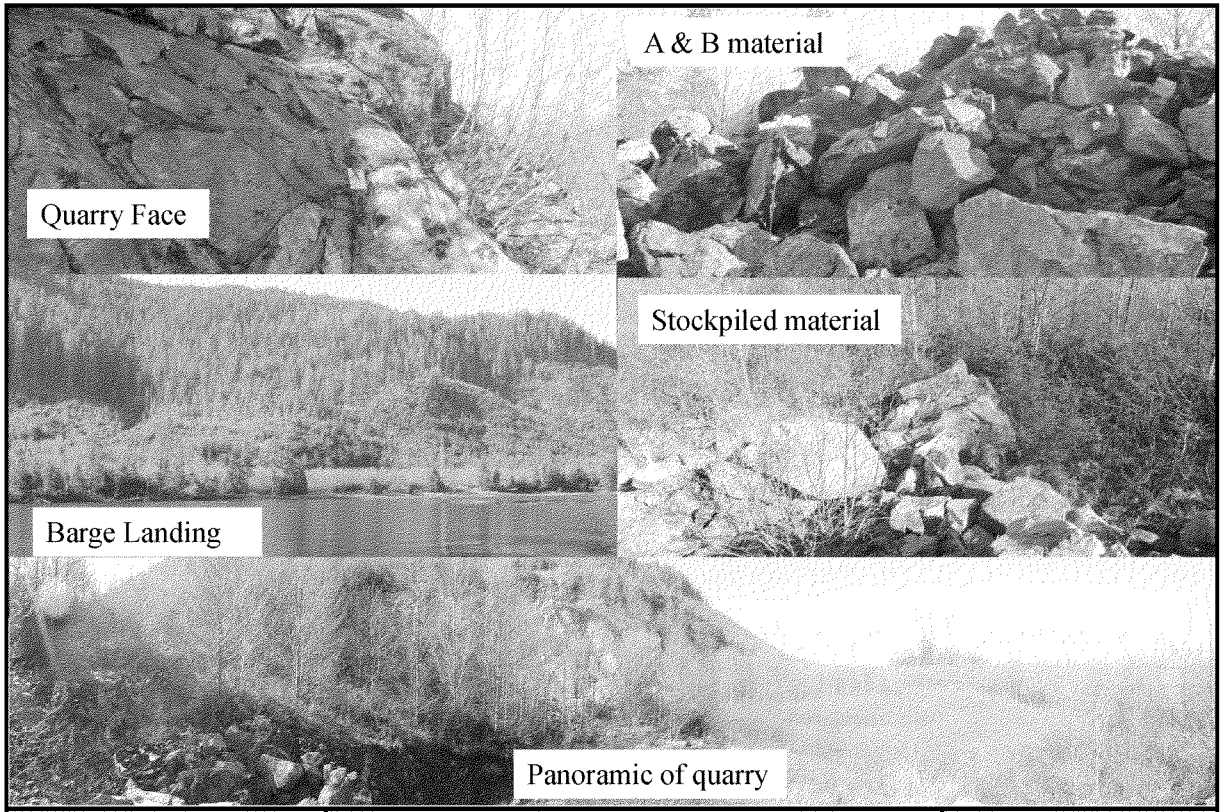


Material before crushing

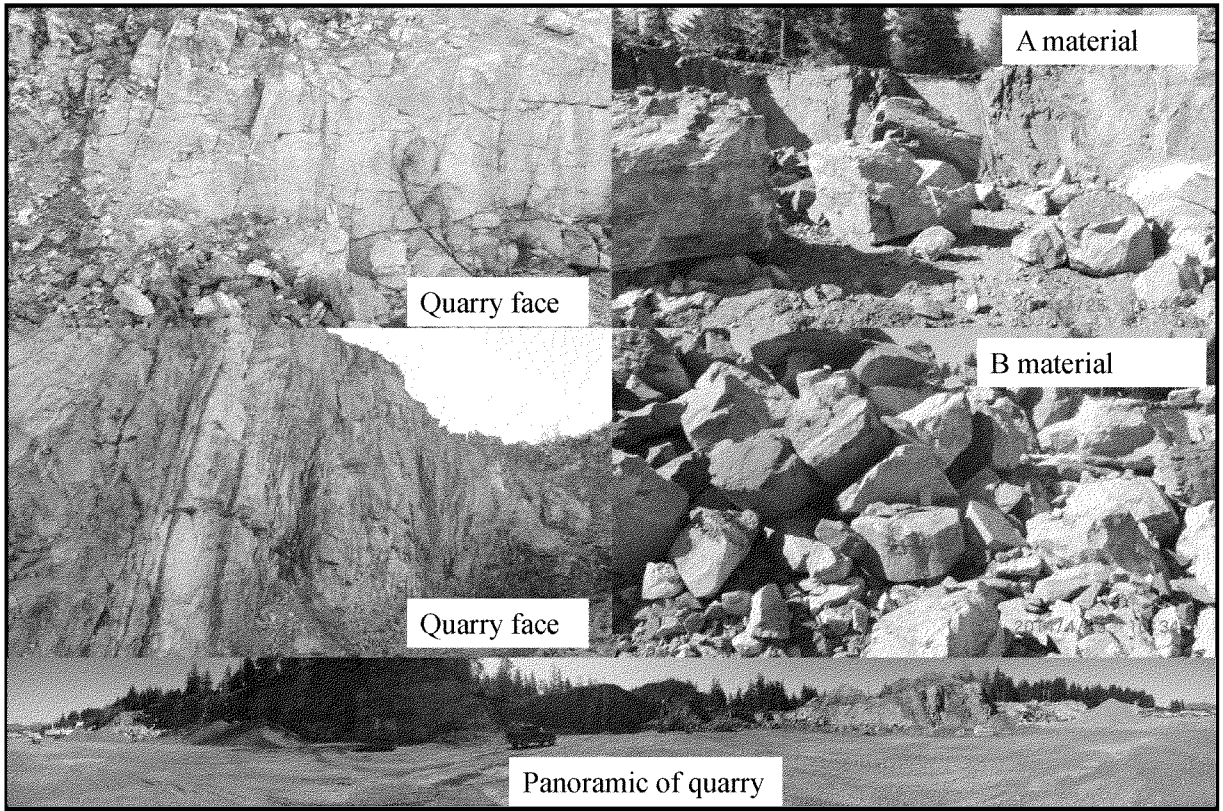


Panoramic of quarry

| | | |
|---|---|---|
| US Army Corps of Engineers<br>Alaska District | **Craig Navigational Improvement Site Visit**<br>**Shaan Seet Quarry – 4.5 Mile**<br>**Craig, AK** | **Figure 3**<br>**2 May 2014** |

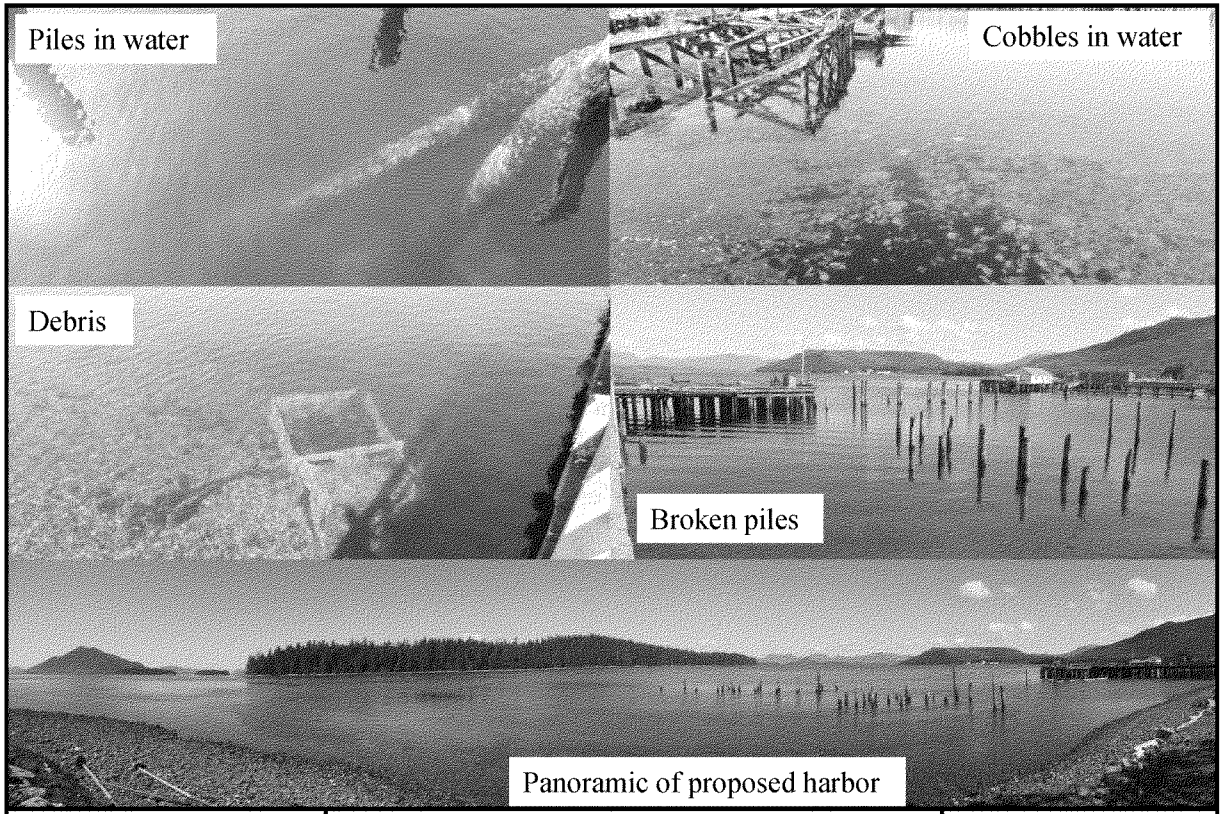



| | | |
|---|---|---|
| US Army Corps of Engineers<br>Alaska District | Craig Navigational Improvement Site Visit<br>St. John's Quarry<br>Craig, AK | Figure 4<br>2 May 2014 |



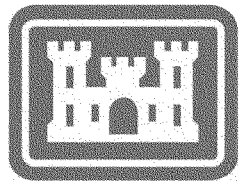

| | | |
|---|---|---|
| US Army Corps of Engineers<br>Alaska District | **Craig Navigational Improvement Site Visit**<br>**Southeast Road Builders Quarry – 7 Mile**<br>**Craig, AK** | **Figure 5**<br>**2 May 2014** |

Quarry Face
B material
Quarry Face
B & Core Material
Panoramic of quarry
US Army Corps of Engineers
Alaska District
Craig Navigational Improvement Site Visit
Southeast Road Builders Quarry – Black Rock Quarry
Craig, AK
Figure 6
2 May 2014




| | | |
|---|---|---|
| US Army Corps of Engineers<br>Alaska District | **Craig Navigational Improvement Site Visit**<br>**Proposed harbor**<br>**Craig, AK** | **Figure 7**<br>**2 May 2014** |

# Appendix F
# Cost Engineering



# Construction Cost Estimate

For

Recommended Plan (Alternate 2B) from Interim Integrated Feasibility Report,

Craig Harbor Navigation Improvements

U.S. Army Corps of Engineers, Alaska District (POA)

November 2015

# TABLE OF CONTENTS


- Cost Estimate Narrative
- Mandatory Center of Expertise Cost Agency Technical Review, Certification Statement
- Total Project Cost Summary Sheet
- MCACES (Mii) Summary Level Cost Estimate Report
- Abbreviated Risk (ARA) Risk Register
- Project Schedule

**NAVIGATION IMPROVEMENTS**
**CRAIG, ALASKA**
**Cost Estimate Basis**

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 feasibility level 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.

Multiple alternatives were developed along the way and the names of these alternatives changed some as well. The various alternatives were variations in configurations and size of the breakwater and harbor size. Rubble mound breakwater using layered rock of differing size was consistent however throughout the study.

Ultimately 3 configurations were chosen to be carried forward and the others rejected. All cost estimates for rejected alternatives were not included with this appendix. 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.

The recommended plan is 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.

Alternative 1 is similar to 2b with an overall size of 7.5 acres.

Alternative 2a was configured slightly different that the other two with two breakwaters and a total size of about 10.1 acres. The land-attached breakwater would about 956 feet long, and the detached breakwater would be about 957 feet long with an east-west alignment.

There is approximately 3,000 square feet of old dock and piers, 7,650 VLF of pilings and other miscellaneous debris to be demolished from the new harbor basin area created.

The estimates also include costs for the Local Sponsor Funded facilities. They include gangways, floats and piling for small vessel moorage.

Development of Costs and the Estimate: This estimate assumes open solicitation and adequate competition, without restrictive contract clauses. It's considered a Class 3 level estimate.

Design Documents: The designs used for this estimate were provided by POA Hydraulics and Hydrology (H&H) Section, and are summarized in the other portions of the report. They were feasibility level in nature and included a plan and section drawing.

Quantities: The quantities used in the estimates were provided by H&H designers for each material type. The provided quantities were 'neat line' and were calculated based on existing bathymetry surveys, not current data. These neat line quantities were adjusted in the estimates for waste, expansion and typical tolerances allowed during construction.

The demolition quantities were estimated based on field site visits and estimator judgment.

The quantities for the gangways, floats, piles and other LSF facilities were adjusted during feasibility study to align with anticipated vessels the harbor will accommodate. Pile length was based on historical lengths for similar projects. All quantities were developed in conjunction with the PDT.

Work Breakdown Structure: The estimate work breakdown structure for the project is as follows;

- Real Estate
- Mobilization/Demobilization
- Surveys (Hydrographic)
- Demolition of existing harbor facilities
- Breakwater Construction
    - Load & Haul Rock
    - Place Rock
    - Navigation Markers
- Inner Harbor Development (Local Sponsor Facilities)
    - Piles, caps & Anodes
    - Mooring Floats & Gangways

Cost Estimate: All of the alternatives were initially developed with excel using historical pricing from similar projects.

The current working cost estimate for Alt 2b was developed using Mii 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, current Davis Bacon wage rates and the Mii Equipment Library for Region 09. The estimate has been updated with historically quoted material prices, production rates and equipment costs.

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 Mii estimate to account for additional labor and equipment adjustments. The estimate assumes an overall production factor 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.

Schedule: Escalation has been estimated to a mid-point construction of July 2019 using EM 1110-2-1304, September 2014.

Contingency: Contingency was developed using the abbreviated risk analysis (ARA) methodology endorsed by the cost DX in Walla Walla at 22% overall. All PDT members provided input and were involved with the impact discussions. The initial meeting in August of 2014 provided the baseline concerns and discussions. As the study progressed and the alternatives were clarified, subsequent coordination and discussions were updated within the register to reflect the changes in scope and risk.

The highest individual contingency feature of work was for demolition work. The dock and pilings are known factors but other possible debris is expected and noted during the site visit. The overall impact to the cost was minimal because this of the small cost for this item.

The breakwater, survey and navigation aid feature of work contributed the largest dollar value to the project contingency. Price of rock at the quarry, location of the rock source and cost to transfer to project, and the sheer quantity of core rock needed equate to over 80% of the total project cost therefore, it's natural for this feature to have the majority of the contingency value.

Contractor Markups: Job office overhead was calculated based on the schedule duration and standard project office support requirements. The overall calculated JOOH for prime contractor was around 21%. The HOOH was a running 5%. Profit and bond were derived using weighted guidelines and standard bond tables.

Subcontractor markups were flat percentages at 10% and 5% for JOOH and HOOH respectively.

Assumptions and Factors impacting the Cost Estimates: Mob/demob is assumed out of Anchorage, AK which is approximately 870 miles from Craig. Equipment may be found locally but may not be readily available during the construction phase of the project.

Construction of the breakwater doesn't necessarily pose a large cost and schedule risk as it's a fairly typical design. However one of the main cost drivers is the rock cost and transportation of the rock from the source to the project. Therefore the assumption for rock source used in the estimate was important to reduce overall risk of the breakwater construction costs.

In order to investigate rock sources, 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. The Geotechnical Appendix contains a lot more detailed observations, photos and documentation for the potential quarry sites close to the project. See the table below for a summary that with pertinent information to help evaluate cost risk;

| | 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

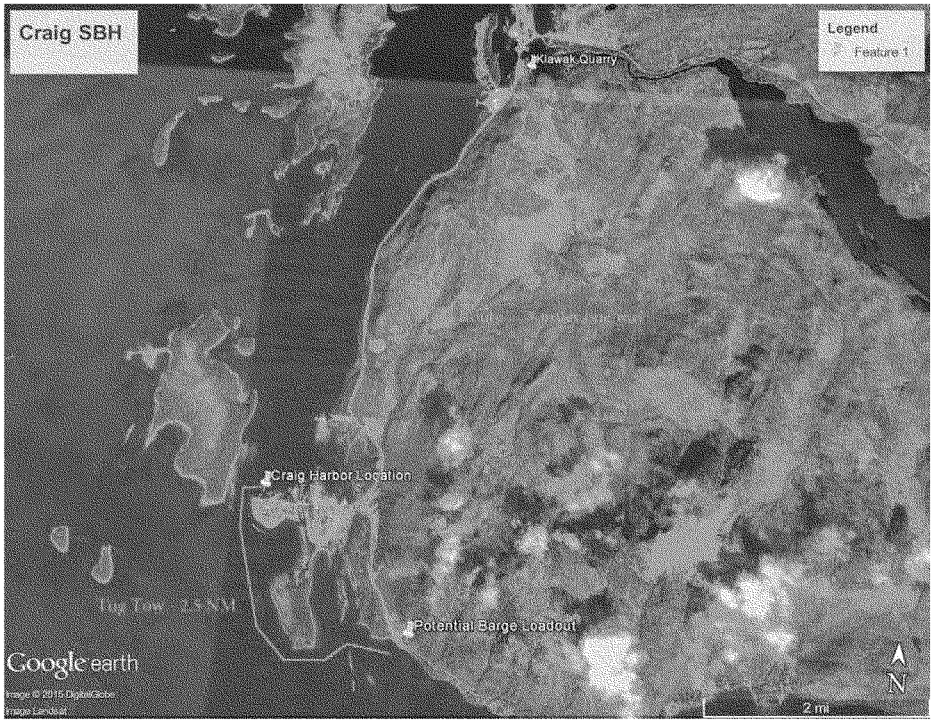
Ultimately, the PDT concluded to assume that Klawock quarry should be used for the material source as a basis of cost. Klawock's quarry appears to have enough rock and equipment to provide all three types of rock for the rubble-mound breakwaters. It is an

active quarry mining rock providing sand and gravel to the community along with a busy asphalt division. It is located about eight miles from the job site.

Unit cost for rock is based on historical data from similar projects using rock that is close to the same size and quantity and from a verbal quote obtained by Nathan Epps (CEPOA-EN-HH) in September 2013 during a site visit. Based on discussions with Paul Tibido the duty foreman at the rock quarry a quote of $15 per ton for rock loaded into a truck at the quarry. The risk register addresses this issue by recognizing the fact that a solid quote for a unit cost can't be obtained at the time of the estimate.

Construction of the breakwater is assumed to be water based as opposed to land based. Based on discussions with PDT members with experience designing and constructing similar projects, this method appears to be the most realistic method of construction.

Since a majority of the breakwater is in water up to 40' deep the Mii file assemblies include the following process for core rock placement; 1) truck haul the rock from the quarry to a barge landing, 2) load the barge, 3) tow dump scow/barge with tug to placement location, 4) dump/place the rock at the construction site via dump scow. 70% of the material to be open water dumped and 30% placed with skip box. Production rates for open dumping is naturally faster than via skip box and the assemblies were adjusted to reflect that difference. A and B rock placement was assumed to be 100% placed with floating crane & excavators.




Construction costs for the harbor float replacement were based upon bids received for Tenakee Springs, Alaska. Tenakee Springs is approximately 184 miles (as the crow flies) from Craig, Alaska. Tenakee Springs is located at 57.7808 latitude and -135.219 longitudes. Craig is located at 55.4622 latitude and -132.839 longitudes.

Pricing based upon compilation of bids for Tenakee Springs Harbor-Float Replacement for the State of Alaska dated January 09, 2014 with an assumed escalation rate of 1.8% per year (total 3.6%) for the projected start date of 2017.

These costs are the full bid pricing compilation including all overhead, JOOH, profit and other markups associated with the project.

Summary: The following pages include back-up documents and information to support the development of this feasibility level estimate. It is considered a Class 3 estimate.

# WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

## COST AGENCY TECHNICAL REVIEW

## CERTIFICATION STATEMENT

For Project No. 102831

POA – Craig Navigation Improvements
Craig, Alaska

The Craig Navigation Improvements presented by Alaska District, has undergone a successful Cost Agency Technical Review (Cost ATR), performed by the Walla Walla District Cost Engineering Mandatory Center of Expertise (Cost MCX) team. The Cost ATR included study of the project scope, report, cost estimates, schedules, escalation, and risk-based contingencies. This certification signifies the products meet the quality standards as prescribed in ER 1110-2-1150 Engineering and Design for Civil Works Projects and ER 1110-2-1302 Civil Works Cost Engineering.

As of July 24, 2015, the Cost MCX certifies the estimated total project cost of:

FY 2016 Price Level: $36,464,000
Fully Funded Amount: $39,287,000

It remains the responsibility of the District to correctly reflect these cost values within the Final Report and to implement effective project management controls and implementation procedures including risk management throughout the life of the project.

JACOBS.MICHAEL.PIERRE.1160569537

Digitally signed by JACOBS.MICHAEL.PIERRE.1160569537
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=JACOBS.MICHAEL.PIERRE.1160569537
Date: 2015.07.24 11:51:40 -07'00'

**For: Kim C. Callan, PE, CCE, PM**
**Chief, Cost Engineering MCX**
**Walla Walla District**

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: CRAIG NAVIGATION IMPROVEMENTS
PROJECT NO: P2 102831
LOCATION: Craig, Alaska

**DISTRICT: POA Alaska District** **PREPARED: 7/22/2015**
POC: CHIEF, COST ENGINEERING, K. Harve

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): 2016<br>Effective Price Level Date: 1 OCT 15 | | | | | | | | | |
| WBS NUMBER<br>A | Civil Works Feature & Sub-Feature Description<br>B | COST ($K)<br>C | CNTG ($K)<br>D | CNTG (%)<br>E | TOTAL ($K)<br>F | ESC (%)<br>G | COST ($K)<br>H | CNTG ($K)<br>I | **TOTAL ($K)**<br>J | Spent Thru: **10/1/2014** ($K) | **TOTAL FIRST COST** ($K) | ESC (%) | COST ($K)<br>M | CNTG ($K)<br>N | FULL ($K)<br>O |
| **10** | BREAKWATER & SEAWALLS | $22,591 | $5,756 | 25% | $28,347 | 1.5% | $22,920 | $5,840 | $28,760 | $0 | $28,760 | 6.8% | $24,470 | $6,235 | $30,706 |
| **12** | NAVIGATION PORTS & HARBORS | $3,296 | $388 | 12% | $3,684 | 1.5% | $3,344 | $393 | $3,737 | $0 | $3,737 | 8.9% | $3,642 | $428 | $4,070 |
| | **CONSTRUCTION ESTIMATE TOTALS:** | $25,887 | $6,144 | | $32,031 | 1.5% | $26,264 | $6,234 | $32,497 | $0 | $32,497 | 7.0% | $28,112 | $6,664 | $34,776 |
| **01** | LANDS AND DAMAGES | $23 | $2 | 10% | $25 | 1.5% | $23 | $2 | $26 | $0 | $26 | 4.2% | $24 | $2 | $27 |
| **30** | PLANNING, ENGINEERING & DESIGN | $1,421 | $91 | 6% | $1,512 | 2.3% | $1,454 | $93 | $1,547 | $0 | $1,547 | 9.5% | $1,592 | $102 | $1,694 |
| **31** | CONSTRUCTION MANAGEMENT | $2,200 | $141 | 6% | $2,341 | 2.3% | $2,251 | $144 | $2,395 | $0 | $2,395 | 16.5% | $2,623 | $168 | $2,791 |
| | **PROJECT COST TOTALS:** | $29,531 | $6,378 | 22% | $35,909 | | $29,991 | $6,473 | **$36,464** | $0 | **$36,464** | 7.7% | $32,351 | $6,936 | $39,287 |

_____ CHIEF, COST ENGINEERING, K. Harvey
_____ PROJECT MANAGER, L. Cordova
_____ CHIEF, REAL ESTATE, M. Coy
_____ CHIEF, PLANNING,B. Sexauer
_____ CHIEF, ENGINEERING, D. Frenier
_____ CHIEF, OPERATIONS
_____ CHIEF, CONSTRUCTION, P. Coullahan
_____ CHIEF, CONTRACTING, C. Tew
_____ CHIEF, PM-PB, K. Farmer
_____ CHIEF, DPM, R. Bowker

| | | |
|---|---|---|
| ESTIMATED FEDERAL COST: | **80%** | **$31,429** |
| ESTIMATED NON-FEDERAL COST: | **20%** | **$7,857** |
| **ESTIMATED TOTAL PROJECT COST:** | | **$39,287** |

Filename: Craig_ADM_TPCS MCX FINAL.xlsx
TPCS

**** CONTRACT COST SUMMARY ****

PROJECT: CRAIG NAVIGATION IMPROVEMENTS
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: 7/22/2015

| Civil Works Work Breakdown Structure | | ESTIMATED COST | | | | PROJECT FIRST COST (Constant Dollar Basis) | | | | TOTAL PROJECT COST (FULLY FUNDED) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate Prepared: 15-Mar-14<br>Effective Price Level: 01-Oct-14 | | | | Program Year (Budget EC): 2016<br>Effective Price Level Date: 1 OCT 15 | | | | | | | | |
| | | | | RISK BASED | | | | | | | | | | |
| WBS NUMBER | Civil Works Feature & Sub-Feature Description | COST ($K) | CNTG ($K) | 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** | Mobe-Demobe | $921 | $159 | 17% | $1,080 | 1.5% | $934 | $162 | $1,096 | 2019Q3 | 6.8% | $998 | $173 | $1,170 |
| **10** | Demolition | $294 | $90 | 31% | $384 | 1.5% | $298 | $92 | $390 | 2019Q3 | 6.8% | $318 | $98 | $416 |
| **10** | Breakwater, Survey and Nav Aids | $21,376 | $5,507 | 26% | $26,883 | 1.5% | $21,687 | $5,587 | $27,274 | 2019Q3 | 6.8% | $23,154 | $5,965 | $29,119 |
| **12** | Mooring Floats and Gangways | $2,285 | $255 | 11% | $2,540 | 1.5% | $2,318 | $258 | $2,577 | 2020Q3 | 8.9% | $2,525 | $281 | $2,806 |
| **12** | Piles, Caps and Anodes | $1,011 | $133 | 13% | $1,144 | 1.5% | $1,026 | $135 | $1,161 | 2020Q3 | 8.9% | $1,117 | $147 | $1,264 |
| | **CONSTRUCTION ESTIMATE TOTALS:** | $25,887 | $6,144 | 24% | **$32,031** | | $26,264 | $6,234 | $32,497 | | | $28,112 | $6,664 | $34,776 |
| **01** | LANDS AND DAMAGES | $23 | $2 | 10% | $25 | 1.5% | $23 | $2 | $26 | 2018Q2 | 4.2% | $24 | $2 | $27 |
| **30** | PLANNING, ENGINEERING & DESIGN | | | | | | | | | | | | | |
| *0.5%* | Project Management | $129 | $8 | 6% | $137 | 2.3% | $132 | $8 | $140 | 2018Q2 | 8.8% | $144 | $9 | $153 |
| *0.5%* | Planning & Environmental Compliance | $129 | $8 | 6% | $137 | 2.3% | $132 | $8 | $140 | 2018Q2 | 8.8% | $144 | $9 | $153 |
| *2.0%* | Engineering & Design | $518 | $33 | 6% | $551 | 2.3% | $530 | $34 | $564 | 2018Q2 | 8.8% | $577 | $37 | $613 |
| *0.5%* | Reviews, ATRs, IEPRs, VE | $129 | $8 | 6% | $137 | 2.3% | $132 | $8 | $140 | 2018Q2 | 8.8% | $144 | $9 | $153 |
| *0.5%* | Life Cycle Updates (cost, schedule, risks) | $129 | $8 | 6% | $137 | 2.3% | $132 | $8 | $140 | 2018Q2 | 8.8% | $144 | $9 | $153 |
| *0.5%* | Contracting & Reprographics | $129 | $8 | 6% | $137 | 2.3% | $132 | $8 | $140 | 2018Q2 | 8.8% | $144 | $9 | $153 |
| *0.5%* | Engineering During Construction | $129 | $8 | 6% | $137 | 2.3% | $132 | $8 | $140 | 2020Q1 | 16.5% | $154 | $10 | $164 |
| *0.0%* | Planning During Construction | $0 | $0 | 6% | $0 | 0.0% | $0 | $0 | $0 | 0 | 0.0% | $0 | $0 | $0 |
| *0.5%* | Project Operations | $129 | $8 | 6% | $137 | 2.3% | $132 | $8 | $140 | 2018Q2 | 8.8% | $144 | $9 | $153 |
| **31** | CONSTRUCTION MANAGEMENT | | | | | | | | | | | | | |
| *4.0%* | Construction Management | $1,035 | $66 | 6% | $1,101 | 2.3% | $1,059 | $68 | $1,127 | 2020Q1 | 16.5% | $1,234 | $79 | $1,313 |
| *2.0%* | Project Operation: | $518 | $33 | 6% | $551 | 2.3% | $530 | $34 | $564 | 2020Q1 | 16.5% | $618 | $39 | $657 |
| *2.5%* | Project Management | $647 | $41 | 6% | $688 | 2.3% | $662 | $42 | $704 | 2020Q1 | 16.5% | $771 | $49 | $821 |
| | **CONTRACT COST TOTALS:** | $29,531 | $6,378 | | $35,909 | | $29,991 | $6,473 | $36,464 | | | $32,351 | $6,936 | $39,287 |



Filename: Craig_ADM_TPCS MCX FINAL.xlsx
TPCS

Craig Harbor Certified Cost Estimate for Recommended Plan (Alternate 2b)
This report represents the summary level costs for WBS items shown on the Abbreviated Risk Register and Total Project Cost Summary (TPCS) Sheet. These are Contract Costs and DO NOT include contingency, SIOH, PED or Real Estate costs. Those are captured and reported on risk register and TPCS.

This alternative (Alt #2b) 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 alternative requires demolition of some existing harbor features, no dredging, and a rubble mound breakwater using layered system.



| | |
|---|---|
| Estimated by | U.S. Army Corps of Engineers, Alaska District |
| Designed by | U.S. Army Corps of Engineers, Alaska District |
| Prepared by | POA-EN-CE |
| Preparation Date | 7/22/2015 |
| Effective Date of Pricing | 10/1/2015 |
| Estimated Construction Time | 735 Days |

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Designed by

U.S. Army Corps of Engineers, Alaska District

Estimated by

U.S. Army Corps of Engineers, Alaska District

Prepared by

POA-EN-CE

| | |
|---|---|
| Design Document | Craig Harbor Interim Integrated Feasibility Report |
| Document Date | 11/5/2015 |
| District | Alaska |
| Contact | Karl Harvey (907) 753-5738 |
| Budget Year | 2016 |
| UOM System | Original |

**Direct Costs**

LaborCost
EQCost
MatlCost
SubBidCost
Travel/PerDiem
Shipping
Fees

**Timeline/Currency**

| | |
|---|---|
| Preparation Date | 7/22/2015 |
| Escalation Date | 10/1/2014 |
| Eff. Pricing Date | 10/1/2015 |
| Estimated Duration | 735 Day(s) |
| Currency | US dollars |
| Exchange Rate | 1.000000 |

**Costbook CB12EB-b: MII English Cost Book 2012-b**

**Labor LabAK1: Davis Bacon South 63rd 01/04/2014**
**Note: General Decision: AK120001 AK1 Construction Type: Building and Heavy**

**Labor Rates**

LaborCost1
LaborCost2
LaborCost3
LaborCost4

**Equipment EP14R09: MII Equipment 2014 Region 09**

**09 ALASKA**

| | |
|---|---|
| Sales Tax | 4.40 |
| Working Hours per Year | 1,040 |
| Labor Adjustment Factor | 1.19 |
| Cost of Money | 2.13 |
| Cost of Money Discount | 25.00 |
| Tire Recap Cost Factor | 1.50 |
| Tire Recap Wear Factor | 1.80 |
| Tire Repair Factor | 0.15 |
| Equipment Cost Factor | 1.10 |
| Standby Depreciation Factor | 0.50 |

**Fuel**

| | |
|---|---|
| Electricity | 0.155 |
| Gas | 4.360 |
| Diesel Off-Road | 3.870 |
| Diesel On-Road | 4.110 |

**Shipping Rates**

| | |
|---|---|
| Over 0 CWT | 63.98 |
| Over 240 CWT | 53.95 |
| Over 300 CWT | 43.11 |
| Over 400 CWT | 49.09 |
| Over 500 CWT | 33.08 |
| Over 700 CWT | 31.15 |
| Over 800 CWT | 27.79 |

| Description | ContractCost |
|---|---|
| **ProjectSummary Report** | **25,887,601** |
| **Mobilization-Demobilization** | **921,209** |
| **Demolition** | **293,676** |
| **Breakwater, Survey and Nav Aids** | **21,376,069** |
| **Mooring Floats/Gangways** | **2,285,482** |
| **Piles, Caps & Anodes** | **1,011,165** |

## 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 & 2/12/15

Total Estimated Construction Contract Cost = $25,887

| | CWWBS | Feature of Work | Contract Cost | | % Contingency | $ Contingency | Total |
|---|---|---|---|---|---|---|---|
| | 01 LANDS AND DAMAGES | Real Estate | $ 23 | | 20.00% | $ 5 | $ 28 |
| 1 | 10 BREAKWATERS AND SEAWALLS | Mob/Demob | $921 | | 17.30% | $ 159 | $ 1,080 |
| 2 | 10 BREAKWATERS AND SEAWALLS | Demolition | $294 | | 30.76% | $ 90 | $ 384 |
| 3 | 10 BREAKWATERS AND SEAWALLS | Breakwater + Survey + Nav Aids | $21,376 | | 25.76% | $ 5,507 | $ 26,883 |
| 4 | 12 02 HARBORS | Mooring Floats & Gangways | $2,285 | | 11.15% | $ 255 | $ 2,540 |
| 5 | 12 02 HARBORS | Piles, Caps & Anodes | $1,011 | | 13.17% | $ 133 | $ 1,144 |
| 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** | **$25,887** | *100.0%* | 0.00% | $ - | $ 25,887 |
| 13 | 30 PLANNING, ENGINEERING, AND DESIGN | **Planning, Engineering, & Design** | $ 1,421 | | 6.40% | $ 91 | $ 1,512 |
| 14 | 31 CONSTRUCTION MANAGEMENT | **Construction Management** | $ 2,200 | | 6.40% | $ 141 | $ 2,341 |
| XX | FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW) | | | | | $ - | |

| **Totals** | | | | | |
|---|---|---|---|---|---|
| Real Estate | $ 23 | 20.00% | $ 5 | $ | 27.60 |
| Total Construction Estimate | $25,887 | 23.73% | $ 6,144 | $ | 32,031 |
| Total Planning, Engineering & Design | $ 1,421 | 6.40% | $ 91 | $ | 1,512 |
| Total Construction Management | $ 2,200 | 6.40% | $ 141 | $ | 2,341 |
| Total | $ 29,531 | 22% | $ 6,380 | $ | 35,911 |

| | | Base | 50% | 80% |
|---|---|---|---|---|
| **Range Estimate ($000's)** | | $30k | $34k | $36k |

* 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. | |
|---|---|

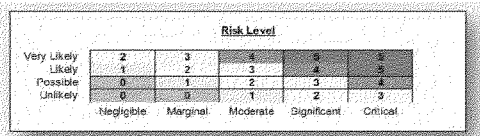
**Craig SBH, Alaska Alt 2b, TSP**

Feasibility (Alternatives)

Abbreviated Risk Analysis

**Meeting Date:** 15-Aug-14

Updated during ATR Review Feb to March 2015




# Risk Register

| Risk Element | Feature of Work | Concerns (consult Risk Elements tab) | PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact) | Impact | Likelihood | Risk Level |
|---|---|---|---|---|---|---|
| **Project Scope Growth** | | | | **Maximum Project Growth** | | **60%** |
| PS-1 | Mob/Demob | Potential for scope growth, added features and quantities? Investigations sufficient to support design assumptions? | Possibility for breakwater to increase in size (change in scope) but equipment needs wouldn't necessarily grow. If dredging were to be added, additional equipment would be required thus increasing cost but this isn't likely to be added to scope. | Marginal | Unlikely | 0 |
| PS-2 | Demolition | Potential for scope growth, added features and qantities? Investigations sufficient to support design assumptions? | Additional demolition/debris is a possibility within the harbor. Additional site work may be needed to determine the extent of both on the job site. | Marginal | Likely | 2 |
| PS-3 | Breakwater + Survey + Nav Aids | Potential for scope growth, added features and quantities? Currently the estimate is based on the tentitively selected plan (TSP). Its possible the scope and design will change between now and if/when the project gets to P&D stage; Design confidence? The concept design is realitively basic in that it's a rubble mound breakwater, the wave design has been studied fairly well. The intent is to provide wave protection for small boats and at this point, the design does that. There also is a possibility that impacts to eel grass areas and mitigation for those impacts could cause project scope changes. | It's possible that during TSP selection and subsequent reviews, the project scope could change. This could be due to unknown environmental issues, new wave design data, geotechnical data that is gathered later, possible benefit/cost ratio changes that require different sized harbor, or allow the size to increase. The likelihood at this point of the scope changing and that effecting the breakwater is very possible with the impact potentially being moderate. | Moderate | Possible | 2 |
| PS-4 | Mooring Floats & Gangways | Potential for scope growth, added features and quantities? Project accomplish intent? | Little room to add features. Harbor slip numbers are farily set due to the fact that it is a function of the overall cost/benefit economic analysis. | Marginal | Unlikely | 0 |
| PS-5 | Piles, Caps & Anodes | Potential for scope growth, added features and quantities? Project accomplish intent? | Little room to add features. Harbor slip numbers are farily set due to the fact that it is a function of the overall cost/benefit economic analysis. | Marginal | Possible | 1 |
| PS-6 | 0 | | | Marginal | Unlikely | N/A |
| PS-7 | 0 | | | Negligible | Unlikely | N/A |
| PS-8 | 0 | | | Negligible | Unlikely | N/A |
| PS-9 | 0 | | | Negligible | Unlikely | N/A |
| PS-10 | 0 | | | Negligible | Unlikely | N/A |
| PS-11 | 0 | | | Negligible | Unlikely | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| PS-12 | Remaining Construction Items | | | Significant | Possible | N/A |
| PS-13 | Planning, Engineering, & Design | Scope of the b/w design will depend on outcome of the feasibility report. Cost and schedule to complete design is dependant on size, shape, wave environment ect. These can effect time needed.Potential for scope growth, added features and quantities? Currently the estimate is based on the tentitively selected plan (TSP). Its possible the scope and design will change between now and if/when the project gets to P&D stage. Design confidence? The concept design is realitively basic in that it's a rubble mound breakwater, the wave design has been studied fairly well. The intent is to provide wave protection for small boats and at this point, the design does that. There also is a possibility that impacts to eel grass areas and mitigation for those impacts could cause project scope changes. | Cost for this feature is developed using a percentage of the overall cost. The percentage used falls within a traditional range of actual costs for similar projects done in the past.It's possible that during TSP selection and subsequent reviews, the project scope could change. This could be due to unknown environmental issues, new wave design data, geotechnical data that is gathered later, possible benefit/cost ratio changes that require different sized harbor, or allow the size to increase. The likelihood at this point of the scope changing and that effecting the breakwater is very possible with the impact potentially being moderate. | Marginal | Possible | 1 |
| PS-14 | Construction Management | Potential for scope growth, added features and quantities? Watercare and diversion fully understood, planned? | construction management effort is mainly dependant on the length of time the construction is active. The percentage used is within a traditional range for similar projects. | Marginal | Possible | 1 |
| **Acquisition Strategy** | | | | | **Maximum Project Growth** | **40%** |
| AS-1 | Mob/Demob | Acquisition strategy will likely be to large business that will base out of Pacific Northwest or Southeast Alaska. Could see no interested parties from these area bid project therefore causing contractor to mobe from more distant location. | Bidding climate has been good for recent projects in the region of similar scope. Mob demobe was assumed from Seattle, which is representative of recent projects. Contractors are bidding from Southeast Alaska which would result in an opportunity thus decreasing overall cost, but this isn't a guarrente. Typical to allow multiple seasons to account for weather and mob-demobe issues thus reducing the impact. If Mob/Demob is out of a closer port than the impacts to the cost estimate would reduce the cost of the Mob/Demob. | Marginal | Possible | 1 |
| AS-2 | Demolition | Requirement for subcontracting? | Possible subcontracting needed for demolition. | Moderate | Possible | 2 |
| AS-3 | Breakwater + Survey + Nav Aids | 8a or small business likely could cause challenges in constructing the b/w if unexperienced contractor is awarded project. Accelerated schedule or harsh weather schedule could create delays and impact cost and completion | This type of project is typically not pursued as an 8a solicitation. Its possible but not likely. If it were, an RFP type of solicitation could be written to require any bidder to demonstrate their ability and past performance to complete, therefore impact would be marginal. | Marginal | Possible | 1 |
| AS-4 | Mooring Floats & Gangways | 8a or small business likely? Accelerated schedule or harsh weather schedule? Requirement for subcontracting? Limited bid competition anticipated? | This portion of the project will be solicited and administed by others (non-federal government). Parametric prices used are based on awarded projects completed by agencies that perform this type of construction (State DOT and City's). | Negligible | Unlikely | 0 |
| AS-5 | Piles, Caps & Anodes | 8a or small business likely? Requirement for subcontracting? Accelerated schedule or harsh weather schedule? | This portion of the project will be solicited and administed by others (non-federal government). Parametric prices used are based on awarded projects completed by agencies that perform this type of construction (State DOT and City's). | Negligible | Unlikely | 0 |
| AS-6 | 0 | | | Negligible | Unlikely | N/A |
| AS-7 | 0 | | | Negligible | Unlikely | N/A |
| AS-8 | 0 | | | Negligible | Unlikely | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| AS-9 | 0 | | | Negligible | Unlikely | N/A |
| AS-10 | 0 | | | Negligible | Unlikely | N/A |
| AS-11 | 0 | | | Negligible | Unlikely | N/A |
| AS-12 | Remaining Construction Items | | | Marginal | Likely | N/A |
| AS-13 | Planning, Engineering, & Design | no concerns identified during discussions | | Marginal | Possible | N/A |
| AS-14 | Construction Management | Contracting plan firmly established? | Construction management effort is mainly dependant on the length of time the construction is active. The acquisition method does effect effort needed to adminster. If an inexperienced contractor or if the contractor is having problems executing the project the effort needed will increase. Typically with CW projects, the costs are reimbursable so if there are increases, the partners will share and absorb the costs. | Marginal | Possible | 1 |
| **Construction Elements** | | | | **Maximum Project Growth** | | **30%** |
| CON-1 | Mob/Demob | High risk or complex construciton elements, site access, in-water? Estimate assumes mobilization of both land based and water based equipment for construction method. | For a well equiped, civil marine type of contractor, this projet is fairly standard and should not pose highly complex requirements. | Marginal | Possible | 1 |
| CON-2 | Demolition | High risk or complex construciton elements, site access, in-water? Demo of old harbor facilities may encounter environmental and disposal issues. Unique construction methods? Demo of dock piles and other structures could be challange. Special equipment or subcontractors needed? | Some in-water work will need to employed as there is debris and old pilings in the water. Due to fact that at this point it's not possible to investigate all aspects of the demo requirements, there are some risks to estimating the actual cost and the impacts could be moderate and definately possible | Moderate | Possible | 2 |
| CON-3 | Breakwater + Survey + Nav Aids | No perscribed method of constructing breakwater. Currently the assumptions are to use marine based construction for the majority of the b/w. Contractor could use different method. | In-water work will need to employed, and estimate uses equipment and proven equipment/labor assemblies for this feature of work. Since the bathemytry of the harbor is fairly deep (most of it is deeper than -20' MLLW), the compelxity of the core and most of the b-rock lends itself to marine based constuction. The likelihood if the construction methods assumed not being used are possible but impact to cost/schedule would be marginal. | Marginal | Possible | 1 |
| CON-4 | Mooring Floats & Gangways | High risk or complex construciton elements, site access, in-water? Unique construction methods? Special equipment or subcontractors needed? | Gangways and floats are very typical and not highly complex to construct by well equiped experienced contractors. | Marginal | Unlikely | 0 |
| CON-5 | Piles, Caps & Anodes | Unique construction methods? Special mobilization? Special equipment or subcontractors needed? Potential for construction modifications and claims? | Only if subsurface material is dense and prevents driving the piles then special equipment may need to be brought in. However, there are existing piles in the area so this shows it's been accomplished in the past. | Moderate | Possible | 2 |
| CON-6 | 0 | | | Marginal | Unlikely | N/A |
| CON-7 | 0 | | | Negligible | Unlikely | N/A |
| CON-8 | 0 | | | Negligible | Unlikely | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| CON-9 | 0 | | | Negligible | Unlikely | N/A |
| CON-10 | 0 | | | Negligible | Unlikely | N/A |
| CON-11 | 0 | | | Negligible | Unlikely | N/A |
| CON-12 | Remaining Construction Items | | | Negligible | Unlikely | N/A |
| CON-13 | Planning, Engineering, & Design | No concerns were identified for construction elements during discussions | | Marginal | Possible | N/A |
| CON-14 | Construction Management | No concerns were identified for construction elements during discussions | | Marginal | Possible | N/A |
| **Quantities for Current Scope** | | | | **Maximum Project Growth** | | **20%** |
| Q-1 | Mob/Demob | No concerns were identified for this risk element and feature during discussions | | Significant | Unlikely | N/A |
| Q-2 | Demolition | Possibility for increased quantities due to loss, waste, or subsidence? Appropriate methods applied to calculate quantities? | Possible that the actual quantities will increase and may impact cost. No real way to tell what's there except via visual inspection | Marginal | Possible | 1 |
| Q-3 | Breakwater + Survey + Nav Aids | Estimated quantity of rock used in the estimate could be incorrect due to in accurate bathemetry data at this stage (no current hydrographic surveys available); changes to the harbor bottom by the time P&D is authorized and then into construction. Changes to the estimated quantities could impact the cost estimate. | The survey data used is fairly current. Based on historical hydrographic data, this location tends to be stable and doesn't experience large shoaling/scouring. The likelihood that changes to the bottom and therefore estimated quantities will change are possible which will vary the quantities used in the estimate. The method used to calculate the quantities is typical and has a fair degree of confidence and includes some inherent margin of error, so even though its possible the qty's will be different, the impact of changes would be moderate. | Moderate | Possible | 2 |
| Q-4 | Mooring Floats & Gangways | Quantity is based on economic analysis. After TSP discussion, the size could change. | Quantities and size of harbor is fairly set due to economics analysis being benificial. A larger harbor isn't likely as it's not completely justified at this point. | Marginal | Unlikely | 0 |
| Q-5 | Piles, Caps & Anodes | Level of confidence based on design and assumptions? Sufficient investigations to develop quantities? | Quantities and size of harbor is fairly set due to economics analysis being benificial. A larger harbor isn't likely as it's not completely justified at this point. | Marginal | Unlikely | 0 |
| Q-6 | 0 | | | Marginal | Unlikely | N/A |
| Q-7 | 0 | | | Negligible | Unlikely | N/A |
| Q-8 | 0 | | | Negligible | Unlikely | N/A |
| Q-9 | 0 | | | Negligible | Unlikely | N/A |
| Q-10 | 0 | | | Negligible | Unlikely | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| Q-11 | 0 | | | Negligible | Unlikely | N/A |
| Q-12 | Remaining Construction Items | | | Marginal | Likely | N/A |
| Q-13 | Planning, Engineering, & Design | Level of confidence based on design and assumptions?<br>Appropriate methods applied to calculate quantities? | Design and quantity computation assumptions used are tried and proven and have a high degree of confidence; methods used to calculate quantities are also very standard and include use of electronic tools with fairly accurate survey data. | Marginal | Unlikely | 0 |
| Q-14 | Construction Management | No concerns identified during discussions | | Marginal | Possible | N/A |
| **Specialty Fabrication or Equipment** | | | | **Maximum Project Growth** | | **75%** |
| FE-1 | Mob/Demob | Ability to reasonably transport? Risk of specialty equipment function first time? Test? | None anticipated. Rubblemount breakwater work is common in many communities throughout Alaska. | Marginal | Unlikely | 0 |
| FE-2 | Demolition | no concerns identified during discussions | | Moderate | Unlikely | N/A |
| FE-3 | Breakwater + Survey + Nav Aids | no concerns identified during discussions | | Moderate | Unlikely | N/A |
| FE-4 | Mooring Floats & Gangways | Unusual parts, material or equipement manufactured or installed?<br>Confidence in supplier's ability? Confidence in contractor's ability to install? Ability to reasonably transport? | Very standard material are available for gangways and floats. Not an unusual feature of work. | Marginal | Unlikely | 0 |
| FE-5 | Piles, Caps & Anodes | Confidence in contractor's ability to install?<br>Risk of specialty equipment function first time? Test? | Very standard material are available for piles. Not an unusual feature of work. | Marginal | Unlikely | 0 |
| FE-6 | 0 | | | Negligible | Unlikely | N/A |
| FE-7 | 0 | | | Negligible | Unlikely | N/A |
| FE-8 | 0 | | | Negligible | Unlikely | N/A |
| FE-9 | 0 | | | Negligible | Unlikely | N/A |
| FE-10 | 0 | | | Negligible | Unlikely | N/A |
| FE-11 | 0 | | | Negligible | Unlikely | N/A |
| FE-12 | Remaining Construction Items | | | Negligible | Unlikely | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| FE-13 | Planning, Engineering, & Design | Unusual parts, materials or equipment manufactured or installed? Confidence in suppliers' ability? | Rubblemound breakwaters are standard and not specialty items. Quarries exist in the area to supply intended design's main component. | Marginal | Unlikely | 0 |
| FE-14 | Construction Management | Confidence in contractor's ability to install? Ability to reasonably transport? | Several contractors have installed SBH within the region in the past years. No specialty equipment for construction is anticipated. | Moderate | Unlikely | N/A |
| **Cost Estimate Assumptions** | | | | | **Maximum Project Growth** | **35%** |
| EST-1 | Mob/Demob | Estimate assumptions are based on contractor bringing water based equipment. If it turns out land based is also needed, mobe-demobe may be light. | Project will most likely be built via water based methods, but if additional land based equip is brought costs may be higher. | Moderate | Possible | 2 |
| EST-2 | Demolition | This work isn't typically listed in the cost book and doesn't have standard production and crews established. Estimate made assumptions using time for crews to complete | Possible the work will entail more effort than what was estimated so it's impact could be moderate. | Moderate | Possible | 2 |
| EST-3 | Breakwater + Survey + Nav Aids | B/w construction assumptions that could impact cost and schedule are cost of rock, source of the rock, methodologies of construction, very few cost book items, and its not possible to get reliable rock quotes. All can impact cost/schedule. | The assumptions used are fairly traditional and have been used on many similar projects. Rock source is assumed to be local, this is sound and has been verified as best as it can by experts conducting site visits. Even though the contract will not specify a location source for rock, the competative bid process should help to keep the price within an affordable range. | Moderate | Possible | 2 |
| EST-4 | Mooring Floats & Gangways | Reliability and number of key quotes? Overuse of Cost Book, lump sum, allowances? | Quotes were used from other projects within the region. Lump sum items were kept to a minimum. The costs were based on past projects and extrapolated to fit the harbor size and slip number. Its' possible the historical costs don't apply to this project exactly, but based on the type of facilities and features the costs for these features are fairly consistent. | Marginal | Likely | 2 |
| EST-5 | Piles, Caps & Anodes | Assumptions regarding crew, productivity, overtime? Site accessibility, transport delays, congestion? Lack confidence on critical cost items? | Quotes were used from other projects within the region. Lump sum items were kept to a minimum. | Negligible | Unlikely | 0 |
| EST-6 | 0 | | | Marginal | Possible | N/A |
| EST-7 | 0 | | | Negligible | Unlikely | N/A |
| EST-8 | 0 | | | Negligible | Unlikely | N/A |
| EST-9 | 0 | | | Negligible | Unlikely | N/A |
| EST-10 | 0 | | | Negligible | Unlikely | N/A |
| EST-11 | 0 | | | Negligible | Unlikely | N/A |
| EST-12 | Remaining Construction Items | | | Negligible | Unlikely | N/A |
| EST-13 | Planning, Engineering, & Design | Lack of confidence on critical cost items? Is the percentage used for cost development accurate? | falls within a standard range. Possible for cost growth. | Marginal | Possible | 1 |
| EST-14 | Construction Management | Lack of confidence on critical cost items? | Line items from recent estimates were used to ensure that critical cost items are correctly captured. | Marginal | Possible | 1 |
| **External Project Risks** | | | | | **Maximum Project Growth** | **40%** |

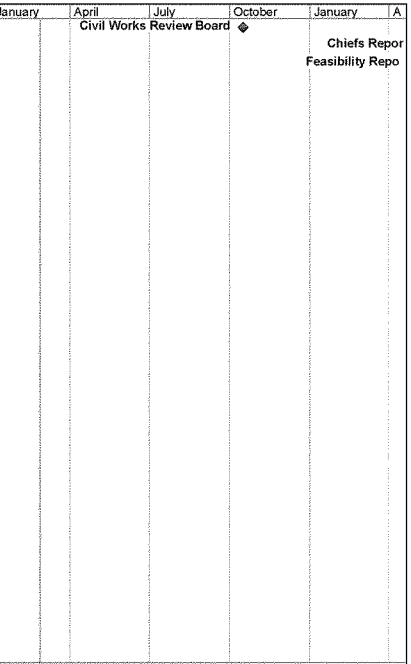
| | | | | | | |
|---|---|---|---|---|---|---|
| EX-1 | Mob/Demob | Potential for severe adverse weather? May delay mobe-demobe schedule; Unanticipated inflations in fuel, key materials? | Project duration will most likely allow enough time for mobe-demobe to occur without weather impacting schedule. Fuel can fluctuate. Estimate uses current prices. Spikes can cause impact. | Moderate | Unlikely | 1 |
| EX-2 | Demolition | Could demo of old facilities cause concern from locals because of historical or other issues? | Could be an issue if the community isn't completely in favor of demolition aspects. Also may be archeological impacts | Significant | Unlikely | 2 |
| EX-3 | Breakwater + Survey + Nav Aids | Potential for severe adverse weather will cause delays and impact cost and schedule; Unanticipated inflations in fuel, key material costs; Potential for market volatility impacting competition | Adverse weather is likely but Craig is in a location that is ice free year round and the contract duration can be adjusted to allow enough seasons to complete without having to factor in accelleration. Fuel has been flat for a couple years. Market volatility must always deemed a possibility for rock prices. | Marginal | Possible | 1 |
| EX-4 | Mooring Floats & Gangways | no concerns identified during discussions | | Negligible | Unlikely | N/A |
| EX-5 | Piles, Caps & Anodes | no concerns identified during discussions | | Negligible | Unlikely | N/A |
| EX-6 | 0 | | | Marginal | Possible | N/A |
| EX-7 | 0 | | | Negligible | Possible | N/A |
| EX-8 | 0 | | | Negligible | Unlikely | N/A |
| EX-9 | 0 | | | Negligible | Unlikely | N/A |
| EX-10 | 0 | | | Negligible | Unlikely | N/A |
| EX-11 | 0 | | | Negligible | Unlikely | N/A |
| EX-12 | Remaining Construction Items | | | Negligible | Unlikely | N/A |
| EX-13 | Planning, Engineering, & Design | Political influences, lack of support, obstacles? | Completely possible for the project to be approved later in the future than assumed which could effect cost. | Negligible | Likely | 1 |
| EX-14 | Construction Management | no concerns identified during discussions | | Marginal | Possible | N/A |

**Craig SBH, Alaska Alt 2b, TSP**
Feasibility (Alternatives)
Abbreviated Risk Analysis

## Risk Evaluation

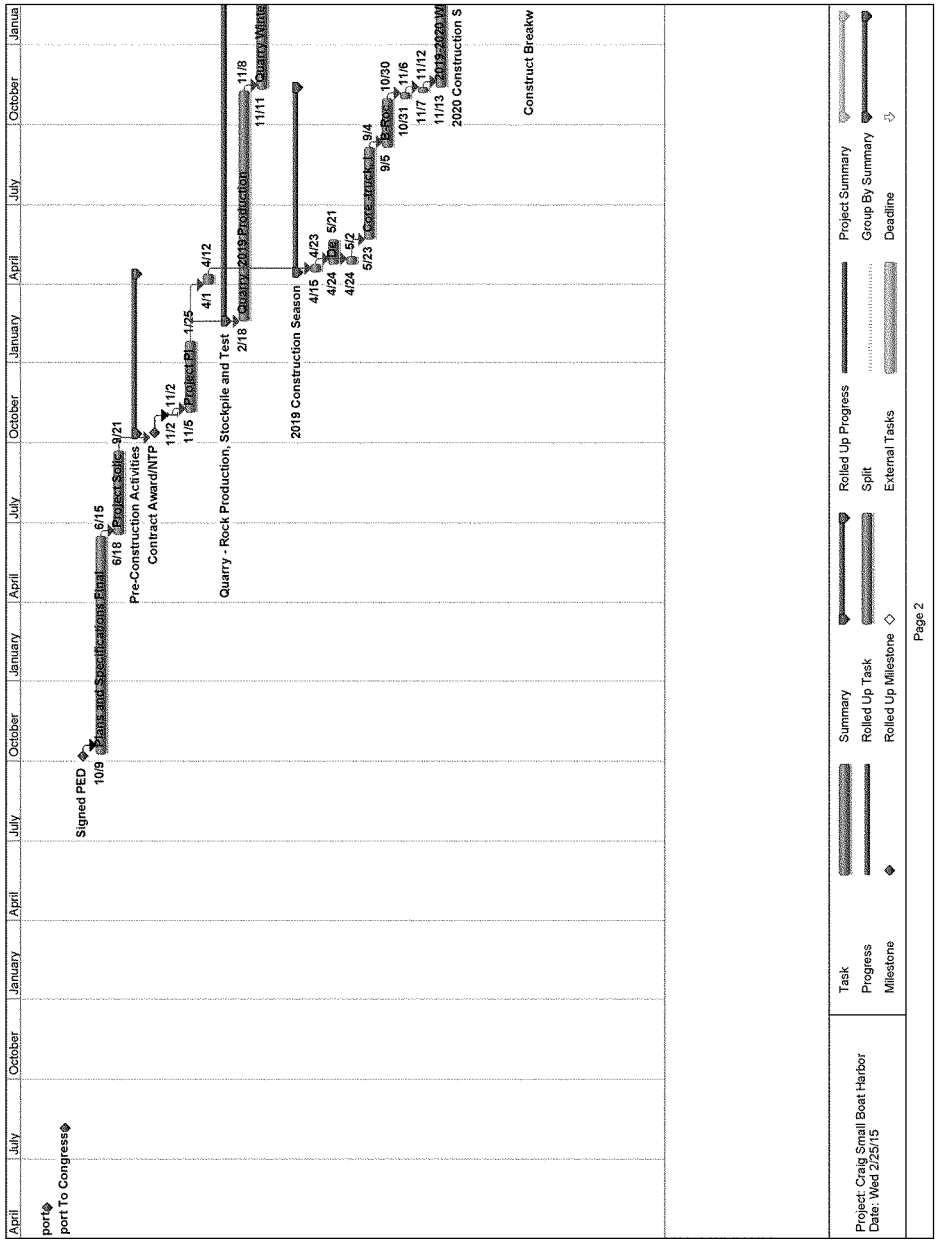
| WBS | Potential Risk Areas | Project Scope Growth | Acquisition Strategy | Construction Elements | Quantities for Current Scope | Specialty Fabrication or Equipment | Cost Estimate Assumptions | External Project Risks | Cost in Thousands |
|---|---|---|---|---|---|---|---|---|---|
| **01 LANDS AND DAMAGES** | **Real Estate** | | | | | | | | $0 |
| **10 BREAKWATERS AND SEAWALLS** | **Mob/Demob** | 0 | 1 | 1 | N/A | 0 | 2 | 1 | $1 |
| 10 BREAKWATERS AND SEAWALLS | Demolition | 2 | 2 | 2 | 1 | N/A | 2 | 2 | $0 |
| 10 BREAKWATERS AND SEAWALLS | Breakwater + Survey + Nav Aids | 2 | 1 | 1 | 2 | N/A | 2 | 1 | $21 |
| 12 02 HARBORS | Mooring Floats & Gangways | 0 | 0 | 0 | 0 | 0 | 2 | N/A | $2 |
| 12 02 HARBORS | Piles, Caps & Anodes | 1 | 0 | 2 | 0 | 0 | 0 | N/A | $1 |
| 0 | 0 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | $0 |
| **0** | **0** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | $0 |
| **0** | **0** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | $0 |
| **0** | **0** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | $0 |
| **0** | **0** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | $0 |
| **0** | **0** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | $0 |
| All Other (less than 10% of construction costs) | Remaining Construction Items | N/A | N/A | N/A | N/A | N/A | N/A | N/A | $26 |
| 30 PLANNING, ENGINEERING, AND DESIGN | Planning, Engineering, & Design | 1 | N/A | N/A | 0 | 0 | 1 | 1 | $1 |
| 31 CONSTRUCTION MANAGEMENT | Construction Management | 1 | 1 | N/A | N/A | N/A | 1 | N/A | $2 |
| | | | | | | | | | **$55** |
| **Risk** | | $ 1 | $ 1 | $ 2 | $ 1 | $ - | $ 1 | $ 1 | **$6** |
| **Fixed Dollar Risk Allocation** | | $ - | $ - | $ - | $ - | $ - | $ - | $ - | **$0** |
| | Risk | $ 1 | $ 1 | $ 2 | $ 1 | $ - | $ 1 | $ 1 | **$6** |
| | | | | | | | | **Total** | **$62** |

| ID | Task Name | Duration | Start | Finish | Predecessors |
|---|---|---|---|---|---|
| 1 | Civil Works Review Board | 1 day | Fri 10/16/15 | Fri 10/16/15 | |
| 2 | Chiefs Report | 1 day | Fri 5/6/16 | Fri 5/6/16 | |
| 3 | Feasibility Report To Congress | 1 day | Fri 8/5/16 | Fri 8/5/16 | |
| 4 | Signed PED | 1 day | Fri 10/6/17 | Fri 10/6/17 | |
| 5 | Plans and Specifications Final | 180 days | Mon 10/9/17 | Fri 6/15/18 | 4 |
| 6 | Project Solicitation and Selection Process | 70 days | Mon 6/18/18 | Fri 9/21/18 | 5 |
| 7 | **Pre-Construction Activities** | **131 days** | **Fri 10/12/18** | **Fri 4/12/19** | |
| 8 | Contract Award/NTP | 1 day | Fri 10/12/18 | Fri 10/12/18 | 6FS+14 days |
| 9 | Pre-Con Meeting | 1 day | Fri 11/2/18 | Fri 11/2/18 | 8FS+14 days |
| 10 | Project Plans | 60 days | Mon 11/5/18 | Fri 1/25/19 | 9 |
| 11 | Mob-Demobe | 10 days | Mon 4/1/19 | Fri 4/12/19 | 10FS+45 days |
| 12 | **Quarry - Rock Production, Stockpile and Test** | **390 days** | **Mon 2/18/19** | **Fri 8/14/20** | |
| 13 | Quarry -2019 Production | 190 days | Mon 2/18/19 | Fri 11/8/19 | 10FS+15 days |
| 14 | Quarry Winter Shutdown | 100 days | Mon 11/11/19 | Fri 3/27/20 | 13 |
| 15 | Quarry 2020 Production | 100 days | Mon 3/30/20 | Fri 8/14/20 | 14 |
| 16 | **2019 Construction Season** | **152 days** | **Mon 4/15/19** | **Tue 11/12/19** | |
| 17 | Site Survey and Layout | 7 days | Mon 4/15/19 | Tue 4/23/19 | 11 |
| 18 | Demo Existing Facilities | 20 days | Wed 4/24/19 | Tue 5/21/19 | 17 |
| 19 | 2019 Pre-Condition HydroSurvey | 7 days | Wed 4/24/19 | Thu 5/2/19 | 17 |
| 20 | Core -truck, load on barge, tow and dump | 75 days | Thu 5/23/19 | Wed 9/4/19 | 19FS+14 days |
| 21 | B-Rock - Truck, load on barge, tow and place w/crane | 40 days | Thu 9/5/19 | Wed 10/30/19 | 20 |
| 22 | Protect work and prepare for shut-down | 5 days | Thu 10/31/19 | Wed 11/6/19 | 21 |
| 23 | 2019 Pre-Shutdown Survey | 4 days | Thu 11/7/19 | Tue 11/12/19 | 22 |
| 24 | 2019-2020 Winter Shut-Down | 104 days | Wed 11/13/19 | Mon 4/6/20 | 23 |
| 25 | **2020 Construction Season** | **136 days** | **Tue 4/7/20** | **Tue 10/13/20** | **24** |
| 26 | 2020 Mobe | 6 days | Tue 4/7/20 | Tue 4/14/20 | |
| 27 | 2020 Pre-Condition Survey | 5 days | Wed 4/15/20 | Tue 4/21/20 | 26 |
| 28 | A-Rock -truck, load on barge tow and Place w/ Crane and exca | 60 days | Fri 5/1/20 | Thu 7/23/20 | 27FS+7 days |
| 29 | **Construct Breakwater Attached to Shore** | **34 days** | **Fri 7/24/20** | **Wed 9/9/20** | |
| 30 | Core Rock | 14 days | Fri 7/24/20 | Wed 8/12/20 | 28 |
| 31 | B-Rock | 10 days | Thu 8/13/20 | Wed 8/26/20 | 30 |
| 32 | A-Rock | 10 days | Thu 8/27/20 | Wed 9/9/20 | 31 |
| 33 | Final Survey | 7 days | Thu 9/10/20 | Fri 9/18/20 | 32 |
| 34 | Close-Out Inspections | 14 days | Mon 9/21/20 | Thu 10/8/20 | 33 |
| 35 | Demobilize | 16 days | Mon 9/21/20 | Mon 10/12/20 | 33 |
| 36 | Contract Completion | 1 day | Tue 10/13/20 | Tue 10/13/20 | 35 |




Project: Craig Small Boat Harbor
Date: Wed 2/25/15

Task | Summary | Rolled Up Progress | Project Summary
Progress | Rolled Up Task | Split | Group By Summary
Milestone | Rolled Up Milestone | External Tasks | Deadline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Quarry - Rock Production, Stockpile and Test
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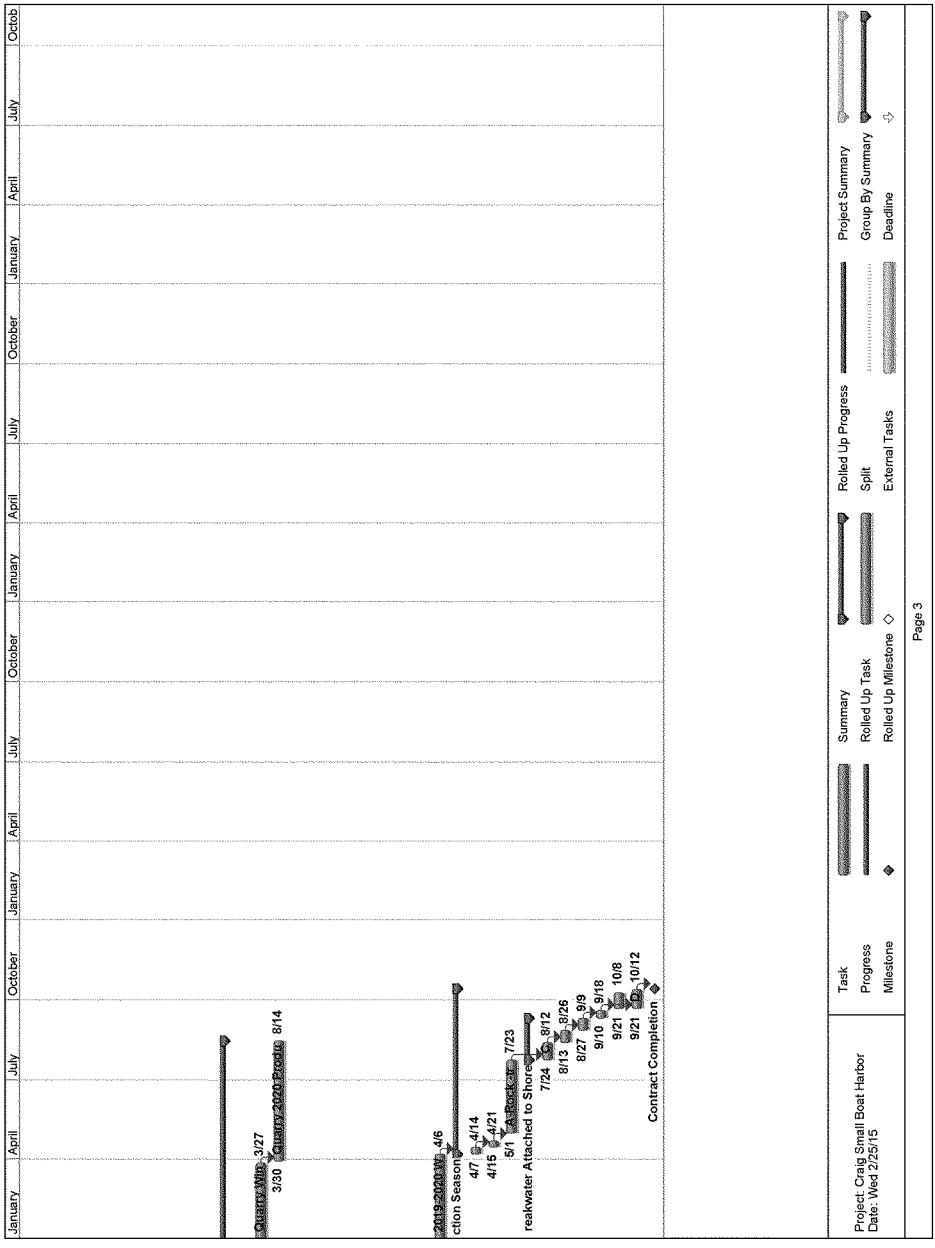
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Rolled Up Milestone
Rolled Up Progress
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# Appendix G
# Real Estate

| | | |
|---|---|---|
| US Army Corps of Engineers<br>Pacific Ocean Division | **REAL ESTATE PLAN**<br><br>**APPENDIX G** | Alaska District |

# NAVIGATIONAL IMPROVEMENTS

# CRAIG, ALASKA

**Real Estate Division**
**Alaska District**
**U.S. Army Corps of Engineers**

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# 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 (LERR) that will be required.

## PROJECT TYPE AND APPLICABILITY:

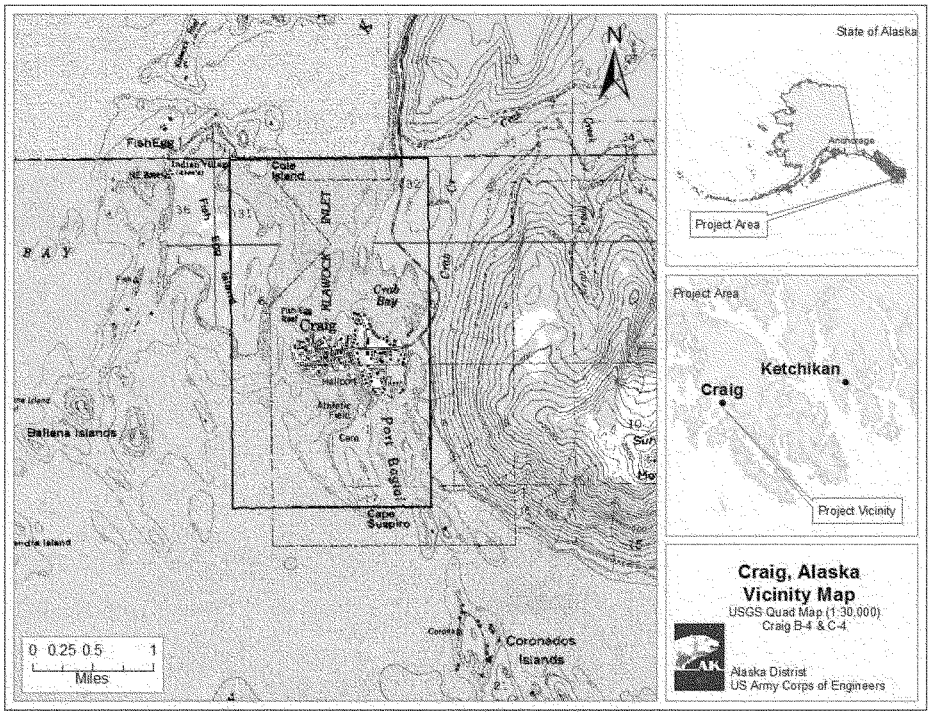
This feasibility study is being conducted under authority granted by a resolution adopted on December 2, 1970, by the Committee on Public Works of the U.S. House of Representatives. The resolution states:

> *"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 recommended plan.


State of Alaska
Anchorage
Project Area
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
N
FishEgg
Cole Island
KLAWOCK INLET
Crab Bay
Craig
Port Bagial
Cape Suspiro
Ballena Islands
Coronados Islands
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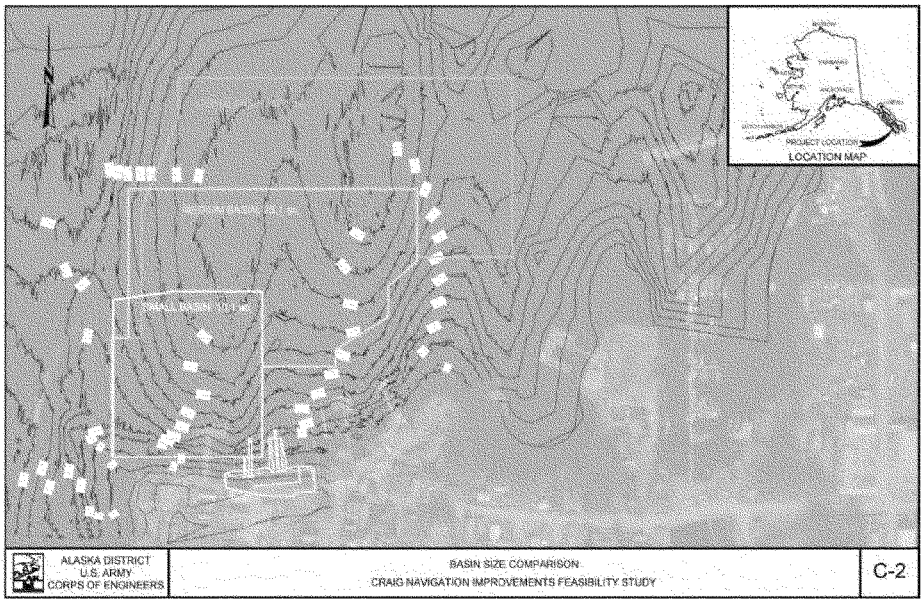
Miles


PROJECT LOCATION
LOCATION MAP
ALASKA DISTRICT
U.S. ARMY
CORPS OF ENGINEERS
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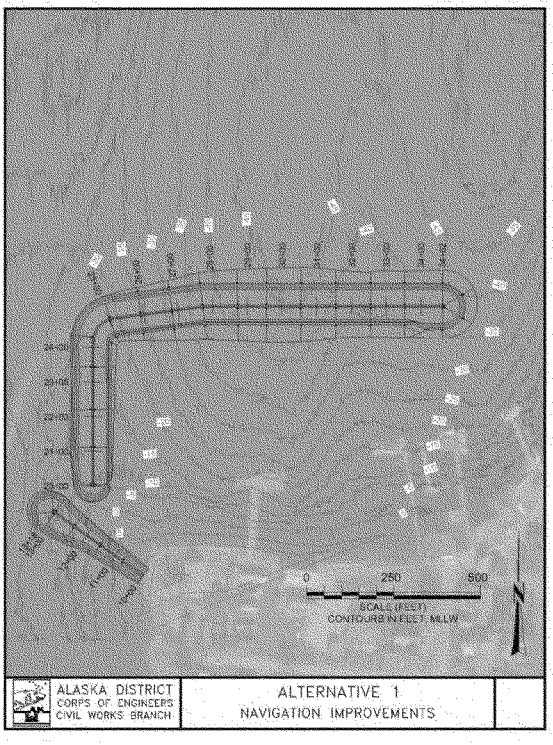
### Alternative 1: Small Basin with No Western Entrance Channel:

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 Table 1. 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 |



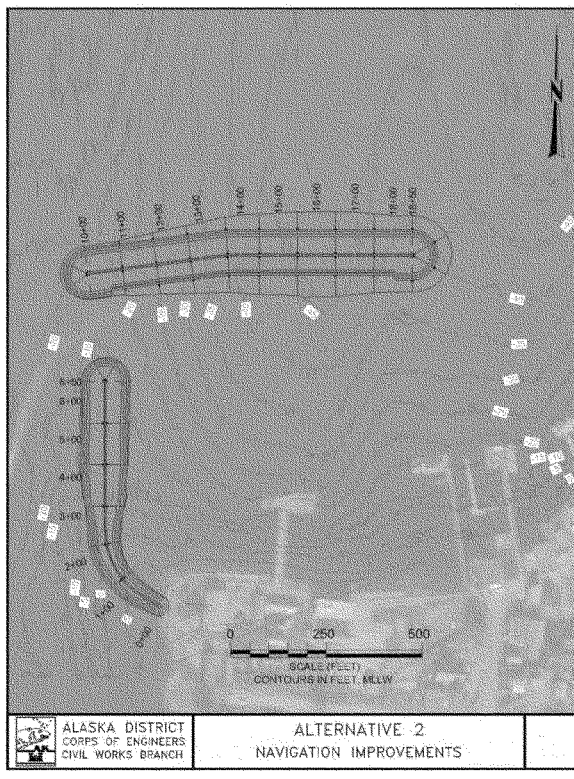

**Alternative 1**

### 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 |



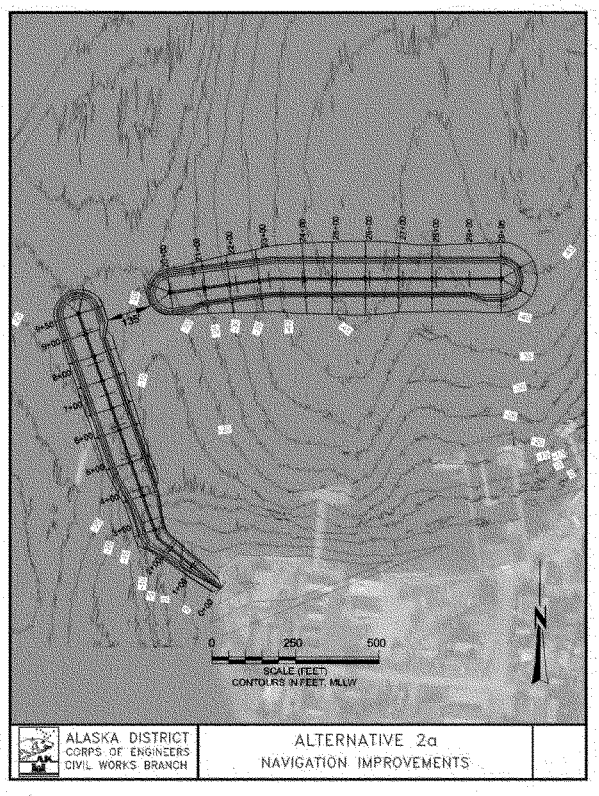

**Alternative 2**

### 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 |



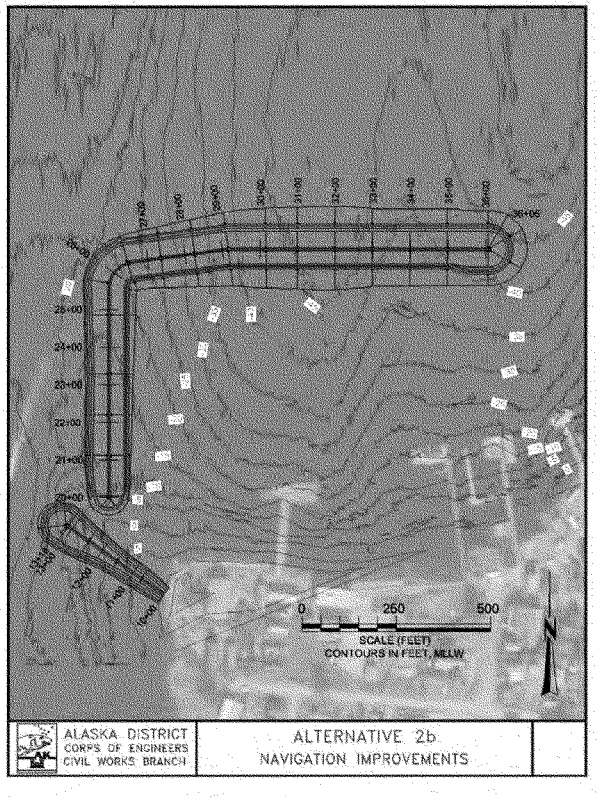

**Alternative 2a**

## 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 |



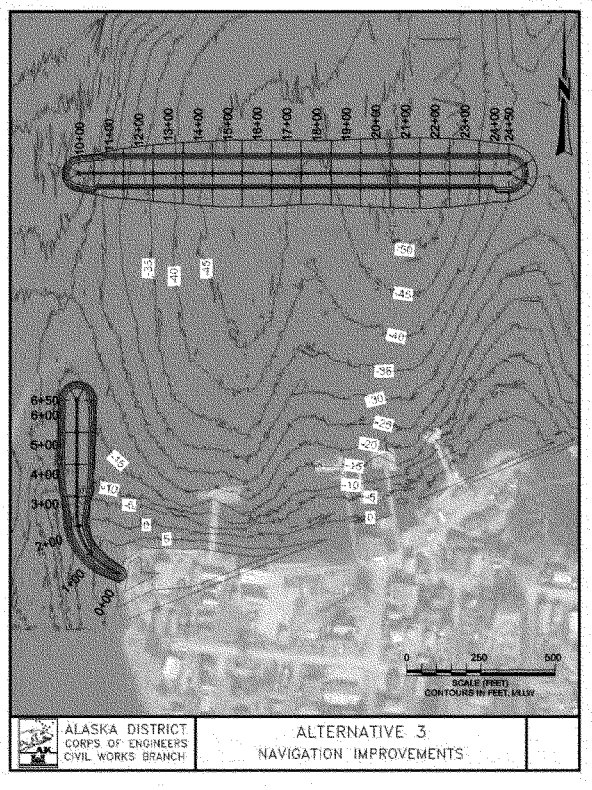

**Alternative 2b**

### 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 |



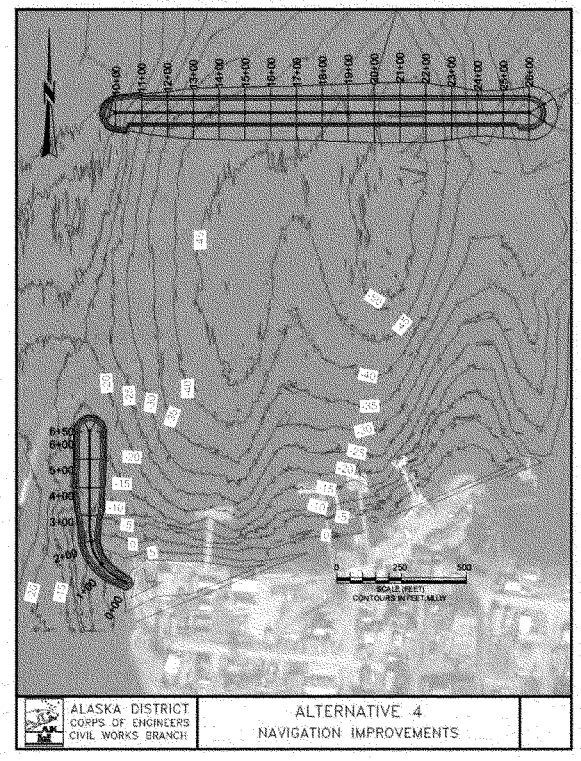

**Alternative 3**

### 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 (LERR):

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. Lands, easements, and rights-of-way necessary to implement this project include lands currently owned by the City of Craig and the State of Alaska, No disposal areas or perpetual easements have been identified. The State of Alaska owns the pertinent tidelands and submerged lands. The City of Craig owns the uplands.

Real estate requirements are as follows:

**TABLE 7- LERR 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 Area | City of Craig | 0.65 AC | Temporary Easement | LSF |

## PROJECT COMPONENTS:

See Baseline Cost Estimate Section.

## STANDARD ESTATES:

FEE, 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 any privately owned lands for the project. 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 | $7,300 | $11,400 | $18,700 |
| Land Acquisition Costs (To be Determined) | $0 | $3,000* | $3,000* |
| Subtotal | $7,300 | $14,400 | $21,700 |
| 20% Contingency - Crediting | $1,460 | $2,900 | $4,400 |
| | | | |
| **PROJECT TOTALS** | **$9,000** | **$17,000** | **$26,000** |

* Estimate is based on $1.50 per square foot. Totals may not sum due to rounding. Values in the Baseline Cost Estimate are estimates and not a final LERR 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 a highly 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 LERR 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 LERR | 4-6 weeks after PPA execution |
| CERTIFY ALL NECESSARY LERR 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** _____ **NO** X

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** _____ **NO** X

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** X **FULLY CAPABLE** _____

**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:**

Jon Bolling
Craig City Administrator

**PREPARED BY:**

JOHN J SMITH
Realty Specialist

**REVIEWED AND APPROVED BY:**

MICHAEL D COY
Chief, Real Estate

# Appendix H

# Environmental Correspondence

**DEPARTMENT OF THE ARMY**
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
JOINT BASE ELMENDORF-RICHARDSON, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Environmental Resources Section

FEB 16 2012

U.S. Fish and Wildlife Service
Attn: Ms. Ann Rappoport
Field Supervisor
605 West 4th Avenue, Room 62
Anchorage, Alaska 99501-2248

Dear Ms. Rappoport,

The U.S. Army Corps of Engineers (USACE), Alaska District is in the initial phase of developing proposals for the construction of a new or modification of a small boat harbor at Craig, Alaska (Latitude 55 degrees, 28 minutes, 35.00 seconds, Longitude 133 degrees, 8 minutes, 54.00 seconds). The USACE does not yet have a proposed project description for the project as no alternatives or proposals have as yet been developed.

USACE does not expect to issue a public notice related to the proposed project for a minimum of 18 months. Pursuant to Section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531 et. seq.) USACE is requesting a Threatened/Endangered Species list for Craig, Alaska to facilitate the initial scoping and alternatives development process. USACE is aware that given the timeframe between this request and the formal initiation of Section 7 consultation that an updated list will have to be requested.

If you have any questions related to this request, please contact Mr. Keith Gordon at (907) 753-5710 or via email at Keith.q.gordon@usace.army.mil.

Sincerely,

Michael R. Salyer
Chief, Environmental Resources Section

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
JOINT BASE ELMENDORF-RICHARDSON, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Environmental Resources Section

FEB 16 2012

Dr. Jay Balsinger
Alaska Regional Office
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

Dear Dr. Balsinger,

The U.S. Army Corps of Engineers (USACE), Alaska District is in the initial phase of developing proposals for the construction of a new or modification of a small boat harbor at Craig, Alaska (Latitude 55 degrees, 28 minutes, 35.00 seconds, Longitude 133 degrees, 8 minutes, 54.00 seconds). The USACE does not yet have a proposed project description for the project as no alternatives or proposals have as yet been developed.

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If you have any questions related to this request, please contact Mr. Keith Gordon at (907) 753-5710 or via email at Keith.q.gordon@usace.army.mil.

Sincerely,

Michael R. Salyer
Chief, Environmental Resources Section

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
JOINT BASE ELMENDORF-RICHARDSON, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Environmental Resources Section

Mr. Mark Minnillo
Alaska Department of Fish and Game
P.O. Box 668
Craig, AK 99921-0668

Dear Mr. Minnillo,

The U.S. Army Corps of Engineers (Corps) is continuing its study of alternatives for a proposed navigation improvement project at Craig on the west coast of Prince of Wales Island in Southeast Alaska (figure 1). The Corps has not yet chosen a tentatively selected plan, but each construction alternative currently under development includes two rubble-mound breakwaters defining a new harbor basin offshore of the Wards Cove cannery site: an attached breakwater forming the west side of a harbor basin and a detached breakwater forming the north side. A small area of uplands (about 0.75 acre) may also be created by placing fill along shoreline (figure 2).

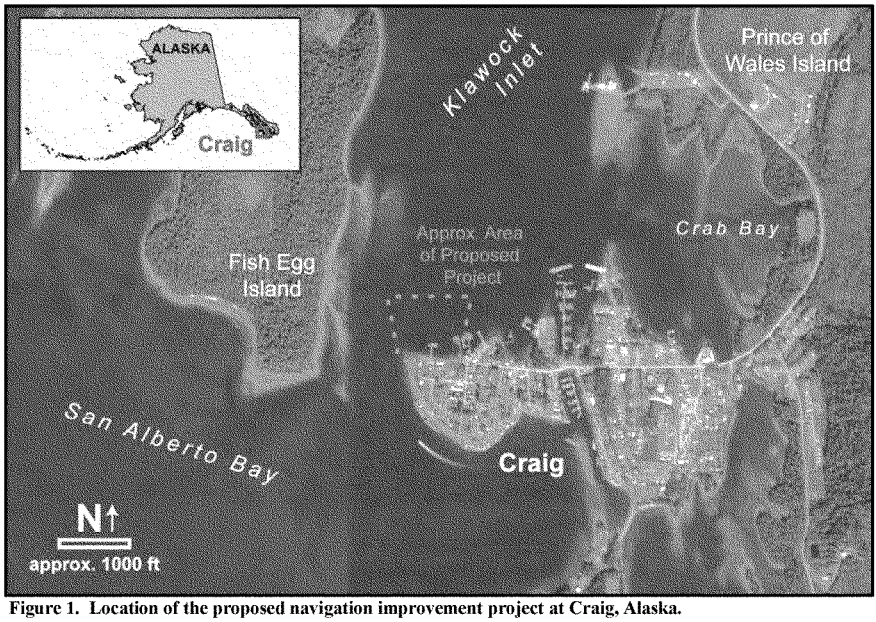



**Figure 1. Location of the proposed navigation improvement project at Craig, Alaska.**

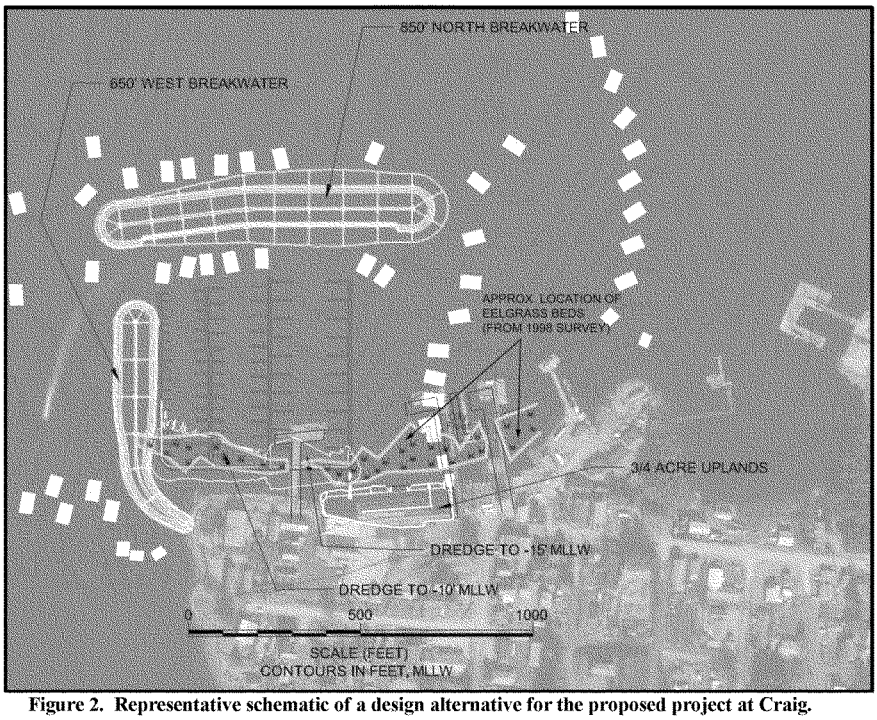



**Figure 2. Representative schematic of a design alternative for the proposed project at Craig.**

The alternatives under consideration differ primarily in the size of the proposed harbor basin, which may be adjusted by changing the distance of the north breakwater from shore and/or by changing the angle of the west breakwater (i.e., having it point to the northwest vs. straight north).

Another variable under consideration is whether it will be necessary to dredge near-shore sediment to deepen the proposed basin. Extending the proposed project farther from shore may avoid the need for dredging and thereby the risk of disturbing both potentially contaminated sediment and a swath of eelgrass known to be present in the near-shore area; however, this would also necessarily increase the overall footprint of the project.

The Corps is gathering information for an environmental assessment and welcomes input from the Alaska Department of Fish and Game (ADFG) on wildlife and fisheries resources in the project area and any questions or concerns about the project that ADFG may have.

The Corps looks forward to working with the ADFG on this project. Please contact me by e-mail at Christopher.B.Floyd@usace.army.mil or by telephone at (907) 753-2700 if you need additional information.

Sincerely,



Chris Floyd
Acting Chief, Environmental Resources Section

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
JOINT BASE ELMENDORF-RICHARDSON, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Environmental Resources Section

Dr. James Balsiger
Alaska Regional Office
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

Dear Dr. Balsiger,

The U.S. Army Corps of Engineers (Corps) is continuing its study of alternatives for a proposed navigation improvement project at Craig on the west coast of Prince of Wales Island in Southeast Alaska (figure 1). The Corps has not yet chosen a tentatively selected plan, but each construction alternative currently under development includes two rubble-mound breakwaters defining a new harbor basin offshore of the Wards Cove cannery site: an attached breakwater forming the west side of a harbor basin and a detached breakwater forming the north side. A small area of uplands (about 0.75 acre) may also be created by placing fill along shoreline (figure 2).

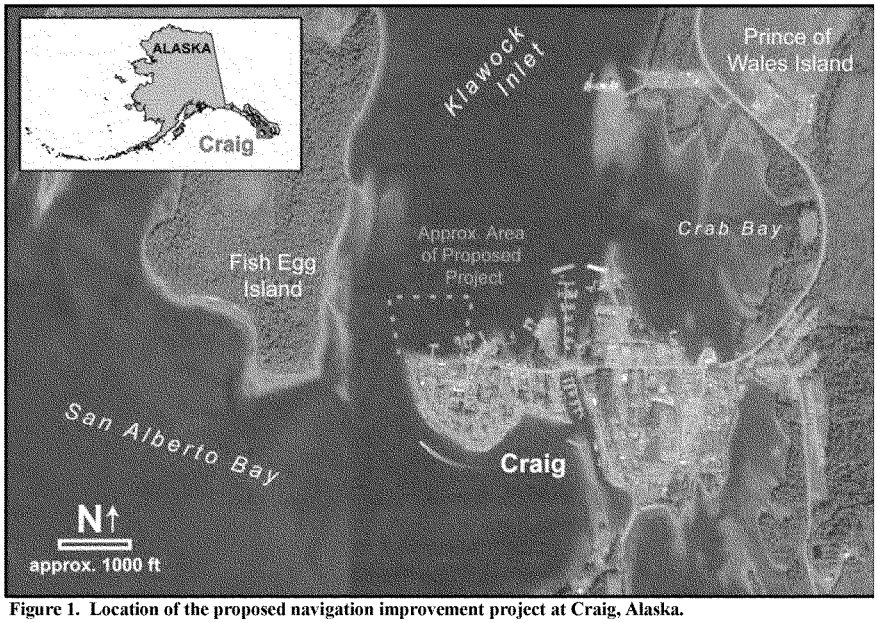



**Figure 1. Location of the proposed navigation improvement project at Craig, Alaska.**

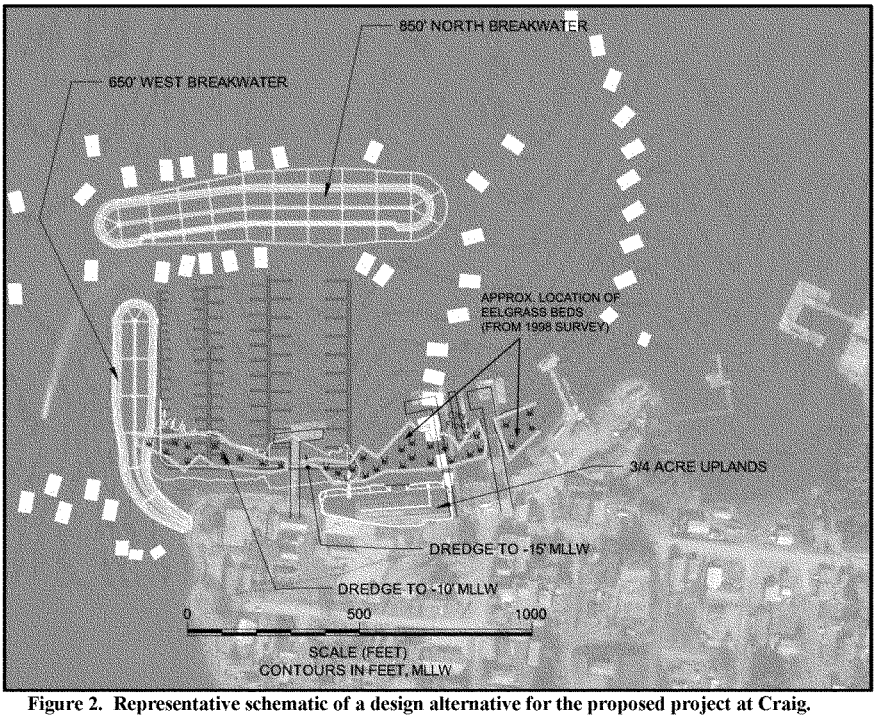



**Figure 2. Representative schematic of a design alternative for the proposed project at Craig.**

The alternatives under consideration differ primarily in the size of the proposed harbor basin, which may be adjusted by changing the distance of the north breakwater from shore and/or by changing the angle of the west breakwater (i.e., having it point to the northwest vs. straight north).

Another variable under consideration is whether it will be necessary to dredge near-shore sediment to deepen the proposed basin. Extending the proposed project farther from shore may avoid the need for dredging and thereby the risk of disturbing both potentially contaminated sediment and a swath of eelgrass known to be present in the near-shore area; however, this would also necessarily increase the overall footprint of the project.

The Corps is gathering information for an environmental assessment and would like to initiate informal consultation with the National Marine Fisheries Service under Section 7 of the Endangered Species Act. We request a list of endangered and threatened species, along with designated critical habitat, that may be present in the vicinity of the proposed project.

The Corps looks forward to working with the NMFS on this project. Please contact me by e-mail at Christopher.B.Floyd@usace.army.mil or by telephone at (907) 753-2700 if you need additional information.

Sincerely,



Chris Floyd
Acting Chief, Environmental Resources Section

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
JOINT BASE ELMENDORF-RICHARDSON, ALASKA 99506-0898

REPLY TO ATTENTION OF:

Environmental Resources Section

Brad Smith, Field Office Supervisor
Protected Resources Division
Alaska Region
National Marine Fisheries Service
222 W. 7th Ave., #43
Anchorage, AK 99513-7577

Dear Mr. Smith,

The U.S. Army Corps of Engineers (Corps) is continuing its study of alternatives for a proposed navigation improvement project at Craig on the west coast of Prince of Wales Island in Southeast Alaska (figure 1). The Corps has not yet chosen a tentatively selected plan, but each construction alternative currently under development includes two rubble-mound breakwaters defining a new harbor basin offshore of the Wards Cove cannery site: an attached breakwater forming the west side of a harbor basin and a detached breakwater forming the north side. A small area of uplands (about 0.75 acre) may also be created by placing fill along shoreline (figure 2).

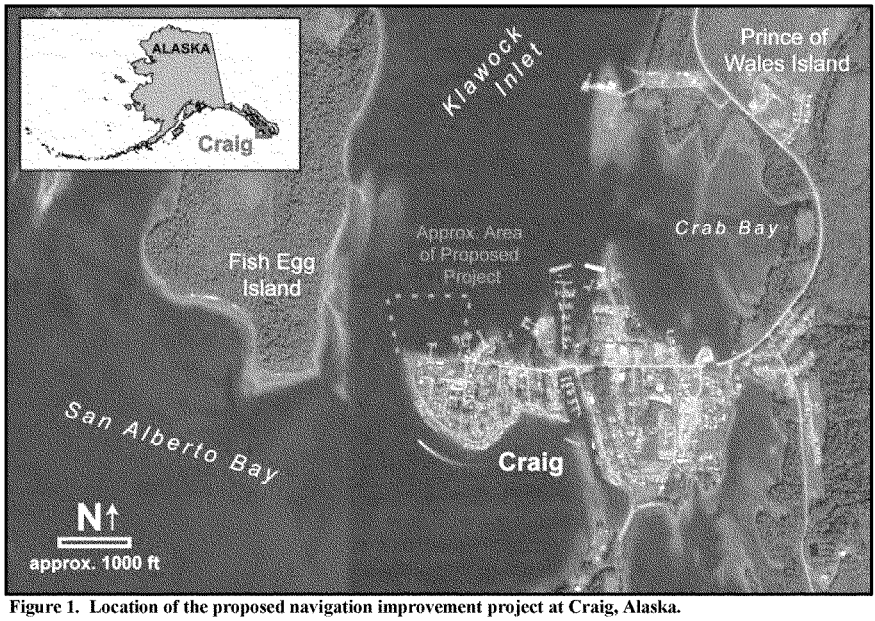
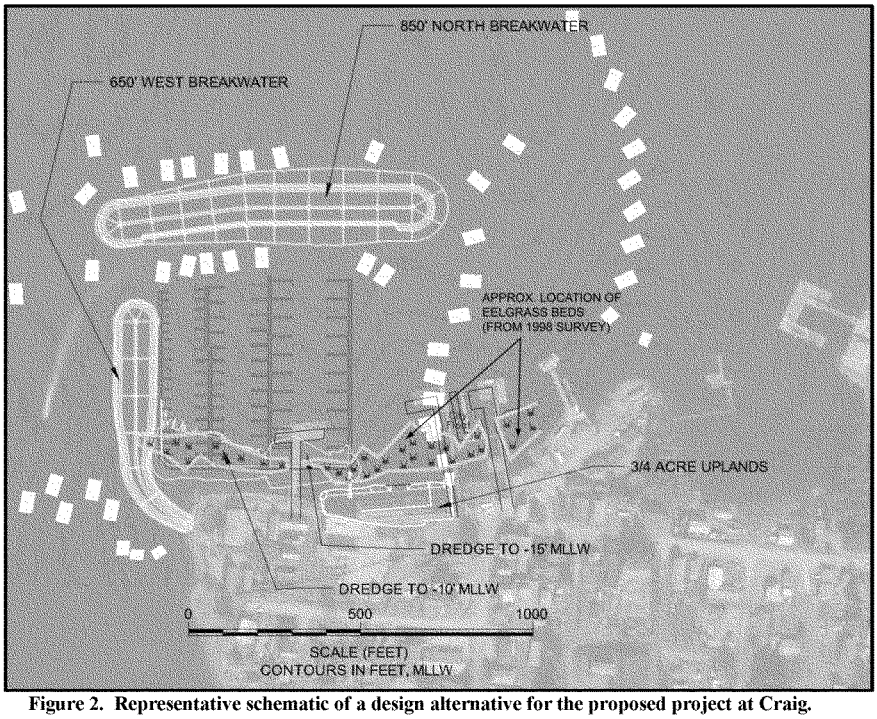



**Figure 1. Location of the proposed navigation improvement project at Craig, Alaska.**

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The Corps looks forward to working with the NMFS on this project. Please contact me by e-mail at Christopher.B.Floyd@usace.army.mil or by telephone at (907) 753-2700 if you need additional information.

Sincerely,



Chris Floyd
Acting Chief, Environmental Resources Section

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
JOINT BASE ELMENDORF-RICHARDSON, ALASKA 99506-0898

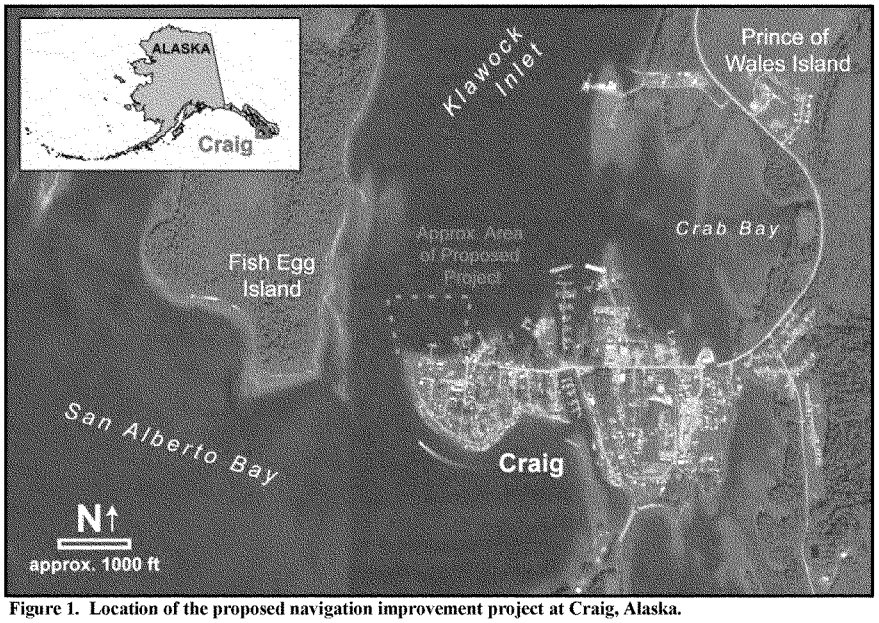
REPLY TO ATTENTION OF:

Environmental Resources Section

Ms. Jeanne Hanson
Habitat Conservation Division
NMFS Alaska Region
222 West 7th Ave., Rm 517
Anchorage, AK 99513-7577

Dear Ms. Hanson,

The U.S. Army Corps of Engineers (Corps) is continuing its study of alternatives for a proposed navigation improvement project at Craig on the west coast of Prince of Wales Island in Southeast Alaska (figure 1). The Corps has not yet chosen a tentatively selected plan, but each construction alternative currently under development includes two rubble-mound breakwaters defining a new harbor basin offshore of the Wards Cove cannery site: an attached breakwater forming the west side of a harbor basin and a detached breakwater forming the north side. A small area of uplands (about 0.75 acre) may also be created by placing fill along shoreline (figure 2).

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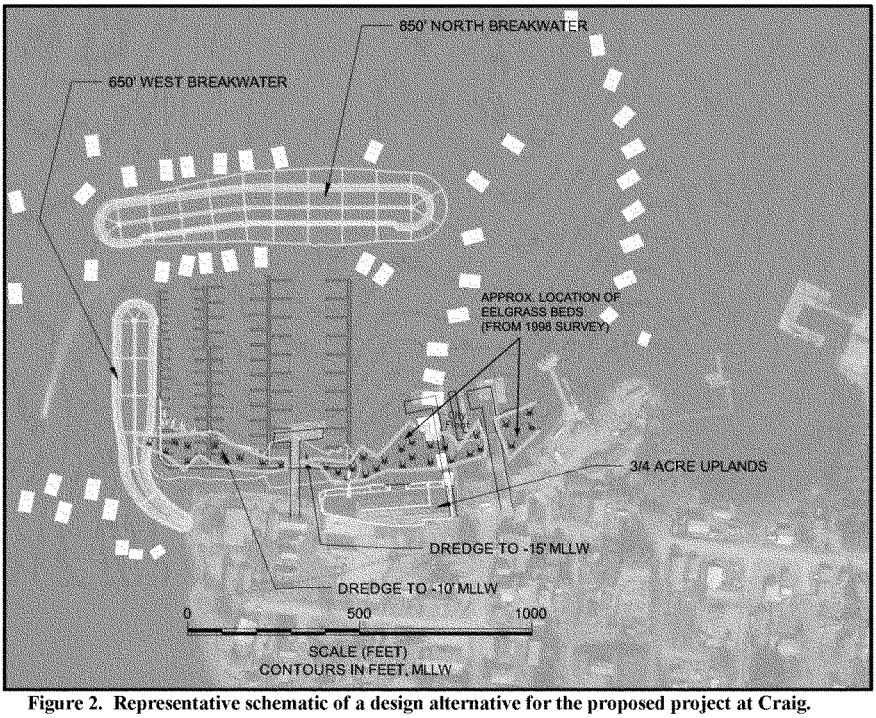


**Figure 2. Representative schematic of a design alternative for the proposed project at Craig.**

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The Corps is gathering information for an environmental assessment (EA), and we request your preliminary recommendations concerning essential fish habitat (EFH) in the project area. We also wish to initiate coordination with the National Marine Fisheries Service under the Fish and Wildlife Coordination Act.

The Corps looks forward to working with the NMFS on this project. Please contact me by e-mail at Christopher.B.Floyd@usace.army.mil or by telephone at (907) 753-2700 if you need additional information.

Sincerely,



Chris Floyd
Acting Chief, Environmental Resources Section

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
JOINT BASE ELMENDORF-RICHARDSON, ALASKA 99506-0898

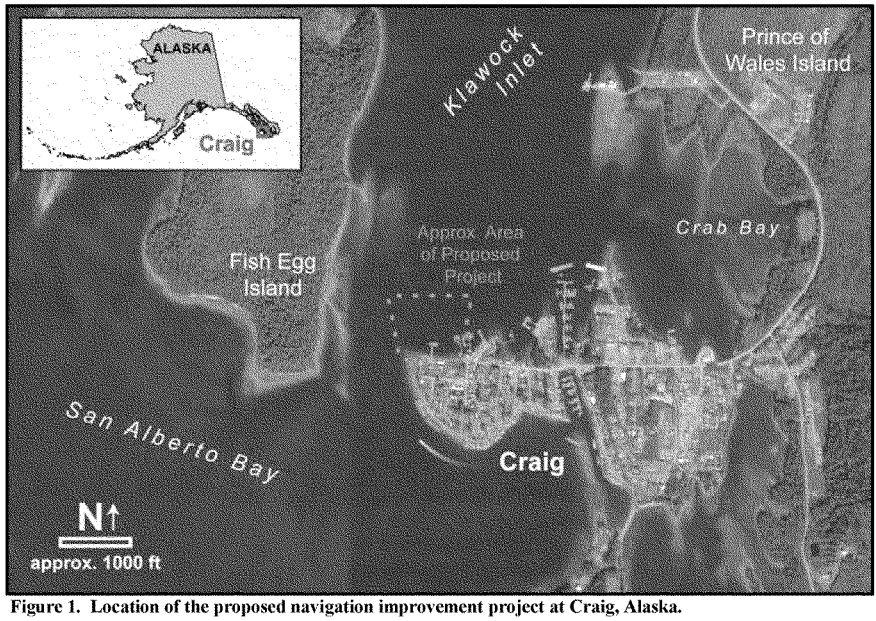
REPLY TO ATTENTION OF:

Environmental Resources Section

Bill Hanson, Field Supervisor
U.S. Fish and Wildlife Service
Juneau Field Office
3000 Vintage Park Blvd., Suite 201
Juneau, Alaska 99801

Dear Mr. Hanson:

The U.S. Army Corps of Engineers (Corps) is continuing its study of alternatives for a proposed navigation improvement project at Craig on the west coast of Prince of Wales Island in Southeast Alaska (figure 1). The Corps has not yet chosen a tentatively selected plan, but each construction alternative currently under development includes two rubble-mound breakwaters defining a new harbor basin offshore of the Wards Cove cannery site: an attached breakwater forming the west side of a harbor basin and a detached breakwater forming the north side. A small area of uplands (about 0.75 acre) may also be created by placing fill along shoreline (figure 2).

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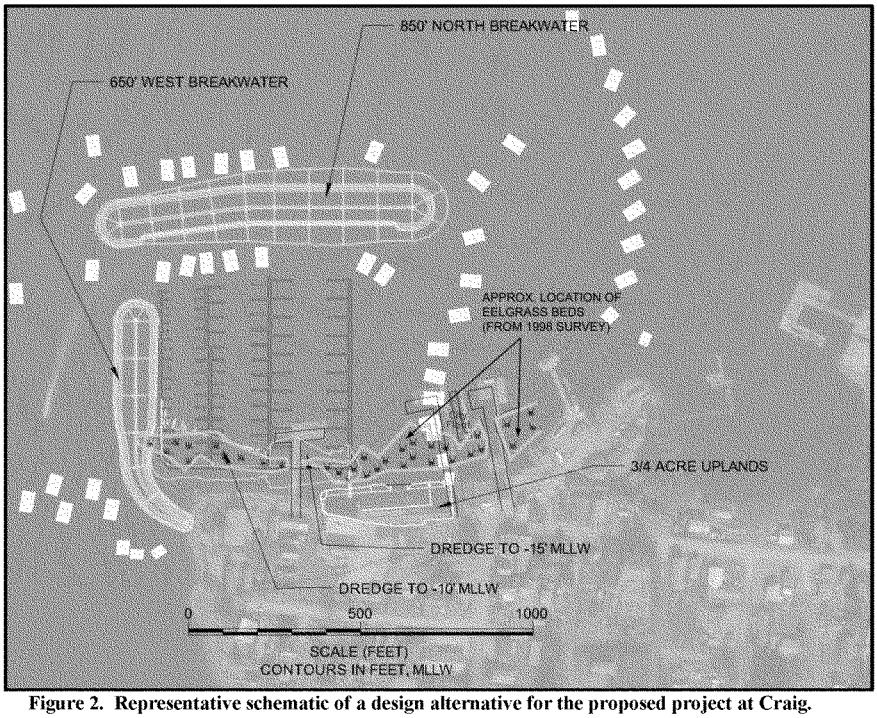


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The Corps is gathering information for an environmental assessment and would like to initiate informal consultation with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act. We request a list of endangered and threatened species, along with designated critical habitat, that may be present in the vicinity of the proposed project. The Corps also wishes to know what level of consultation the USFWS may like to pursue under the Fish and Wildlife Coordination Act for this project.

The Corps looks forward to working with the U.S. Fish and Wildlife Service on this project. Please contact me by e-mail at Christopher.B.Floyd@usace.army.mil or by telephone at (907) 753-2700 if you need additional information.

Sincerely,



Chris Floyd
Acting Chief, Environmental Resources Section

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
JOINT BASE ELMENDORF-RICHARDSON, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Environmental Resources Section

Mr. Jonathan Kurland
Assistant Regional Administrator for Protected Resources
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

Dear Mr. Kurland,

The U.S. Army Corps of Engineers (Corps) is continuing its study of alternatives for a proposed navigation improvement project at Craig on the west coast of Prince of Wales Island in Southeast Alaska (figure 1). The Corps has not yet chosen a tentatively selected plan, but each construction alternative currently under development includes two rubble-mound breakwaters defining a new harbor basin offshore of the Wards Cove cannery site: an attached breakwater forming the west side of a harbor basin and a detached breakwater forming the north side. A small area of uplands (about 0.75 acre) may also be created by placing fill along shoreline (figure 2).

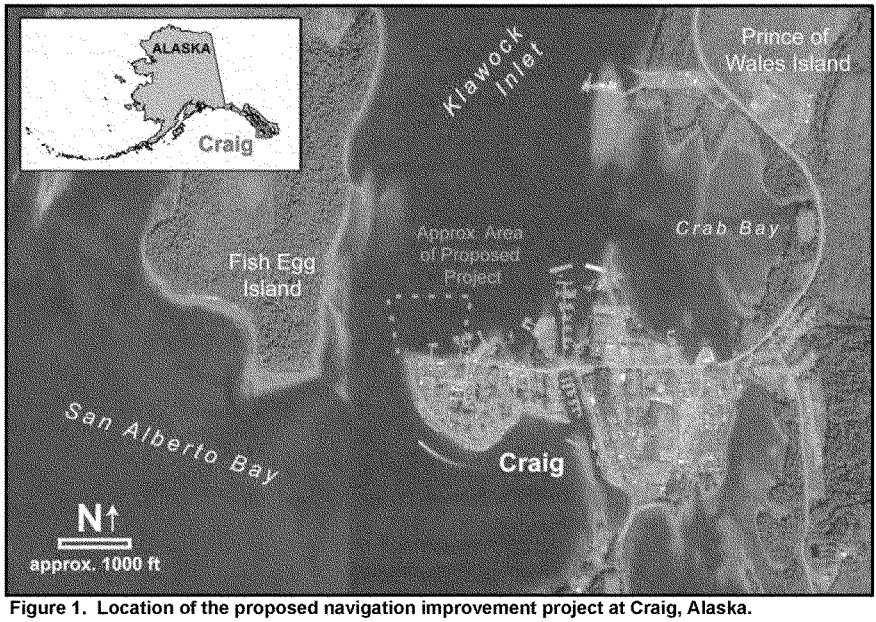
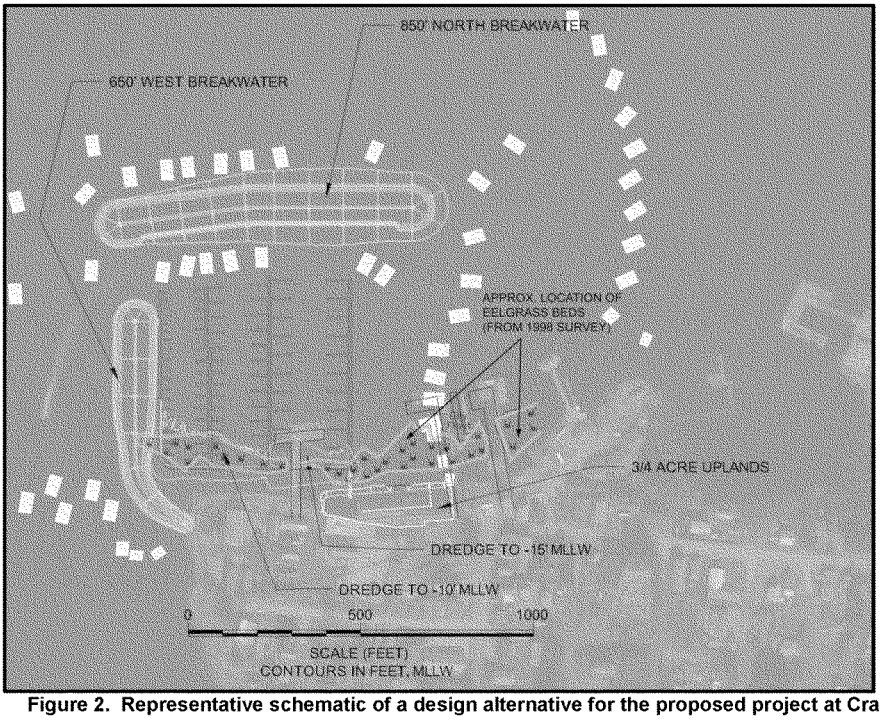



**Figure 1. Location of the proposed navigation improvement project at Craig, Alaska.**

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The Corps is gathering information for an environmental assessment and would like to initiate informal consultation with the National Marine Fisheries Service under Section 7 of the Endangered Species Act. We request a list of endangered and threatened species, along with designated critical habitat, that may be present in the vicinity of the proposed project.

The Corps looks forward to working with the NMFS on this project. Please contact me by e-mail at Christopher.B.Floyd@usace.army.mil or by telephone at (907) 753-2700 if you need additional information.

Sincerely,



Chris Floyd
Acting Chief, Environmental Resources Section

File Name: ltr to NMFS_ESA_Craig.docx/Floyd/05 March 2014
File Location: O:\EN\Public\CW\0 CW Projects\Craig 013804 Craig Harbor\ER\Correspondence\2014

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

May 5, 2014

Chris Floyd
Acting Chief, Environmental Resources Section
U.S. Army Corps of Engineers
P. O. Box 6898
JBER, Alaska 99506-0898

Re: Proposed Navigation Improvement Project at Craig, Alaska

Dear Mr. Floyd:

The National Marine Fisheries Service (NMFS) has received your request for information regarding living marine resources of our concern, including Essential Fish Habitat (EFH) for the proposed navigation improvement project at Craig, Alaska. The U.S. Army Corps of Engineers (Corps) is preparing an environmental assessment (EA) for the proposed project and is considering alternatives that include two rubble-mound breakwaters defining a new harbor basin offshore of the Wards Cove cannery site: an attached breakwater forming the west side of a harbor basin and a detached breakwater forming the north side. An area of uplands may be created by placing fill along the shoreline. Additionally, the project may include dredging the near-shore sediment to deepen the proposed basin which could disturb eelgrass. NMFS offers the following information regarding species protected under the Endangered Species Act, the Marine Mammal Protection Act, the Fish and Wildlife Coordination Act, and the Magnuson-Stevens Fishery Conservation and Management Act.

**Endangered Species Act (ESA) and ESA Listed Species**

Section 7(a)(2) of the ESA directs federal interagency cooperation "to insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species" or result in the destruction or adverse modification of critical habitat. NMFS is responsible for the administration of the ESA as it applies to listed cetaceans, pinnipeds, fish, and reptiles (sea turtles) in Alaska.

Per your request, ESA-listed marine mammal species that may occur in waters around Craig include the endangered humpback whale (*Megaptera novaeangliae*). The endangered leatherback turtle is uncommon but recorded in the Gulf of Alaska. All other marine turtles are rare or "casual visitors" to Alaskan waters. Because the western Distinct Population Segment of Steller sea lions (*Eumetopias jubatus*) is not likely to be found within the action area (Jemison et.al. 2013), consultation is not required on this species.

Several Pacific salmon stocks and other fish species are listed under the ESA and occur within Alaskan waters. These include the following Evolutionarily Significant Units: 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, Green Sturgeon. These stocks range throughout the North Pacific. However, the specific occurrence of these listed species within the project area is highly unlikely.

**Marine Mammal Protection Act (MMPA) and MMPA Species**

All marine mammals are protected under the MMPA which prohibits the injury, harm or harassment of marine mammals. In addition to the ESA-listed marine mammals previously mentioned, non-listed marine mammals that may occur in the project area include: the gray whale, killer whale, minke whale, Pacific white-sided dolphin, Dall's porpoise, harbor porpoise, and harbor seal. All of these species may swim and forage in marine waters near the proposed project at any time of year on an opportunistic basis. We do not have detailed information on the frequency or magnitude of occurrence of ESA or MMPA-protected species in Craig, Alaska near the proposed project area. General information on ESA species and MMPA species under NMFS jurisdiction can be found at: http://www.fakr.noaa.gov/protectedresources.

**Fish and Wildlife Coordination Act (FWCA)**

NMFS coordinates projects under provisions of the FWCA for living marine resources not specifically managed as a commercial fishery resource. The project area includes marine habitats that have enhanced ecological functions, such as submerged vegetation (eelgrass and kelps) and areas of attachment substrate (rock). Eelgrass beds and kelp gardens function as nursery areas, providing food, shelter, and protection from predators. Within the project area, eelgrass is present nearshore in a patchy distribution. ShoreZone imagery depicts giant kelp and soft brown kelp at the point where the proposed west breakwater meets the shoreline and kelps extend south along the shoreline (Figure 1.) Please visit the ShoreZone website at: http://alaskafisheries.noaa.gov/mapping/szflex/.




Figure 1. Distribution on eelgrass, soft brown kelps, and giant kelp in the vicinity of the boat harbor proposed in Craig, Alaska.

**Essential Fish Habitat (EFH)**
Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), requires all federal agencies to consult with the Secretary of Commerce on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH. However, should the federal action agency determine their action will not adversely affect EFH then no EFH consultation is required. Section 305(b)(2) requires all federal agencies to consult with the Secretary on all actions or proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH.

EFH is designated in Alaska for species managed under specific federal Fishery Management Plans. Within the project area, EFH for five species of Pacific salmon (Chinook, chum, coho, pink, and sockeye) has been designated. Salmon species utilize marine waters and substrates at various life stages. Salmon use nearshore and estuary areas for feeding, rearing, and avoiding predators when migrating to and from the sea. Nearshore areas also serve as important juvenile and adult salmon migratory corridors. Please visit our web site for additional information on habitat and EFH: http://www.alaskafisheries.noaa.gov/habitat.

**Avoidance and Minimization of Impacts to Living Marine Resources, including EFH**
Since the project is at the scoping phase, detailed recommendations are not proposed at this time. However, the following information may be helpful to the Corps as they consider alternatives.

- Regardless of the alternative selected, all work below the high tide line should be limited to low tidal stages to reduce turbidity.
- In order to avoid impacts to outmigrating salmon smolts, avoid in-water work from March 15 through June 15 in any year.
- Opportunity may exist to design the breakwater for the enhancement of kelp colonization (gently sloping or stepped rip rap with benches). Should dredging occur in eelgrass areas, we suggest the project consider relocating the eelgrass to a previously disturbed site in the local Craig and Klawock area, where it may re-establish.
- Should the Corps determine that tideland fill is required for this project, we would recommend that the fill material used be non-acid generating rock and consist of material that is free of fine sediments to the extent practicable, so as to reduce suspended material from entering the water.
- NMFS generally recommends that structures (i.e. docks, ramps) not be placed over eelgrass beds, so as to avoid impacts associated with shading and grounding.
- Avoid the use of any wood that has been surface or pressure-treated with creosote or treated with pentachlorophenol. If treated wood must be used, any wood that comes in contact with water should be treated with waterborne preservatives approved for use in aquatic and/or marine environments. These include, but are not limited to: Chromated Copper Arsenic (CCA) Type C, Ammoniacal Copper Zinc Arsenate (ACZA), Alkaline Copper Quat (ACQ), Copper Boron Azole (CBA) or Copper Azole (CA).
- Fish have been observed to avoid sounds similar to those produced by vibratory hammers and to remain within the field of harmful sound associated with an impact hammer (Dolat 1997). To drive piles, consider using a vibratory hammer to the extent practicable. Vibratory hammers produce less intense sounds than impact hammers (NMFS 2005). If an impact hammer is required because of substrate type or the need for seismic stability,

then drive piles as deep as possible with a vibratory hammer before the impact hammer is used.

- In-water blasting produces intense underwater sound pressure waves that can kill or injure fish. In-water blasting should be avoided unless it is the only practicable method for setting piles in bedrock. If underwater blasting must be used, mitigative measures (e.g. stemming) should be employed to contain the explosive energy within the bedrock to the greatest extent possible, and because potentially harmful sound pressure waves are attenuated more rapidly in shallow water than in deep water (Rogers and Cox 1988), blasts should be conducted during the lowest tide level practical.

Further, we recommend evaluating all mitigation opportunities locally and we are willing to work with the Corps to identify such opportunities.

We hope this information is useful in fulfilling your requirements under section 7 of the ESA and section 305(b)(2) of the MSA. Please direct any questions regarding marine mammals or endangered species to Kate Savage at (907) 586-7312, and questions regarding EFH to Cindy Hartmann Moore at (907) 586-7585.

Sincerely,

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

cc: Kate Savage, NMFS, AKR, PRD
Cindy Hartmann Moore, NMFS, AKR, HCD
Steve Brockmann, FWS, Juneau
Mark Minnillo, ADF&G, Craig
Jackie Timothy, ADF&G, Juneau

**References**

Dolat, S.W. 1997. Acoustic measurements during the Baldwin Bridge Demolition (final, dated March 14, 1997). Prepared for White Oak Construction by Sonalysts, Inc., Waterford, CT. 34 pp plus appendices.

Jemison, L. A., G.W. Pendleton, L.W. Fritz, K. K. Hastings, J. M. Maniscalci, A. W. Trites and T. S. Gelatt. 2013. Inter-Population Movements of Steller Sea Lions in Alaska with Implications for Population Separation. PLOS One 8, 14p.

National Marine Fisheries Service. 2005. Final Environmental Impact Statement, Essential Fish Habitat Identification and Conservation in Alaska, Vol. 2, Appendix G; National Marine Fisheries Service, Department of Commerce. April, 2005.

Rogers, P.H. and M. Cox. 1988. Underwater sound as a biological stimulus. pp. 131-149. *In* Sensory biology of aquatic animals. Atema, J, R.R. Fay, A.N. Popper, and W.N. Tavolga, eds. Springer-Verlag. New York.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
JOINT BASE ELMENDORF-RICHARDSON, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Environmental Resources Section

June 6, 2014

Ms. Kate Savage
Protected Resources Division
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

Dear Ms. Savage,

The U.S. Army Corps of Engineers (Corps), Alaska District is continuing its study of a proposed navigation improvement project at Craig, Alaska, on the west coast of Prince of Wales Island in Southeast Alaska (figure 1). The project would construct one or more rubblemound breakwaters defining a new 10-acre mooring basin offshore of the former Wards Cove cannery site and create a small area of uplands (about 0.75 acre) by placing fill along the shoreline. The preliminary design has been refined to avoid dredging and develop breakwater alignments that minimize loss of eelgrass in the project area (figures 2 and 3).

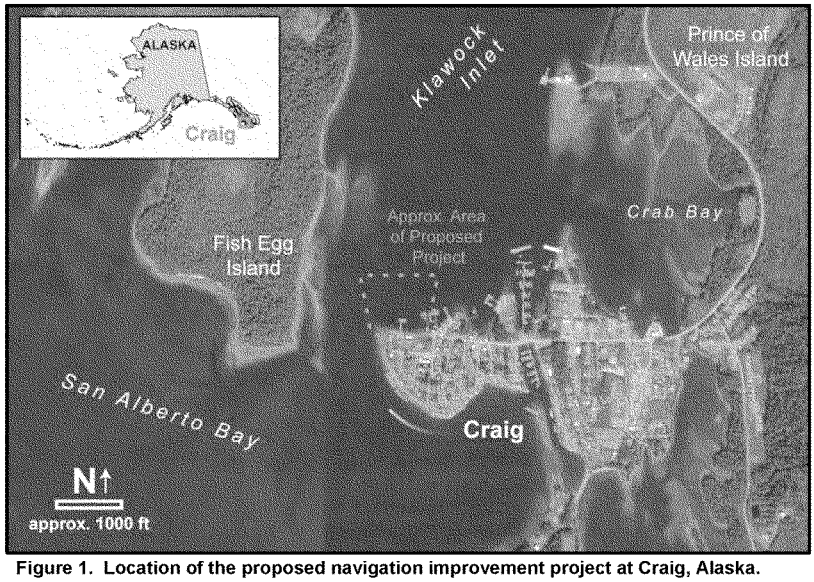


**Figure 1. Location of the proposed navigation improvement project at Craig, Alaska.**

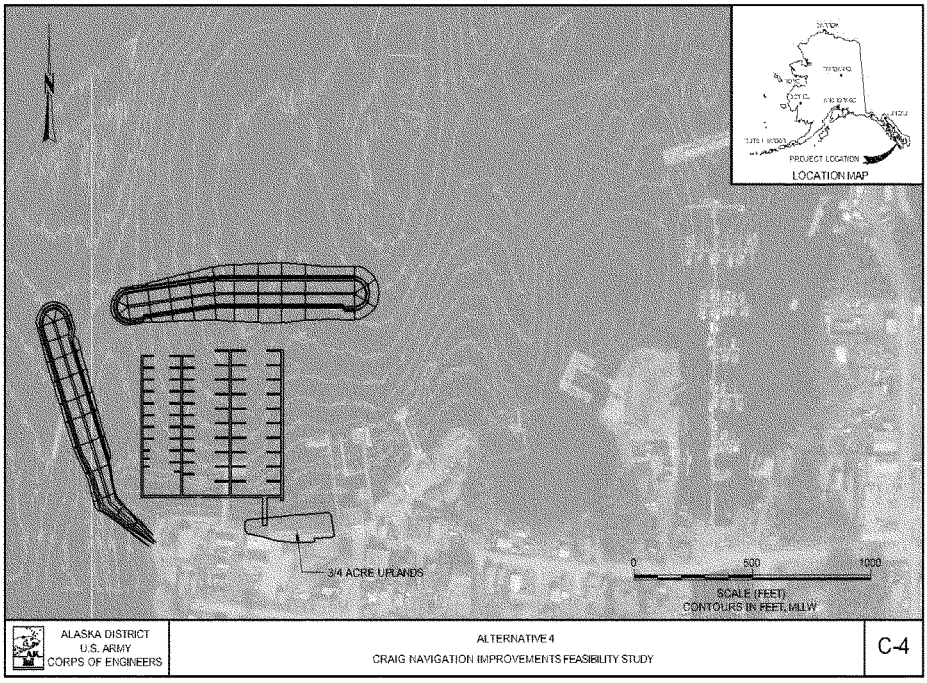


**Figure 2. Breakwater alignment under Alternative 4.**

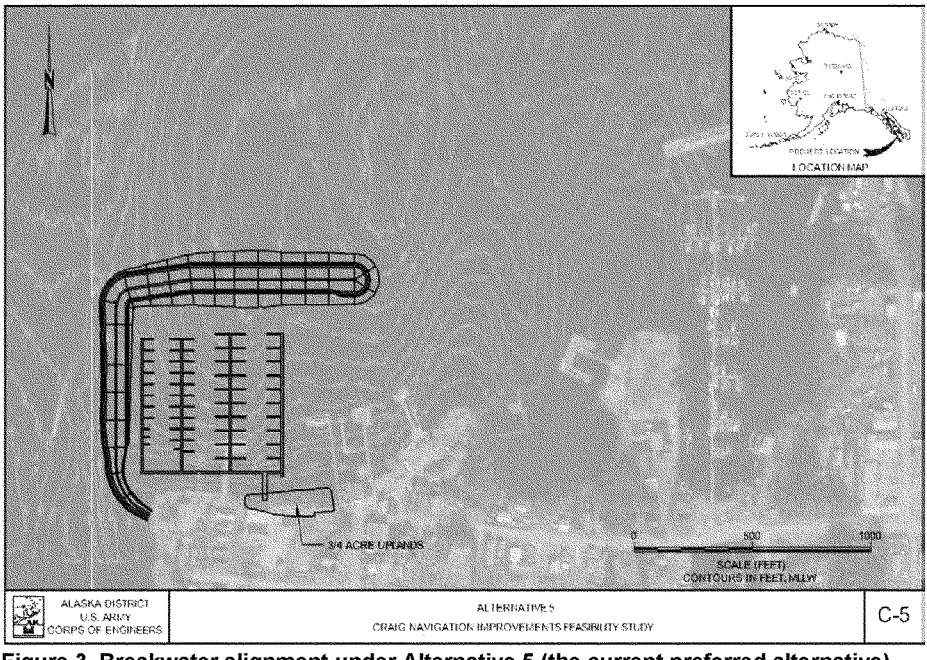


**Figure 3. Breakwater alignment under Alternative 5 (the current preferred alternative).**

The principle in-water construction activity would be the placement of rock for the breakwaters; no underwater blasting, hammering, or pile-driving is anticipated

Previous Coordination. The Corps informed the National Marine Fisheries Service (NMFS) of this project in a March 2014 letter requesting information on species listed under the Endangered Species Act (ESA). The NMFS responded in a letter dated May 5, 2014. In the letter, the NMFS identified the humpback whale as the ESA-listed species under NMFS jurisdiction most likely to be found in the area. The NMFS stated that the western Distinct Population Segment of Steller sea lions is not likely to be found within the project area and that consultation on Steller sea lions would not be necessary. The NMFS also noted that endangered leatherback sea turtles have been recorded in the Gulf of Alaska and that individuals from several ESA-listed salmon, steelhead, and sturgeon stocks originating from the Columbia, Snake, and Willamette basins can occur in Alaska waters.

Local Habitat and Assessment of Effect. The project site is at the south end of Klawock Inlet. The general area hosts a prominent Pacific herring roe fishery and several salmon streams. Seasonal concentrations of fish may attract humpback whales and non-ESA-listed marine mammals protected under the Marine Mammal Protection Act (MMPA), such as Dall's porpoise, harbor porpoise, Pacific white-sided dolphin, and killer whale. The peak of the herring spawning season extends from mid-March to mid-April. The proposed site offshore of the former cannery has been impacted by its use for vessel moorage since the 1920s, and does not appear to provide valuable fish habitat compared with nearby areas. Alaska Department of Fish and Game (ADFG) biologist and diver Scott Walker has stated in recent correspondence that herring seem to avoid the developed north shore of Craig Island, preferring the kelp beds along the south and west shores. Beach-seining and underwater videography of the project site by Corps personnel in April 2014 also did not reveal large numbers of fish. Available evidence suggests that the project site does not typically draw large concentrations of fish that might lure marine mammals into the area during construction.

The principle potential adverse effect on protected species from the proposed action would be avoidance or displacement as a result of short-term, in-water construction activity and project vessel movements. No blasting or pile-driving is anticipated, so injurious underwater noise should not result from project 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 or from the work area from other locations in Southeast Alaska would be similar to that generated by routine small vessel traffic in the shipping lanes. Low levels of turbidity would be generated by fill and rock placement in the marine environment, causing marine mammals to temporarily avoid the area until such time that the construction-generated plume dissipates to background levels. The completed project would not result in the loss of habitat valuable to protected species; in fact, the rock breakwaters can be expected to colonize rapidly with kelp and other marine organisms and provide additional spawning and rearing habitat for Pacific herring and other forage species.

Proposed Mitigation. To minimize the risk of harm to listed and protected marine species (to include ESA-listed humpback whales, species protected by the MMPA, and marine turtles), the Corps proposes the following mitigation steps:

- 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.

- In-water work between March 15and 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.

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 (e.g., 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.

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, ESA-listed sea turtles, or ESA-listed fish stocks, and seeks concurrence with this determination from the NMFS.

If you have any questions, please contact me at 907-753-2700 or via email at Christopher.B.Floyd@usace.army.mil.

Sincerely,



Chris Floyd
Acting Chief, Environmental Resources Section

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

July 9, 2014

Col. Christopher D. Lestochi
U.S. Army Corps of Engineers, Alaska District
P.O. Box 6898
JBER, Alaska 99506-0898

Re: Craig Navigational Improvements Project, NMFS #AKR-2014-9384

Dear Colonel Lestochi:

The National Marine Fisheries Service (NMFS) has completed informal consultation under section 7(a)(2) of the Endangered Species Act (ESA) regarding the proposed Craig Navigational Improvements Project. The Army Corps of Engineers (ACOE) is proposing to build a new breakwater system in Craig, Alaska. The ACOE determined that this project may affect, but is not likely to adversely affect, the endangered humpback whale (*Megaptera novaengliae*). Because the western Distinct Population Segment (DPS) of Steller sea lions are not likely to be found within the action area (Jemison et al. 2013), the ACOE determined that the action will not affect the western DPS of Steller sea lion. As a result, that species is not considered in this consultation.

NMFS received your request for written concurrence on June 6, 2014. Based on our analysis of the information provided to us by the ACOE, NMFS concurs with your determination that this project is not likely to adversely affect humpback whales.

**Description of the Proposed Action**
The project includes the construction of one or more rubble-mound breakwaters defining a new 10 acre mooring basin offshore of the former Wards Cove cannery site at the south end of Klawock Inlet in Craig, Alaska (Fig. 1). The principal in-water construction activity would be the placement of rock for the breakwater; no underwater blasting, hammering, or pile-driving is anticipated.

**Description of the Action Area**
The action area is defined in the ESA regulations (50 CFR 402.02) as the area within which all direct and indirect effects of the project will occur. The action area is distinct from and larger than the project footprint because some elements of the project may affect listed species some

distance from the project footprint. The action area, therefore, extends out to a point where no measurable effects from the project are expected to occur. The action area for the Craig Navigation Improvement Project is defined as the physical site of breakwater(s) placement and adjacent waters that may be impacted by noise and turbidity associated with project construction.

**Proposed Mitigation Measures**
The Corps proposed to implement the following mitigation measures as part of this action:

- The project is designed to avoid dredging and develop breakwater alignments that minimize the loss of eelgrass from the project area.
- Project vessels will be limited to a speed of 8 knots.
- Workers conducting in-water construction will be instructed to watch for marine mammals and cease work if an animal approaches within 50 meters.
- In-water work will not occur between March 15 and June 15. This period coincides with peak herring spawning and juvenile salmon out-migration activities, when humpback whales are most likely to be in the project area.
- Construction will include an ACOE approved Oil Spill Prevention and Control Plan.

**Listed Species**
Humpback whales are found in all ocean basins worldwide, and typically occur in tropical and subtropical waters during the winter and migrate seasonally to high latitudes during the summer (Allen and Angliss 2013). Populations of these whales were depleted in the nineteenth and twentieth centuries due to commercial exploitation, and numbers in the North Pacific following the cessation of whaling in 1966 have been estimated as low as 1,400 (Gambell 1976) and 1,200 (Johnson and Wolman 1984). Humpback whales are currently found throughout their historic summer feeding range in the North Pacific, including coastal and inland waters around the Pacific Rim from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, west through the Aleutian Islands to the Kamchatka Peninsula and the Sea of Okhotsk (Allen and Angliss 2013). Populations appear to be increasing worldwide and the best current estimate for humpback whale abundance in the North Pacific is 21,063 animals (data from 2006-08), which exceeds some estimates of pre-whaling numbers (Barlow et al. 2011).

Humpback whales are the most common large cetacean in Southeast Alaska. The abundance of humpback whales that forage throughout British Columbia and Southeast Alaska is estimated at between 3,000 and 5,000 individuals with an increasing annual population trend of 4 to 8% (Calambokidis et al. 2008; Barlow et al. 2011). Although migration timing varies among individuals, most whales depart for Hawaii in fall or winter and begin returning to Southeast Alaska in spring, with continued returns through the summer and a peak occurrence in Southeast Alaska during late summer to early fall. However, there are significant overlaps in departures and returns (Baker et al.1985; Straley 1990). In Southeast Alaska, primary prey species include euphausiids and small schooling fishes such as capelin, Pacific sand lance, walleye pollock, and Pacific herring (Wing and Kreiger 1983; Kreiger and Wing 1984, 1986; Straley 1990).

Within Southeast Alaska, humpback whales are found throughout all major waterways and in a variety of habitats, including open-ocean entrances, open-strait environments, nearshore waters, areas with strong tidal currents, and secluded bays and inlets. Annual concentrations are consistent at several locations primarily around northern southeast Alaska, with lesser historical presence in Sumner and Clarence Strait (Baker et al.1985; Straley et al. 1995; Dahlheim 2009). These patterns of occurrence likely follow the spatial and temporal changes in types, densities and distribution of prey (Bryant et al. 1981; Baker et al. 1985; Kreiger and Wing 1986; Baker et al.1992). Both fish and euphausiid densities show significant annual, seasonal, and spatial variations (Wing and Kreiger 1983) and humpbacks adjust their foraging locations to areas of high prey densities.

**Effects of the Action**

For purposes of the ESA, "effects of the action" means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR 402.02). To concur that an action may affect, but is not likely to adversely affect, listed species, NMFS must find that all of the effects of the proposed action or interrelated or interdependent actions are expected to be insignificant, discountable, or entirely beneficial. *Insignificant effects* relate to the size of the impact and should never reach the scale where a take will occur. *Discountable effects* are those that are extremely unlikely to occur. Based on best judgment, one would not 1) be able to meaningfully measure, detect, or evaluate insignificant effects; or 2) expect discountable effects to occur. *Beneficial effects* are contemporaneous positive effects with no adverse effects to listed species.

The potential impacts of the proposed action on humpback whales include direct effects such as avoidance behavior due to construction activity and project vessel movement/noise, and/or indirect effects such as prey disturbance. It is unlikely that these effects will reach a scale where take will occur for a number of reasons. While the general area hosts some humpback whale prey species, such as Pacific herring (*Clupea pallasii*) and young salmon (*Oncorhynchus* spp.), these species are not noted in significant numbers around the project area. Herring, for example, appear to prefer the south and west sides of Craig island and avoid the north side. Consequently, we do not expect concentrations of fish that may lure humpback whales into the project area. While the project may generate some noise and turbidity, both are expected to be of low level and short duration. It is also likely that noise associated with the project will be masked by general harbor noise, including the movement of other vessels. Mitigation measures in place also ensure that humpback whale presence will not overlap project effects.

Because whales and their prey species are not commonly found in the project area, because project effects will be limited in extent and duration, and because of mitigation measures in place, impacts to humpback whales from effects associated with this project are likely to be insignificant.

**Conclusion**
Based on this analysis, NMFS concurs with your agency's determination that the planned action may affect, but is not likely to adversely affect, humpback whales.

Reinitiation of consultation is required where discretionary federal involvement or control over the action has been retained or is authorized by law and if (1) take of listed species occurs, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this concurrence letter, or (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16).

Please direct any questions regarding this letter to Kate Savage at Kate.Savage@noaa.gov or (907) 586-7312.

Sincerely,

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

Cc: Cristopher Floyd B POA, christopher.b.floyd@usace.army.mil

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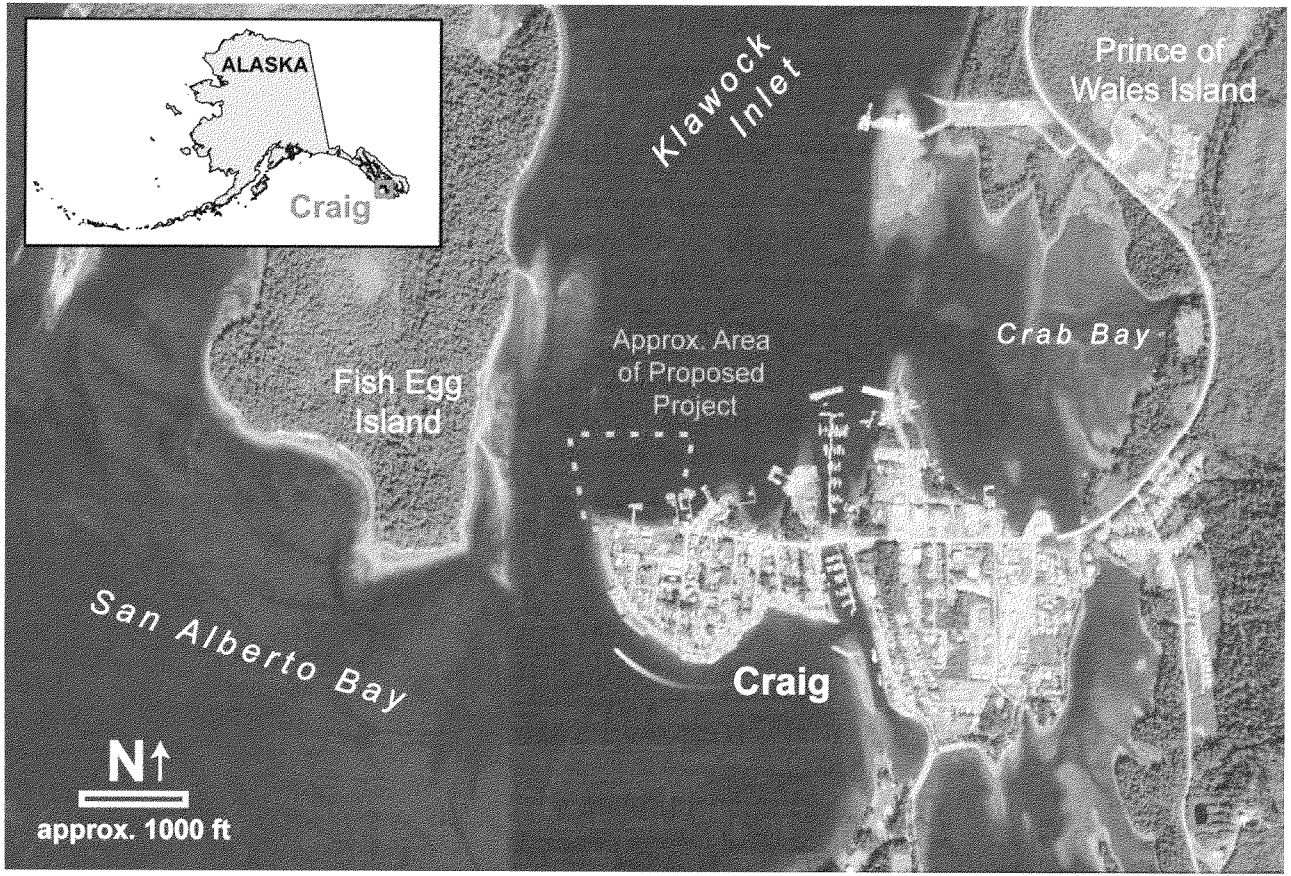


Figure 1. Location and scope of Craig Navigation Improvements Project

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
Joint Base Elmendorf-Richardson, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Environmental Resources Section

OCT 23 2014

Ms. Judith Bittner
State Historic Preservation Officer
Alaska Department of Natural Resources
Office of History and Archaeology
550 West 7th Avenue, Suite 1310
Anchorage, AK 99501-3565

Subject: Amendment to July 16, 2014 Craig Harbor Federal Undertaking Letter to SHPO

Dear Ms. Bittner:

The U.S. Army Corps of Engineers (Corps), in cooperation with the City of Craig, is planning to construct a small boat harbor near the City of Craig, Alaska (Sec. 6; T 74S; R81E; Copper River Meridian; USGS Quad Craig B-4; Figure 1) as authorized under the U.S. House of Representatives Public Works Committee Resolution for Rivers and Harbors in Alaska, adopted 2 December 1970. In compliance with Section 106 of the National Historic Preservation Act of 1966 [36 CFR 800.3(a)(3)], the purpose of this letter is to inform your office of an amendment to a Federal undertaking with an adverse effect to historic properties, provide a determination of eligibility, and request your concurrence on the determination of eligibility.

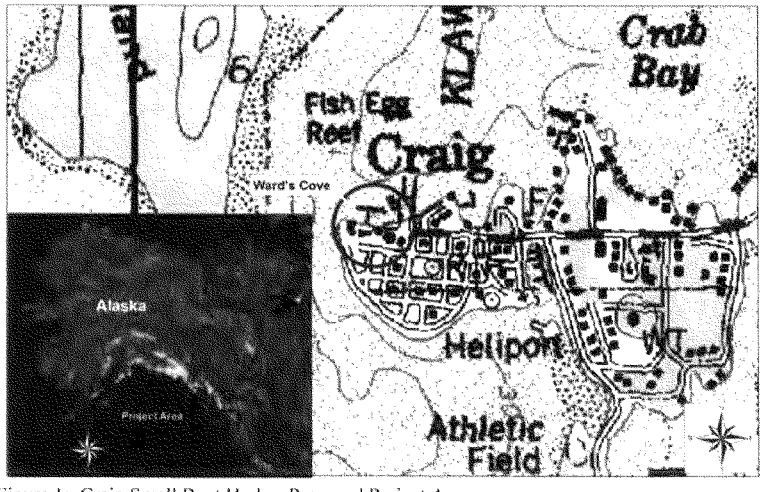


Figure 1: Craig Small Boat Harbor Proposed Project Area

***Description of Undertaking and the Area of Potential Effect (APE):***

The Corps plans to construct a 10.1-acre basin protected by a 1,933-foot-long breakwater in a segmented L-shape. This basin would accommodate 120 vessels. The proposed alternative includes the construction of a breakwater toe that abuts the existing seawall at the northwest end of Wards Cove (Figure 2).

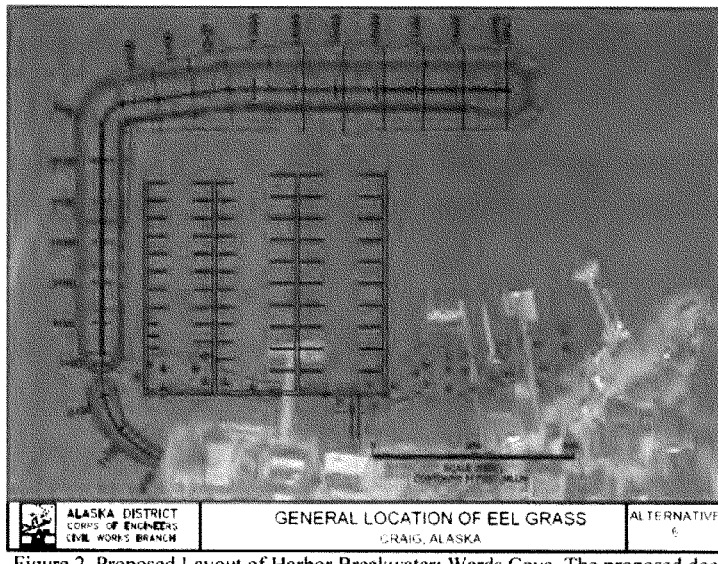


Figure 2. Proposed Layout of Harbor Breakwater: Wards Cove. The proposed dock ramp will either utilize existing footprint of the pier (CRG-722) gangway or be placed between the Pier and the historic Boat Haulout (CRG-723).

Construction of the boat harbor would require removal of the existing dilapidated dock and associated free-standing pilings (CRG-722). The new dock ramp would tie in to either an existing gravel road at the end of the Pier's gangway (Figure 3) or would tie in to the upper tidelands between the Pier gangway and the historic boat haulout (CRG-723). New pilings for the proposed dock would replace some of the existing dilapidated pilings within the submerged littoral zone (Figures 4 and 5). Pilings that are not replaced would be cut at ground level, their bases remaining in situ, so as to prevent sediment from slumping into the piling holes. The project area is accessible by existing roads.

The extension of the breakwater would occur in the sub-littoral areas of Wards Cove. Proposed action for the breakwater includes constructing the breakwater flush against the existing sea-wall. Construction of the breakwater would not extend upland beyond the sea-wall (Figure 6). Considering this, the area of potential effect includes historic Pier site CRG-722, the western and northern littoral zones of Wards Cove, and the connecting roads (Figures 3, 4 and 5).



Figure 3: Gravel road at start of pier gangway (CRG-722), Wards Cove Property; view northwest.

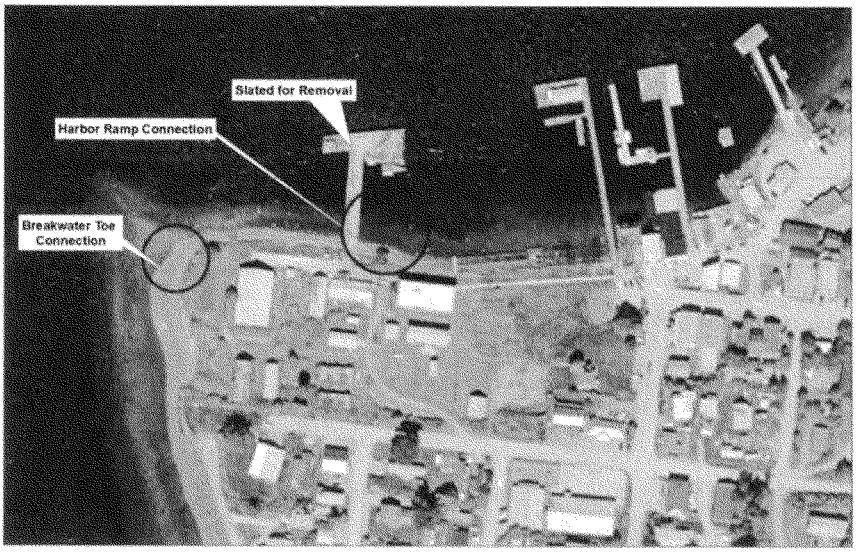


Figure 4. Wards Cove proposed construction areas.

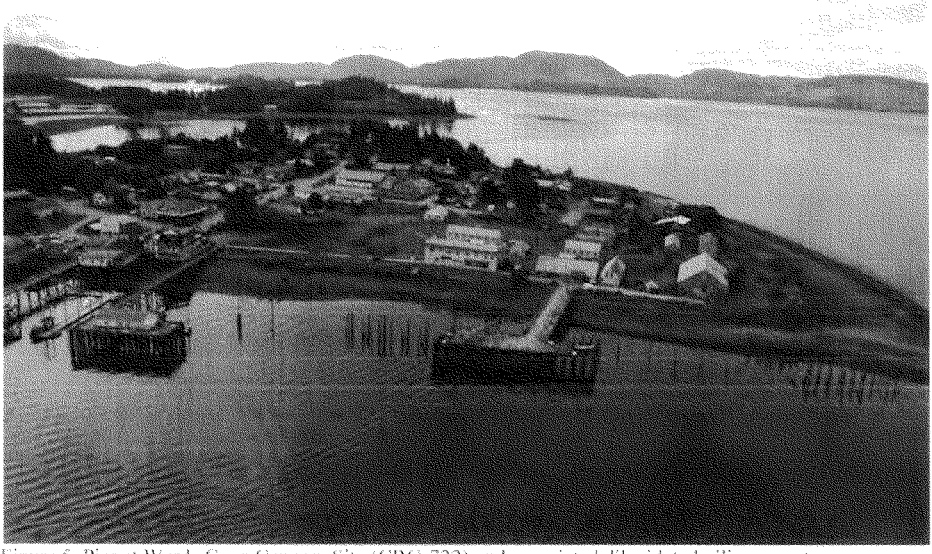

Figure 5. Pier at Wards Cove Cannery Site (CRG-722) and associated dilapidated pilings, center foreground; view south.



Figure 6. Northwest tip of Wards Cove Cannery with sea wall in foreground; view north.

***History:***

Historically, Craig's townsite was called Fish Egg and was primarily utilized as a seasonal fishing camp for the gathering of herring eggs. In 1907, Craig Millar (also spelled "Miller," b. 1878 – d. May 7, 1927) and eight Haida men established a saltery at Fish Egg Island (MacDonald 1949). The settlement consisted of shacks and tents for saltery workers. Between 1908 and 1911, Craig Millar constructed a permanent saltery and cold storage facility along with 20 to 25 houses at what is now the location of the City of Craig (Craig Comprehensive Plan 1987). In 1922, Craig Millar was instrumental in the incorporation of the city, originally as an Alaska second-class city within the Alaska Territory, pre-statehood (Alaska State Library, Electronic Archives).

In 1912, the Lyndenburger Packing Company was established on the northwestern point of Craig in Wards Cove. The cannery packed 57,501 cases in its first year of operation. The salmon processing industry boomed as the demand for canned salmon rose during World War I. During this period, the number of Alaskan canneries increased from 81 in 1914 to 135 in 1918 (MacDonald 1949). Peak production at the Craig cannery occurred in 1917 when it was purchased by the Columbia Salmon Canning Company (MacDonald 1949). In 1929, the cannery was sold to Libby, McNeill and Libby Company.

When the depression came, the price of salmon dropped sharply. In 1931 many Craig fishermen went on strike in order to obtain a higher price for their salmon. Apart from the strike and the continued slump in the salmon market, the effects of the depression were not as evident in Craig as in other areas. In 1935, a second cannery was opened and the Libby cannery expanded.

Reduced fishery production in the early 1950's and the destruction of the Libby Cannery, which burned in the winter of 1956, combined to accelerate the decline in the local economy (Alaska State Library, Electronic Archives). Karen Head, a life-long resident of Craig, stated that the Pier's processing buildings and half the Pier itself were destroyed by the fire (Personal Communication 2014). Shortly after the fire, the property was purchased by Columbia Wards Fisheries, a joint venture of Castle and Cooke and Wards Cove Packing. Columbia Wards Fisheries rebuilt a portion of the Pier for the purpose of boat and barge moorage. A new seine loft, labeled the "Web Loft" in Figure 7, was also constructed.

In 1959, Alaska was granted statehood. The new governor made a commitment to restore the salmon fishery, but rehabilitation of the salmon runs was a gradual process. The 1960's saw a continued economic slump for Craig as a result of several years of poor salmon runs. During this time, the nearby city of Klawock maintained the only operating cannery on Prince of Wales Island while Craig was little more than a maintenance center for the Columbia Ward fishing fleet. Wards Cove Packing acquired full ownership of interest in 1988. To date, the remainder of the Ward Cove Cannery Site sits largely unused. The City of Craig has leased a portion of the property to Astoria Seafoods, which operates a barge based processing facility for seine caught salmon. The barge moors to the historic Pier (CRG-722) (City of Craig 2008:5).

The Wards Cove Packing property consists of approximately 5 acres of upland and 5 acres of intertidal land (Craig Planning Department 2007). Constructed facilities included a bulk fuels facility, a fish processing plant, and a boat maintenance and storage facility that included wooden boatways and a steam donkey winch house. The upper yard consisted of seven aboveground bulk

fuel storage tanks, a pump house, a truck-trailer loading rack, aboveground piping, and a pipeline corridor that extended to a boat fueling dock. The bulk fuels facility was constructed by Standard Oil of California, a corporate predecessor of Chevron, in the 1930s.

Facilities identified in the *Ward Cove Cannery Site Phase 1 Development Plan* include a 200-foot-long by 25-foot-wide wood pile supported pier and a 145-foot-long, 6,000-square-foot wood pile supported industrial dock; a beam structure located on the tidelands traditionally used to haul vessels out of the water for maintenance, repair and storage; a wood pile supported pier and dock with a building on the dock; and a float and ramp attached used as a fuel dock (Craig Planning Department 2007). Standing buildings and structures associated with the cannery include a web loft, paint shed, storage buildings and a warehouse, maintenance building, shower room building, administration building, houses, bunkhouse, family housing, a carpenter shop, a generator shed, and boardwalk (Figure 7).

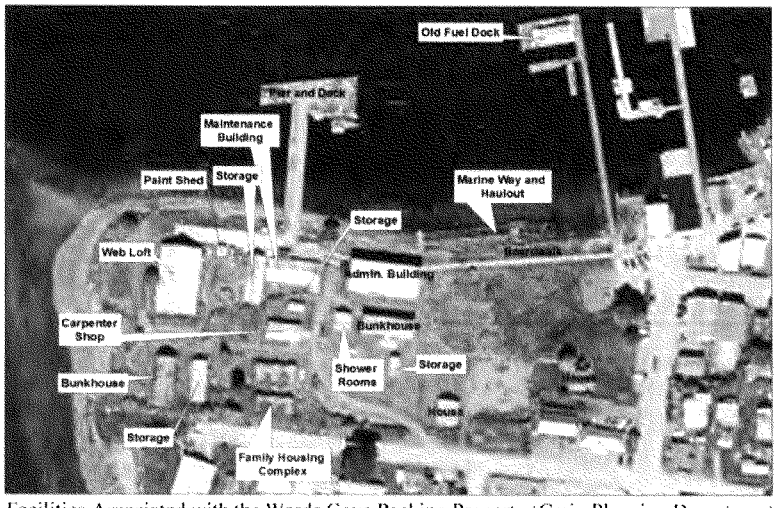


Figure 7. Facilities Associated with the Wards Cove Packing Property (Craig Planning Department 2007)

***Sites Identified in the Area of Potential Effect and National Register Eligibility:***

Two AHRS historic properties are adjacent to the project APE: (1) the Wards Cove Cannery Site (CRG-721), and (2) the Boat Haulout at Wards Cove Cannery (CRG-723). There is one AHRS property listed within the area of potential effect, the Pier at Wards Cove Cannery Site (CRG-722). The following is a statement of official determination of eligibility for CRG-722 within the National Register and an assessment of effects in accordance with 36 CFR 800.4 (c-d).

As part of the Wards Cove Cannery Site (CRG-721), the Pier (CRG-722) is associated with events that have made a contribution to the history of the Alaska fishing industry during World War I and World War II and to the settlement and incorporation of the City of Craig. However, as the cannery was constructed prior to World War I, it lacks a strong, time period association with the broader Coastal Alaska cannery growth trend. Wards Cove Cannery has a stronger association

with local historic events than it does regionally. The National Register Bulletin (NRB) notes, "Mere association with historic events or trends is not enough, in and of itself, to qualify under Criterion A: the property's specific association must be considered important as well" (1990:12). Though Wards Cove Cannery closed its doors to canning after 1956, the property maintained a strong presence in the community as the sole maintenance center for the Columbia Ward fishing fleet. Due to the direct role Wards Cove Cannery played in the establishment and economic development of Craig, the Corps has determined that CRG-722 is potentially ***eligible for the National Register under Criteria A***.

The Pier is also associated with Craig Millar, the founder of the village of Craig. The length of Millar's association with the cannery remains undocumented after it was sold to the Lyndenburger Packing Company in 1912; however, marine transcripts indicate that Millar was present in Craig and active in both the fishing community and village/city politics until his death in 1927 (Alaska State Library, Electronic Archives). The amount of time Millar physically spent associated with the cannery after 1912 remains undetermined and calls into question the integrity of the site being listed under Criterion B. The Corps has determined that the Pier is ***potentially eligible for the National Register under Criteria B***.

In order to contain adequate historic integrity, a property must "retain the essential physical features that enable it to convey its historic identity" (NPS 1990:46). As indicated from an oral interview and historic photos, more than half of the Pier and its processing structures were destroyed in the 1956 fire. The Pier itself has little architectural integrity left and shows signs of natural degradation and cultural modification (see Appendix). The dock and pilings have been modified through "quick-fix" re-stabilization methods so as to prevent water-worn wood from splitting (see Appendix). Thus, the historic feel of the structure has been removed from the site. The extreme degradation and modification of the Pier has also made it difficult, if not impossible, to determine whether the property embodies distinctive workmanship or methods of construction. The period the Pier was constructed can be roughly extrapolated from the date of the fire, in the winter of 1956. Based on historic photos, the remnants of the Pier have been identified at their present location circa 1899 (see Appendix). Thus, location is the only identifiable feature that lends integrity to the Pier within Criterion C. The Corps has determined that the Pier is ***not eligible for the National Register under Criteria C***.

The Pier has very little integrity as a site due to natural erosion and overall degradation of the structure (see Appendix). There are hardly any identifying markers or unique features left that could lend answers to research questions. The Corps has determined that this property is ***not eligible for the National Register under Criteria D***. The Pier at Wards Cove Cannery ***is potentially eligible for the National Register under Criterion A and B***; however, it lacks sufficient integrity to convey its historic identity as a single site.

***Management Recommendations:***

To date, a systematic study has not been performed on the Wards Cove Cannery site (CRG-721). Tim Marshall, Heritage Program Lead for the Craig and Thorne Bay Ranger Districts was consulted regarding the history of the cannery. He explained:

> "The cannery burned in the late 50s but it seems that at least the admin building is still standing. The cannery was vital to the growth of Craig as a population center, but at this time we do not have a good idea of what remains at the cannery that is 50 years or older" (personal communication 2014).

Mr. Marshall related that he participated in a public archaeology project conducted over three seasons (2011-2013) at the site formerly occupied by one of the bunkhouses, explaining that a single lithic artifact was recovered from a shallow depth in one of the excavation units (personal communication 2014). Because of this and the proximity of a locally known prehistoric midden site at the Craig Ranger District parking lot (CRG-0443), it is possible there may be prehistoric deposits within the upland area designated for the small boat harbor ramp.

The historic structures within the area of potential effect include the wood pile-supported Pier (CRG-722) and associated free-standing pilings. At a minimum, a pedestrian survey of the Piers' intertidal zone is needed prior to any Federal undertaking. A pedestrian survey and judgmental shovel tests will also be necessary in the intertidal zone and upland areas where the new dock ramp is to be constructed. An archaeological monitor would also be on site for the removal of the Pier gangway, the land-based pilings, and any other ground disturbing activities.

A pedestrian survey is also recommended in the intertidal zone where the breakwater toe would be placed flush against the northwestern sea wall. Strong currents and winter storms batter this section of the sea wall throughout the year. The Craig Tribal Council has expressed concern that unknown prehistoric/historic elements in the upland site may be eroding out from behind the sea wall (Personal Communication 2014). If this is the case, there is a possibility that artifacts may be scattered across the intertidal zone within the breakwater APE.

The Pier at Wards Cove Cannery site has been determined potentially eligible under Criteria A and B, though it lacks historical integrity. Removal of this Pier and its associated, free-standing pilings would alter the essential physical features that allow the cannery to convey its historic significance. According to 800.5(a)(2)(i), this constitutes an ***adverse effect to historic properties***. Therefore, following the process outlined in 800.6(a-c), the Corps will construct a draft Memorandum of Agreement (MOA) for review by your office and all other interested parties prior to the planned remediation. The Corps hereby invites your office to participate in consultation regarding the Craig small boat harbor project following 36 CFR 800.3(c)(3). Comments may be submitted to shona.d.pierce@usace.army.mil. If you have further questions, please call me at 753-5670.

Sincerely,

Shona D. Pierce

Shona Pierce
Archaeologist

Concur
Floyd (ER)

Cc w/enclosure:
Honorable Dennis Watson, Mayor, City of Craig
Jon Bolling, City Administrator, City of Craig
Brian Templin, City Planner, City of Craig
Edward (Sam) Thomas, Transportation Director, Craig Tribal Association
Lawrence Armour, Klawock Tribal Administrator, Klawock Cooperative Association

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
Joint Base Elmendorf-Richardson, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Environmental Resources Section

NOV 28 2014

Ms. Judith Bittner
State Historic Preservation Officer
Alaska Department of Natural Resources
Office of History and Archaeology
550 West 7th Avenue, Suite 1310
Anchorage, AK 99501-3565

Subject: Revised Craig Harbor Federal Undertaking Letter to SHPO, sent Nov. 6, 2014.

Dear Ms. Bittner:

As per agreement in consultation with SHPO (via phone with Shina Duvall on November 5, 2014), the purpose of this letter is to state a revision to the former U.S. Army Corps of Engineers (Corps) document provided to your office on November 6, 2014. The Corps, in cooperation with the City of Craig, is planning to construct a small boat harbor near the City of Craig, Alaska (Sec. 6; T74S; R81E; Copper River Meridian; USGS Quad Craig B-4; Figure 1) as authorized under the U.S. House of Representatives Public Works Committee Resolution for Rivers and Harbors in Alaska, adopted December 2, 1970. In compliance with Section 106 of the National Historic Preservation Act of 1966 [36 CFR 800.3(a)(3)], the purpose of this letter is to inform your office of an amendment to a Federal undertaking with an adverse effect to historic properties, provide a determination of eligibility, and request your concurrence on the determination of eligibility.

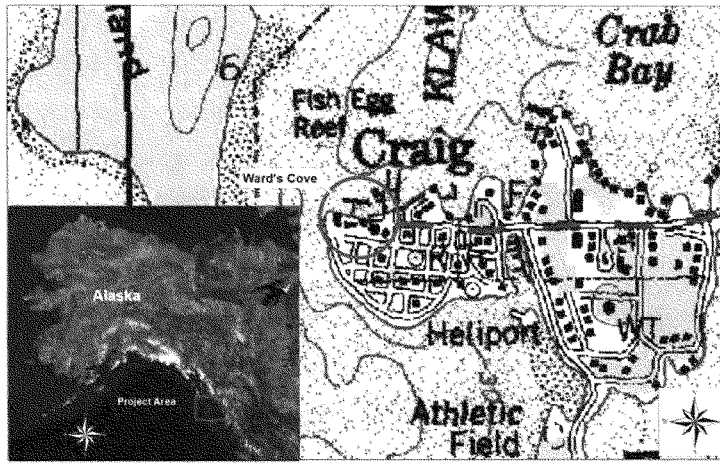


Figure 1: Craig Small Boat Harbor Proposed Project Area

***Description of Undertaking and the Area of Potential Effect (APE):***

The Corps plans to construct a 10.1-acre basin protected by a 1,933-foot-long breakwater in a segmented L-shape. This basin would accommodate approximately 120 vessels. The proposed alternative includes the construction of a breakwater toe that abuts the existing seawall at the northwest end of Wards Cove (Figure 2).

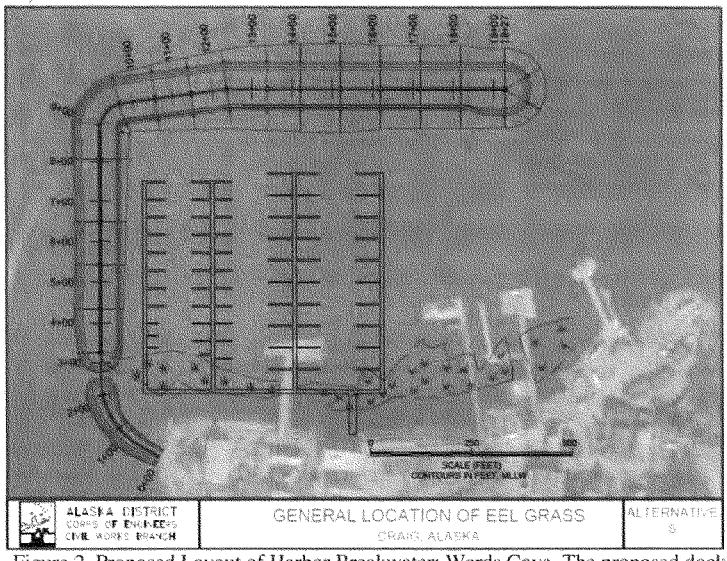


Figure 2. Proposed Layout of Harbor Breakwater; Wards Cove. The proposed dock ramp will either utilize existing footprint of the Pier (CRG-722) gangway or be placed between the Pier and the historic Boat Haulout (CRG-723).

Construction of the boat harbor would require removal of the existing dilapidated dock and associated free-standing pilings (CRG-722). The new dock ramp would tie in to either an existing gravel road at the end of the Pier's gangway (Figure 3) or would tie in to the upper tidelands between the Pier gangway and the historic Boat Haulout (CRG-723). All free-standing pilings will be cut at ground level, their bases remaining in situ, so as to prevent sediment from slumping into the piling holes (Figures 4 and 5). Pier pilings will either be cut at ground level or completely removed. The project area is accessible by existing roads.

The extension of the breakwater would occur in the sub-littoral areas of Wards Cove. Proposed action for the breakwater includes constructing the breakwater flush against the existing sea-wall. Construction of the breakwater would not extend upland beyond the sea-wall (Figure 6). Considering this, the area of potential effect includes historic Pier site CRG-722, the western and northern littoral zones of Wards Cove, and the connecting roads (Figures 3, 4 and 5). The Corps' proposed action has the potential to affect the Old Craig Historic Site (CRG-728), currently identified in the uplands of the Cannery property. The prehistoric component of this site is largely unknown and its boundaries untested.

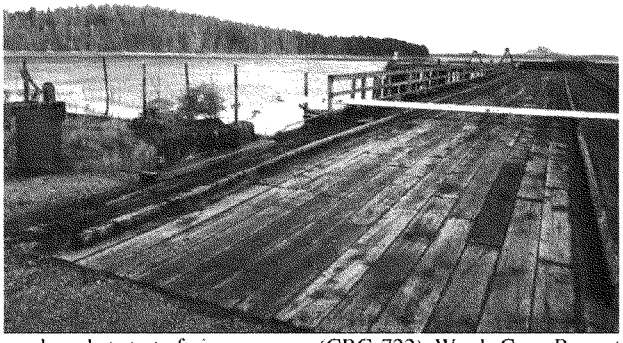

Figure 3: Gravel road at start of pier gangway (CRG-722), Wards Cove Property; view northwest.

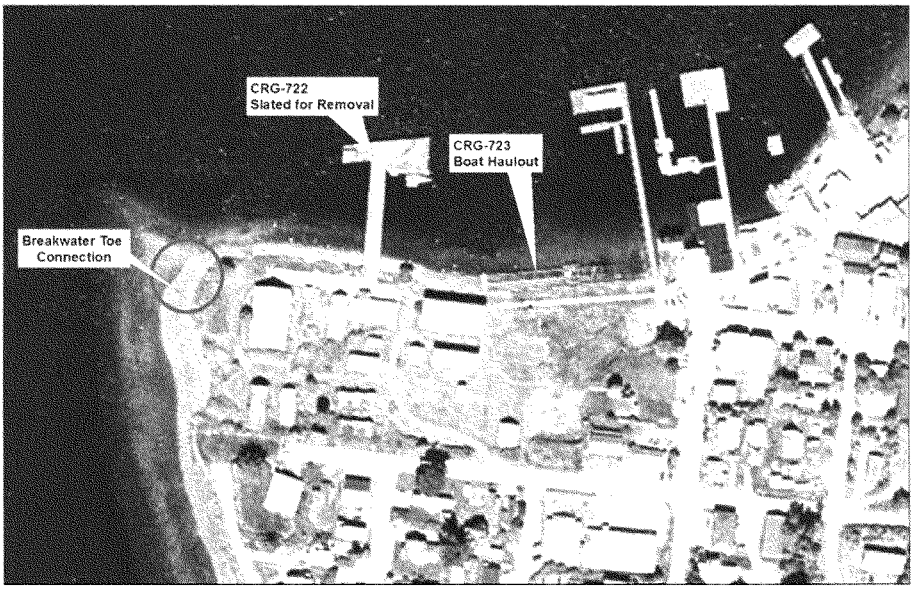


Figure 4. Wards Cove proposed construction areas.

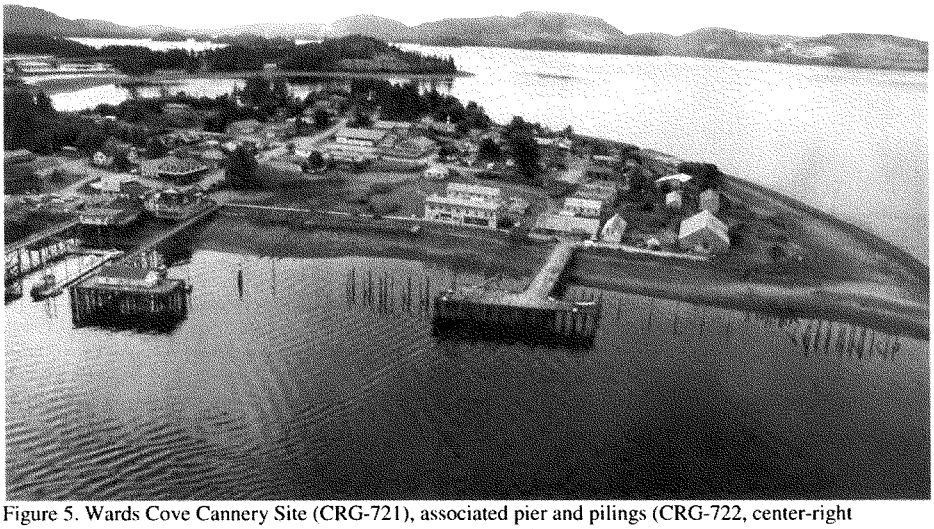

Figure 5. Wards Cove Cannery Site (CRG-721), associated pier and pilings (CRG-722, center-right foreground) and associated boat haulout (CRG-723, center-left foreground); view south.

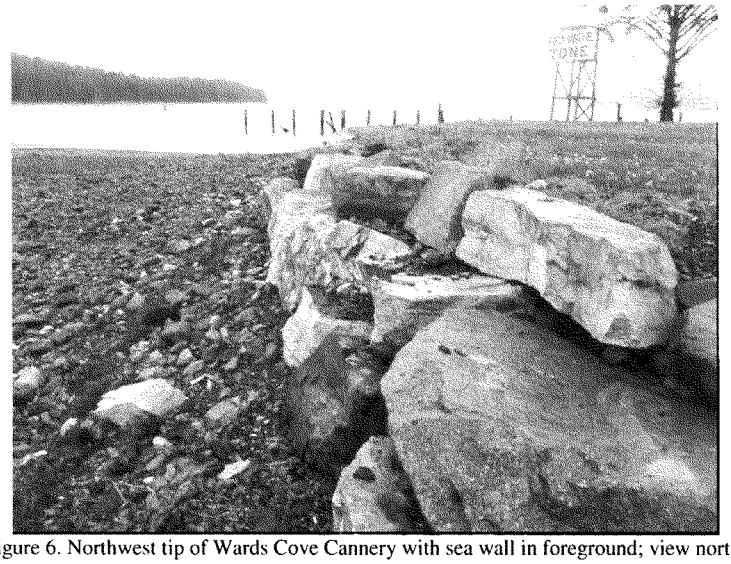

Figure 6. Northwest tip of Wards Cove Cannery with sea wall in foreground; view north.

***History:***

Historically, Craig's townsite was called Fish Egg and was primarily utilized as a seasonal fishing camp for the gathering of herring eggs. In 1907, Craig Millar (also spelled "Miller," b. 1878 – d. May 7, 1927) and eight Haida men established a saltery at Fish Egg (MacDonald 1949). The settlement consisted of shacks and tents for saltery workers. Between 1908 and 1911, Craig Millar helped the Lyndenburger Packing Company construct a permanent saltery and cold storage facility along with 20 to 25 houses at what is now the location of the City of Craig (Craig Comprehensive Plan 1987). In 1922, Craig Millar was instrumental in the incorporation of the city, originally as an Alaska second-class city within the Alaska Territory, pre-statehood (Alaska State Library, Electronic Archives).

In 1912, the Lyndenburger Packing Company was established on the northwestern point of Craig in Wards Cove. The cannery packed 57,501 cases in its first year of operation. The salmon processing industry boomed as the demand for canned salmon rose during World War I. During this period, the number of Alaskan canneries increased from 81 in 1914 to 135 in 1918 (MacDonald 1949). Peak production at the Craig cannery occurred in 1917 when it was purchased by the Columbia Salmon Canning Company (MacDonald 1949). In 1929, the cannery was sold to Libby, McNeill and Libby Company.

When the depression came, the price of salmon dropped sharply. In 1931 many Craig fishermen went on strike in order to obtain a higher price for their salmon. Apart from the strike and the continued slump in the salmon market, the effects of the depression were not as evident in Craig as in other areas. In 1935, a second cannery was opened and the Libby cannery expanded.

Reduced fishery production in the early 1950's and the destruction of the Libby Cannery, which burned in the winter of 1956, combined to accelerate the decline in the local economy (Alaska State Library, Electronic Archives). Karen Head, a life-long resident of Craig, stated that the old Web Loft, the Pier's processing buildings and half the Pier itself were destroyed by the fire (Personal Communication 2014). Shortly after the fire, the property was purchased by Columbia Wards Fisheries, a joint venture of Castle and Cooke and Wards Cove Packing. Columbia Wards Fisheries rebuilt the current Pier and dock for the purpose of boat and barge moorage. A new seine loft, labeled the "Web Loft" in Figure 7, was also constructed in the location of the original Web Loft.

In 1959, Alaska was granted statehood. The new governor made a commitment to restore the salmon fishery, but rehabilitation of the salmon runs was a gradual process. The 1960's saw a continued economic slump for Craig as a result of several years of poor salmon runs. During this time, the nearby city of Klawock maintained the only operating cannery on Prince of Wales Island while Craig was little more than a maintenance center for the Columbia Ward fishing fleet. Wards Cove Packing acquired full ownership of interest in 1988.

The Wards Cove Packing property consists of approximately 5 acres of upland and 5 acres of intertidal land (Craig Planning Department 2007). Constructed facilities included a bulk fuels facility, a fish processing plant, and a boat maintenance and storage facility that included wooden boatways and a steam donkey winch house. The upper yard consisted of seven aboveground bulk fuel storage tanks, a pump house, a truck-trailer loading rack, aboveground piping, and a pipeline

corridor that extended to a boat fueling dock. The bulk fuels facility was constructed by Standard Oil of California, a corporate predecessor of Chevron, in the 1930s. The United States Congress passed legislation in 2004 authorizing an appropriation of USDA Forest Service funds to purchase other city owned property from the City of Craig. In early 2006 the City of Craig finalized the purchase of the property from Ward Cove. To date, the remainder of the Ward Cove Cannery Site sits largely unused. The City of Craig leased a portion of the property to Astoria Seafoods, which operated for two-years as a barge based processing facility for seine caught salmon. The barge moored to the historic Pier (CRG-722) (City of Craig 2008:5).

Facilities identified in the *Ward Cove Cannery Site Phase 1 Development Plan* include a 200-foot-long by 25-foot-wide wood pile supported pier and a 145-foot-long, 6,000-square-foot wood pile supported industrial dock; a beam structure located on the tidelands traditionally used to haul vessels out of the water for maintenance, repair and storage; a wood pile supported pier and dock with a building on the dock; and a float and ramp attached used as a fuel dock (Craig Planning Department 2007). Standing buildings and structures currently associated with the cannery include a web loft, storage buildings, maintenance building, shower room building, administration building, a house, bunkhouse, family housing, a carpenter shop, a generator shed, the Pier, a marine haulout, and boardwalk (Figure 7).

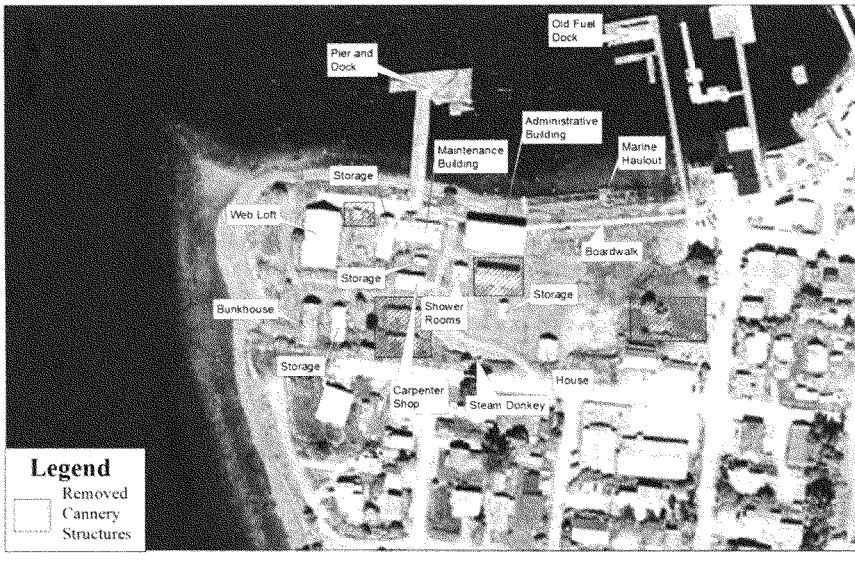


Figure 7. Current Facilities Associated with the Wards Cove Packing Property (USACE Property Site Visit November 2014).

***Sites Identified in the Area of Potential Effect and National Register Eligibility:***

Two Alaska Historic Resource Survey (AHRS) historic features are listed within the area of potential effect, the Pier at Wards Cove Cannery Site (CRG-722) and the Old Craig Historic Site (CRG-728). The Pier feature is directly associated with the Wards Cove Cannery Site (CRG-721), which lies adjacent to the project APE. As this feature is a component of a larger historic property, a determination of eligibility will be sought for the Wards Cove Cannery Site. The following is a statement of official determination of eligibility for CRG-721 and CRG-728 within the National Register and an assessment of effects in accordance with 36 CFR 800.4 (c-d).

In order for a particular property – a district, site, building, structure, or object – to qualify for the National Register, it must meet one or more of the National Register Criteria for Evaluation and retain enough historic integrity necessary to convey its significance (National Park Service 1991). The National Register Criteria are:

a) A: Association with events that have made a significant contribution to the board patterns of history.
b) B: Association with the lives of significant people.
c) C: Embodiment of the distinctive characteristics of a type, period, or method of construction, or representation of the work of a master, or possession of high artistic values, or representation of a significant and distinguishable entity whose components may lack individual distinction.
d) D: Having yielded, or having the ability to yield, information important in prehistory or history.

The Wards Cove Cannery Site is associated with events that have made a contribution to the history of the Alaska fishing industry during World War I and World War II and to the settlement and incorporation of the City of Craig. However, as the cannery was constructed prior to World War I, it lacks a strong, time period association with the broader Coastal Alaska cannery growth trend. Wards Cove Cannery has a stronger association with local historic events than it does regionally. The National Register Bulletin (NRB) notes, "Mere association with historic events or trends is not enough, in and of itself, to qualify under Criterion A: the property's specific association must be considered important as well" (1990:12). Though Wards Cove Cannery closed its doors to canning after 1956, the property maintained a strong presence in the community as the sole maintenance center for the Columbia Ward fishing fleet. Due to the direct role Wards Cove Cannery played in the establishment and economic development of Craig, the Corps has determined that CRG-721 is ***potentially eligible for the National Register under Criteria A.***

Wards Cove Cannery is also associated with Craig Millar, the founder of the village of Craig. The length of Millar's association with the Craig cannery remains undocumented after it was sold to the Lyndenburger Packing Company in 1912; however, marine transcripts indicate that Millar bought the Swift-Arthur-Crosby cannery at Warm Chuck Inlet in 1915, and worked as its Superintendent for at least a year (Alaska State Library, Electronic Archives; Roppel 2013). Transcripts also indicate that Millar was occasionally present in Craig and active in both the fishing community and village/city politics until his death in 1927 (Alaska State Library, Electronic Archives). The amount of time Millar physically spent associated with the Wards Cove

Cannery after 1912 remains undetermined and calls into question the integrity of the site being listed under Criterion B. The Corps has determined that the Cannery is ***not eligible for the National Register under Criteria B.***

The National Register Bulletin #15 (How to Apply the National Register Criteria for Evaluation) states that a building eligible under Criterion C must retain most of the physical features that constitute that style or technique. A property that has lost some historic materials or details can be eligible if it retains the majority of the features that illustrate its style in terms of the massing, spatial relationships, proportion, patterns of windows and doors, texture or materials, and ornamentation." The Wards Cove Cannery Site currently includes the Administrative Building, one bunkhouse, one family house, four storage buildings, a carpenter shop, a maintenance shop, a shower room, a Web Loft, a Pier and dock, an old fuel dock, a steam donkey, a marine haulout and a boardwalk. The Administrative Building and the family house are unique structures on the cannery property in that they are the only buildings to differ from the standard gable roof, metal siding buildings at the Wards Cove Cannery Site (see Appendix A). While unique, the Administrative Building and the family house do not retain a majority of features that illustrate a specific style or ornamentation. The remaining buildings and structures are standard construction types of the period, so do not represent the work of a master or possess high artistic value. The layout of the buildings and structures would have changed at each cannery site, making the spatial organization and landscape of the cannery potentially significant; therefore the Wards Cove Cannery Site (CRG-721) is ***potentially eligible under Criterion C.***

The property at Wards Cove Cannery has the potential to yield important information concerning the historic and prehistoric use of the site. Several ethnic groups worked at the cannery throughout its span of production. These ethnic groups included Philippine, Tlingit, Haida, Chinese, and Caucasian. Philippine, Chinese, and Caucasians tended to live on the cannery grounds, while the local natives stayed in residences at "New Craig." When the cannery finally closed its doors to processing in the late 1950's, numerous artifacts were left behind by the cannery workers. Questions pertaining to historic spatial analysis between the various ethnic living quarters might be answered within this site, as might questions of cultural assimilation and practices amongst locals and foreign cannery workers. The Corps has determined that the Wards Cove Cannery Site is ***potentially eligible for the National Register under Criteria D.***

Additionally, a relatively unknown prehistoric component, CRG-728, the Old Craig Historic Site, is known to exist *in situ* beneath the cannery site. The boundaries of this site have yet to be identified; however, a single lithic tool was recovered on the cannery property during a public excavation. Furthermore, a stylized, ground-argillite artifact (identified as a possible smoking pipe) was found out of context on the northeast edge of the property when the Cannery Manager's House was removed. Among the locals, it is common knowledge that a seasonal, Haida subsistence camp was established on the Wards Cove Cannery point prior to European Contact. In 1912, when the cannery was built, the local Natives were displaced from their homes on the point of "Old Craig" and moved to "New Craig," a section of land near Sunnahae Mountain. Important questions regarding prehistoric and historic subsistence patterns, tool manufacture, spatial analysis of artifacts and site type may be addressed by remaining cultural components on the cannery property. The Corps has determined that the Wards Cove Cannery Site is ***potentially eligible for the National Register under Criteria D.***

The Corps recommends that the Wards Cove Cannery Site is ***eligible for the National Register under Criterion A, C and D***, and that the Old Craig Historic Site is ***eligible for the National Register under Criteria D***.

***Management Recommendations:***

To date, a systematic study has not been performed on the Wards Cove Cannery site. Tim Marshall, Heritage Program Lead for the Craig and Thorne Bay Ranger Districts was consulted regarding the history of the cannery. He explained:

> "The cannery burned in the late 50s but it seems that at least the admin building is still standing. The cannery was vital to the growth of Craig as a population center, but at this time we do not have a good idea of what remains at the cannery that is 50 years or older" (personal communication 2014).

Mr. Marshall related that he participated in a public archaeology project conducted over three seasons (2011-2013) at the site formerly occupied by one of the bunkhouses, explaining that a single lithic artifact (from CRG-728) was recovered from a shallow depth in one of the excavation units (personal communication 2014). Because of this and the proximity of a locally known prehistoric midden site at the Craig Ranger District parking lot (CRG-443), it is possible there may be prehistoric deposits within the upland area designated for removal of the Pier gangway.

The historic features within the area of potential effect include the wood pile-supported Pier (CRG-722) and associated free-standing pilings, and the Old Craig Historic Site (CRG-728). The spatial boundaries of the Old Craig Historic Site have yet to be identified and it remains unclear exactly where, or if, the site extends within the Corps proposed project area. At a minimum, a pedestrian survey of the Pier's intertidal zone is needed prior to any Federal undertaking. A pedestrian survey and judgmental shovel tests will also be necessary in the upland areas where the Pier's gangway would be removed. Supplementary testing will be necessary if additional ground-disturbing activities are to occur in the uplands of the Cannery property. A qualified archaeological monitor will be on site for the removal of the Pier gangway, the land-based pilings, and any other ground disturbing activities.

A pedestrian survey is also recommended in the intertidal zone where the breakwater toe would be placed flush against the northwestern sea wall. Strong currents and winter storms batter this section of the sea wall throughout the year. The Craig Tribal Council has expressed concern that unknown prehistoric/historic elements in the upland site may be eroding out from behind the sea wall (Personal Communication 2014). If this is the case, there is a possibility that artifacts may be scattered across the intertidal zone within the breakwater APE. In 2008, the City of Craig placed filter fabric along the length of the sea wall, between the uplands and the armor rock. The action was meant to prevent upland soil from eroding onto the beach; however, the current integrity of the filter fabric is unknown. Historically, a petroglyph site was reported along the same stretch of beach occupied by the existing sea wall. Oral interviews indicate that locals removed many of the smaller petroglyphs from the cannery beach. Larger petroglyphs were reportedly buried during the continuous, decades-long development of the Cannery site. On November 20, 2014, Corps Archaeologist, Shona Pierce, conducted a preliminary pedestrian

survey of the intertidal zone along the Cannery site. No petroglyphs were identified during the survey.

The Wards Cove Cannery site has been determined potentially eligible for the National Register under Criteria A, C and D; while the Old Craig Historic Site has been determined potentially eligible under Criteria D. As an associated feature of the Cannery site, the Pier (CRG-722) has been determined eligible for the National Register under Criteria A; however, its lack of integrity makes it ineligible under Criteria C and D. As part of the Wards Cove Cannery Site, eligible under Criteria A, removal of this Pier and its associated, free-standing pilings would alter the essential physical features that allow the cannery to convey its historic significance. According to 800.5(a)(2)(i), this constitutes an ***adverse effect to a historic property***. Therefore, following the process outlined in 800.6(a-c), the Corps will construct a draft Memorandum of Agreement (MOA) for review by your office and all other interested parties prior to the planned construction. The Corps hereby invites your office to participate in consultation regarding the Craig small boat harbor project following 36 CFR 800.3(c)(3). Comments may be submitted to me at shona.d.pierce@usace.army.mil, or 907-753-5670.

Sincerely,

Shona D. Pierce

Shona Pierce
Archaeologist

Cc w/enclosure:
Jon Bolling, City Administrator, City of Craig
Brian Templin, City Planner, City of Craig
Edward (Sam) Thomas, Transportation Director, Craig Tribal Association
Ann Guthrie, Tribal Administrator, Craig Tribal Association

References

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Roppel, Pat
2013 Southeast History: Exploring Warm Chuck Cannery. Capitol City Weekly. Posted June 26, 2013.

*Appendix A*

**Brief Building/Structure Descriptions for Determination of Eligibility on the National Register of Historic Places under Criterion C**

**Administrative Building**

The Administrative Building is a corrugated metal, flat roofed building with a hipped edge just below the roof line on the front and sides of the building. A smaller gable roof lookout is situated in the center of the flat roof. The building is slightly elevated and sits on old pilings and is 2.5 levels tall. There are a mixture of window types ranging from double-hung of various sizes, to 1/1, 6/2, 6/6, and 8/2. Siding consists of shiplap boards, and a single cement beam supports each side and the back of the building. Analysis of historic photos shows that the Administrative Building was part of the cannery landscape circa 1912; however, it is absent from photos dated circa 1899.

**Shower Room**

The shower room is a corrugated metal, gable roofed, single-story building. The building is slightly elevated on old pilings. Windows consist of 6/2 pane type in the front and sides of the building. A dilapidated concrete block vent stands against the back of the building. Siding consists of milled timber boards in the front of the building, and corrugated metal on the sides and back.

**Eastern Storage Building**

The eastern storage building is a corrugated metal, gable roofed, single story building. The building is slightly elevated on old pilings. Windows consist of 6/6 and 3/2 double hung panes. An old, dilapidated brick chimney was observed on the eastern side of the roof. Siding consists of corrugated metal. A decaying wooden stairway with railing is located on the eastern side of the building. An old, tar-covered utility pole is located on the northeastern side of the building.

**Family House**

The family house is a corrugated metal, gable roofed, single-story building. The building is slightly elevated on old pilings. A milled, wooden skirt wraps around the base of the structure. Windows are 6/6 and 4/4 double-hung. Cornice returns are evident at the front of the building where external beams support the portion of the roof that overhangs the porch; and again at the back of the building where the cornice return ties in with the siding. Siding consists of milled timber boards. There is a decaying wooden stairway with wooden railings at the front of the house, and a small gable-eave overhang with a wooden stairway at the back of the house. This house was used as a private residence until approximately 2001. Modern modifications are present.

**Steam Donkey**

The steam donkey is in relatively good condition. Inscription on the equipment identifies pieces as being manufactured in St. Paul Minnesota by the American Hoist & Derrick Co. The steam

donkey is located at the southern end of the property near the road. It sits on pieces of a wooden platform. Its chimney has been removed and is located 3 feet west of the steam donkey.

**Carpenter Shop**

The Carpenter Shop is a corrugated metal, gable roofed, single-story building. The building is slightly elevated on old pilings. Siding consists of corrugated metal that extends to ground level. Windows are 6/6 double-hung. The shop doors are corrugated metal wrapped around a wooden frame. The doors hang from a metal rack and are capable of being slid independently to open the shop. There is a metal tag screwed onto the right-hand metal door. The inscription reads, "Libby McNeill&Libby 86 38 15." This building has been in use over the past decade. An assortment of modern carpentry tools and beach-combed nick-knacks are placed in the shop.

**Carpenter Storage Building (Generator Building)**

The Carpenter storage building is a corrugated metal, gable roofed, single-story building. The building sits at ground level. Siding consists of corrugated metal with horizontal wooden slats along the length of the building sides at head level (allowing for ventilation). An open metal pipe on the southern side of the roof allows for additional ventilation, while two pipes extend out, above the metal sliding door, to allow for wiring to lead into the building. Wooden vergeboard is present at the front of the building to support the metal piping and electrical wiring.

**Maintenance Building**

The Maintenance Building is a corrugated metal, gable roofed, two-story building. The gable roof extends beyond the building sides to form an overhanging eave at the front of the building. The eave is supported by smaller 2x4-inch boards that show signs of stress and replacement. A smaller metal shed with a sloping roof is attached to the southeastern side of the building. The building appears to sit at ground level. Siding is composed of corrugated metal. Windows are 6/6, 6/1 and 1/1 over-hung panes. There are two doors and a sliding metal door at the front (south side) of the building. Historic and modern equipment are stored in the Maintenance Building.

**Maintenance Storage Building**

The Maintenance Storage Building is a corrugated metal, gable roofed, two-story building. The building appears to sit at ground level. Siding is composed of corrugated metal. Windows are 6/6 over-hung. Large, two metal sliding doors are located at the front (north end) of the building. Metal, lattice framework in the interior indicates the building once held piping or wood. Box-shelving on the interior side of the building houses bolts, nuts, screws, and nails. The second story is being used as a storage room for odds and ends.

**Web Loft**

The Web Loft is a corrugated metal, gable roofed, two-story building. The building sits at ground level and has two very large, sliding metal doors at the front (north side), as well as a modern wooden door at the top of a small wooden stairway on the northwest side of the building. Two large, sliding metal doors are located on the second level at the back (south side) of the building.

Siding is composed of corrugated metal. Interior frame work is wooden. The original Web Loft was destroyed in the fire of 1956. The current Web Loft was built shortly after the fire and is currently being used by the City of Craig as a storage area. Floating oil boons, old vehicles, and boats are stored in the ground-level, while netting is stored upstairs in the loft.

**West Bunkhouse**

The western bunkhouse is a corrugated metal, gable roofed, two-story building. The building is elevated on old pilings. A majority of the windows have been boarded up or broken, but a 6/6 double-hung pane and a 1/1 pane were observed during the survey. Siding consists of corrugated metal. A plastic/metal door is located on the western side of the building approximately 5 feet off the ground. A small, wood-framed, metal eave hangs over the doorway. No stairway is evident. Wooden ladders have been placed flush against the western and eastern sides of the bunkhouse.

**Bunkhouse Storage Building**

The bunkhouse storage building is a corrugated metal, gable roofed, single-story building. The building is slightly elevated on old pilings. The windows are boarded up all along the building. Siding consists of corrugated metal. A plastic/metal door is located on the western side of the building.

**Fuel Tanks near Administrative Building**

The fuel tanks themselves are in good condition. There is evidence of rusting at the top and base of each tank. Pipe connections at the top are still in relatively decent condition. The brick housing that used to surround the tanks has fallen apart over the decades. There are also reports of locals dismantling portions of the brick wall for the bricks. The cement block base has been vandalized, with graffiti designs on the western half of the base. Spruce and cedar saplings are growing out of the tank foundation and on top of the tanks. The tanks have integrity, but the brick housing is no longer intact.

**Marine Way and Haulout (CRG-723)**

The Marine Way and Haulout are constructed of milled timber and large, wooden support beams. A majority of the structure has been destroyed by the ocean activity, or is in a natural state of degradation. Wooden beams are rotted through on the inside, leaving behind an empty wooden cast of the beam. Historic implements, such as pulleys, large-diameter cables and hooks are located between the Haulout and the boardwalk. These artifacts exhibit extreme rusting from exposure to the elements. The Marine Way and Haulout is no longer intact and lacks structural integrity.

**Boardwalk**

What is left of the existing boardwalk extends from the parking lot in front of Ruth Ann's Restaurant, west to the end of the Administrative Building. The boardwalk sits on old pilings. It was completely re-decked prior to 2009, and leveled by means of stacked scrap boards on top of the old pilings. The only remnants of the original historic boardwalk are the pilings.

**Old Fuel Dock**

The gangway leading to the old fuel gangway has been re-decked in early 2000's. The pilings are the originals and have been stabilized by modern materials to prevent further spitting of the wood. Several pilings have been partially removed, or left hanging in air, tied to the fuel dock building. Old utility pipes for water and electricity run along the side of the gangway to the old fuel dock. The fuel building at the end of the dock is a corrugated metal, gable roofed, single-story structure. An over-hung eave supported by 3x3-inch beams provides a porch-like appearance at the front of the building (east side). Windows are 3/2 and single paned. Siding consists of corrugated metal. A small metal shed with a slanted metal roof is attached to the back of the building (west side). The western side of the dock is severely degraded with chunks of boards missing from the surface. The dock appears to have been re-decked in the past decade, with a mixture of milled lumber to fix problem spots. The building looks like it is currently being used as a fish cleaning facility. A fillet station is located in the building, along with a multitude of modern rubber boots, raingear, life vests and buoys. The floating fuel dock (at water level alongside the building), is suffering from varying degrees of weathering, but otherwise appears to be in use.

**The Pier (CRG-722)**

The Pier (CRG-722) was assessed for integrity under Criteria C as an individual feature. In order to contain adequate historic integrity, a property must "retain the essential physical features that enable it to convey its historic identity" (NPS 1990:46). As indicated from an oral interview and historic photos, more than half of the Pier and its processing structures were destroyed in the 1956 fire. The Pier itself has little architectural integrity left and shows signs of natural degradation and cultural modification. The dock and pilings have been modified through "quick-fix" re-stabilization methods so as to prevent water-worn wood from splitting. Thus, the historic feel of the structure has been removed from the site. The extreme degradation and modification of the Pier has also made it difficult, if not impossible, to determine whether the property embodies distinctive workmanship or methods of construction. Based on historic photos, some remnants of the original Pier have been identified at their present location circa 1899. Thus, location is the only identifiable feature that lends integrity to the Pier.

THE STATE of ALASKA
GOVERNOR BILL WALKER

**Department of Natural Resources**
DIVISION OF PARKS AND OUTDOOR RECREATION
OFFICE OF HISTORY AND ARCHAEOLOGY
550 West 7th Avenue, Suite 1310
Anchorage, AK 99501-3565
Main: 907.269.8721
Fax: 907.269.8908

December 23, 2014

File No.: 3130-1R COE
3330-6 CRG-00721, 3330-6 CRG-00722, and 3330-6 CRG-00728

Shona Pierce
Archaeologist
U.S. Army Engineer District, Alaska
P.O. Box 6898
JBER, Alaska 99506-0898

Subject: Craig Harbor Project

Dear Mr. Floyd:

The Alaska State Historic Preservation Office (AK SHPO) received your revised correspondence (dated November 28, 2014) on November 28, 2014. Following our review of the documentation provided, we offer the following comments:

- We concur that CRG-00721 is **eligible** for the National Register of Historic Places (NRHP) under Criteria A, C, and D. We concur that CRG-00722 is a contributing feature to the Wards Cove Cannery Site and is thus also **eligible** for the NRHP.
- We further concur that CRG-00728 is **eligible** for the NRHP under Criterion D.
- We concur that the proposed undertaking will result in an **adverse effect** to historic properties.
- We have reviewed the Corps' proposed ideas to mitigate the adverse effects that occurred at the site and agree that they are appropriate and represent a good start. We recommend that the mitigation address the overall impacts – both direct and indirect – to the cannery site as a whole.
- We look forward to continued consultation with the Corps and other consulting parties on the subject undertaking and to developing a Memorandum of Agreement (MOA) that would formally stipulate measures to resolve adverse effects. Please note that the agency official shall notify the Advisory Council of the adverse effect finding (36 CFR 800.6[a][1]).

Thank you for the opportunity to comment. Please contact Shina duVall at 269-8720 or shina.duvall@alaska.gov if you have any questions or if we can be of further assistance.

Sincerely,

Judith E. Bittner
State Historic Preservation Officer
JEB:sad

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
Joint Base Elmendorf-Richardson, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Environmental Resources Section

DEC 30 2014

Mr. Reid Nelson
Director
Office of Federal Agency Program
Advisory Council on Historic Preservation
1100 Pennsylvania Avenue, NW, Suite 809
Washington, DC 20004

Subject: Craig Harbor Federal Undertaking for Civil Works Program with the US Army Corps of Engineers. .

Dear Mr. Nelson:

The Corps, in cooperation with the City of Craig, is planning to construct a small boat harbor near the City of Craig, Alaska (Sec. 6; T74S; R81E; Copper River Meridian; USGS Quad Craig B-4; Figure 1) as authorized under the U.S. House of Representatives Public Works Committee Resolution for Rivers and Harbors in Alaska, adopted December 2, 1970. In compliance with Section 106 of the National Historic Preservation Act of 1966 [36 CFR 800.3(a)(3)], the purpose of this letter is to inform your office of a Federal undertaking with an adverse effect to historic properties [36 CFR 800.6(a)(1)] and to invite the Council to participate in consultation with the US Corps of Engineers and the Alaska State Historic Preservation Officer (AKSHPO).

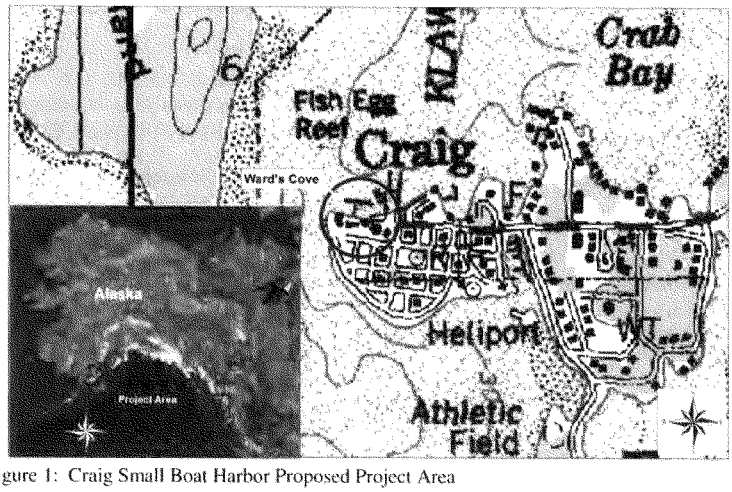


Figure 1: Craig Small Boat Harbor Proposed Project Area

***Description of Undertaking and the Area of Potential Effect (APE):***

The Corps plans to construct a 10.1-acre basin protected by a 1,933-foot-long breakwater in a segmented L-shape. This basin would accommodate approximately 120 vessels. The proposed alternative includes the construction of a breakwater toe that abuts the existing seawall at the northwest end of Wards Cove (Figure 2).

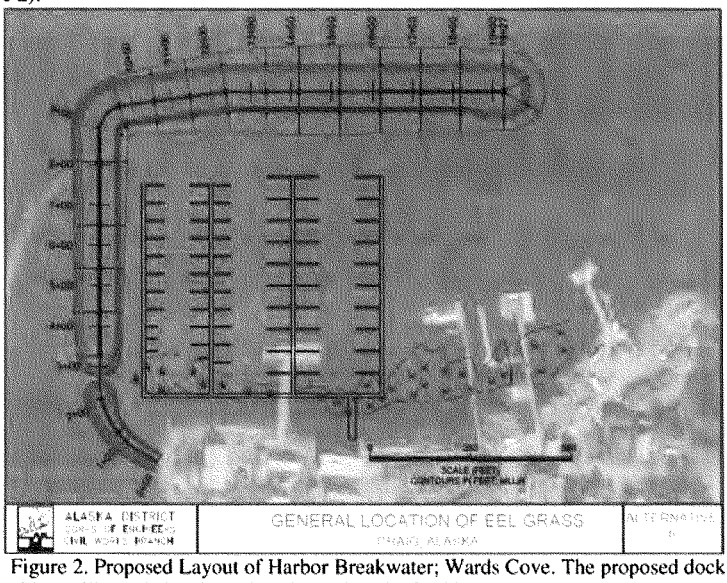


Figure 2. Proposed Layout of Harbor Breakwater; Wards Cove. The proposed dock ramp will either utilize existing footprint of the Pier (CRG-722) gangway or be placed between the Pier and the historic Boat Haulout (CRG-723).

Construction of the boat harbor would require removal of the existing dilapidated dock and associated free-standing pilings (CRG-722). The new dock ramp would tie in to either an existing gravel road at the end of the Pier's gangway (Figure 3) or would tie in to the upper tidelands between the Pier gangway and the historic Boat Haulout (CRG-723). All free-standing pilings will be cut at ground level, their bases remaining in situ, so as to prevent sediment from slumping into the piling holes (Figures 4 and 5). Pier pilings will either be cut at ground level or completely removed. The project area is accessible by existing roads.

The extension of the breakwater would occur in the sub-littoral areas of Wards Cove. Proposed action for the breakwater includes constructing the breakwater flush against the existing sea-wall. Construction of the breakwater would not extend upland beyond the sea-wall (Figure 6). Considering this, the area of potential effect includes historic Pier site CRG-722, the western and northern littoral zones of Wards Cove, and the connecting roads (Figures 3, 4 and 5). The Corps' proposed action has the potential to affect the Old Craig Historic Site (CRG-728), currently identified in the uplands of the Cannery property. The prehistoric component of this site is largely unknown and its boundaries untested.

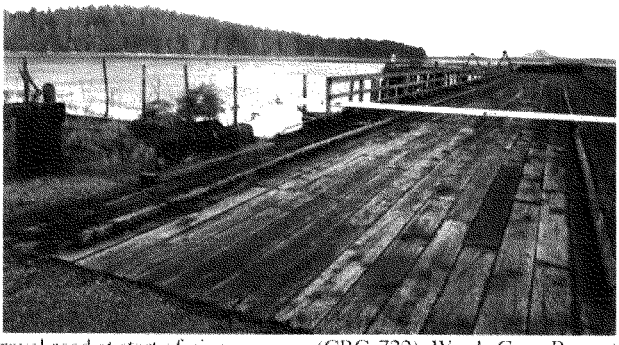

Figure 3: Gravel road at start of pier gangway (CRG-722), Wards Cove Property; view northwest.

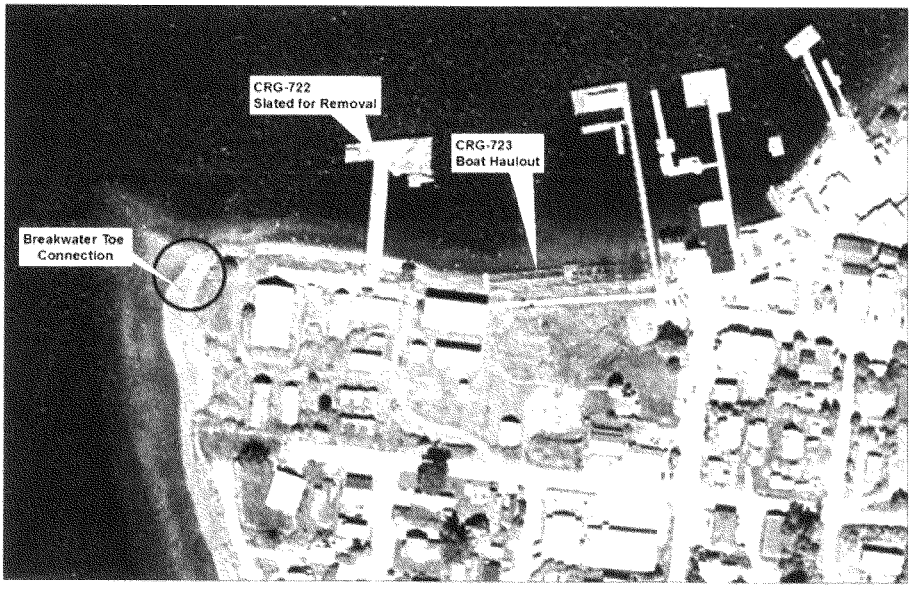


Figure 4. Wards Cove proposed construction areas.



Figure 5. Wards Cove Cannery Site (CRG-721), associated pier and pilings (CRG-722, center-right foreground) and associated boat haulout (CRG-723, center-left foreground); view south.



Figure 6. Northwest tip of Wards Cove Cannery with sea wall in foreground; view north.

In response to the proposed undertaking, Corps Archaeologist conducted a site visit to the Wards Cove Cannery Site (CRG-721) in November of 2014 to identify and evaluate historic properties for the National Register of Historic Places. Historic facilities identified in the *Ward Cove Cannery Site Phase 1 Development Plan* prior to 2009 included a 200-foot-long by 25-foot-wide wood pile supported pier and a 145-foot-long, 6,000-square-foot wood pile supported industrial dock; a beam structure located on the tidelands traditionally used to haul vessels out of the water for maintenance, repair and storage; a wood pile supported pier and dock with a building on the dock; and a float and ramp attached used as a fuel dock (Craig Planning Department 2007). Several of these structures have since been removed due to fire and damaging vandalism. Standing buildings and structures currently associated with the cannery as of November 2014 include a web loft, storage buildings, maintenance building, shower room building, administration building, a house, bunkhouse, family housing, a carpenter shop, a generator shed, the Pier, a marine haulout, and boardwalk (Figure 7).

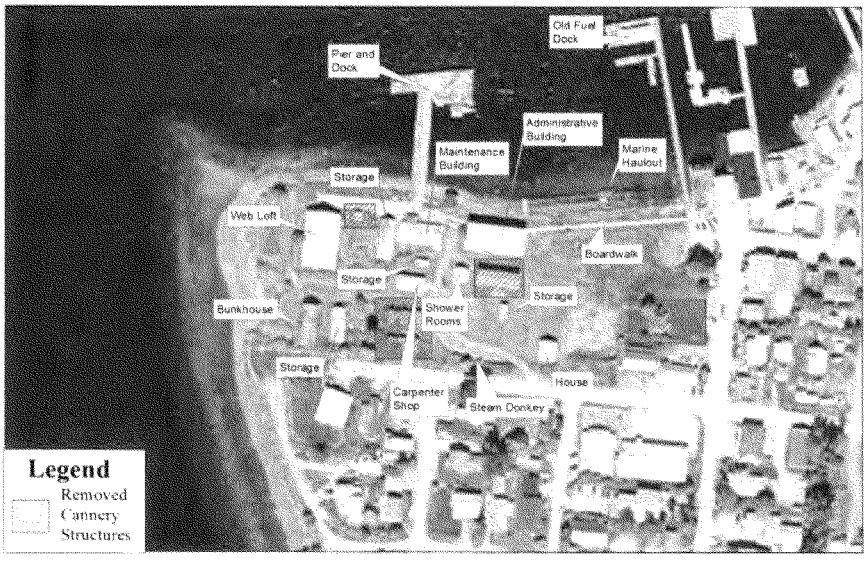


Figure 7. Current Facilities Associated with the Wards Cove Packing Property (USACE Property Site Visit November 2014).

In addition to the evaluation of the Wards Cove Cannery Site (CRG-721), the Corps Archaeologist conducted a literature review and oral interviews concerning a relatively unknown prehistoric component, the Old Craig Historic Site (CRG-728). Prior to the November 2014 site visit, CRG-728 was not on record with the AKSHPO. Tim Marshall, Heritage Program Lead for the Craig and Thorne Bay Ranger Districts was consulted regarding the history of the cannery and the prehistoric site. Mr. Marshall related that he participated in a public archaeology project conducted over three seasons (2011-2013) at the site formerly occupied by one of the bunkhouses, explaining that a single lithic artifact was recovered from a shallow depth in one of the excavation

units at what is now CRG-728. Public excavation at CRG-728 was conducted by teachers and school kids from the local elementary and kept small scale in terms of excavation. The informal report from the public excavation indicated that the boundaries of the site were not identified.

Oral interviews conducted by the Corps Archaeologist revealed that a stylized, ground-argillite artifact (identified as a possible smoking pipe) was found outside CRG-728 estimated boundary in disturbed soils – a debris pile that is assumed to be from the Cannery Manager's House when it was removed in the 1990's. Because of this and the proximity of a locally known prehistoric midden site at the Craig Ranger District parking lot (CRG-443), it is possible there may be prehistoric deposits within the upland area designated for removal at the start of the Pier gangway. Historic documents are sparse for the earliest township years of Craig, however, it is common, local knowledge that a seasonal, Haida subsistence camp was established on the Wards Cove Cannery point prior to European Contact. Oral interviews indicate that the local Natives were displaced from their homes on the point of "Old Craig" around 1912 and moved to "New Craig," a section of land near the base of Sunnahae Mountain.

The Corps Archaeologist identified these three aforementioned Alaska Historic Resource Survey (AHRS) historic features as being within the area of potential effect: the Wards Cove Cannery Site (CRG-721), the Pier at Wards Cove Cannery Site (CRG-722) and the Old Craig Historic Site (CRG-728). As the Pier feature is a component of a larger historic property, CRG-721 was evaluated for inclusion to the National Register. Corps Archaeologist determined that the Cannery is eligible for the National Register under Criterion A, C and D. The Old Craig Historic site was also evaluated for inclusion to the National Register. Corps Archaeologist determined it eligible under Criteria D. Following this finding, the Alaska State Historic Preservation Officer (AKSHPO) concurred with the Corps' determination of eligibility (AK file no. 3130-1R COE), agreeing that the Corps' proposed construction of a breakwater and removal of the historic pier (CRG-722) would result in an adverse effect to CRG-721, and potentially cause an adverse effect to CRG-728. As an individual feature, the Corps Archaeologist found the pier to have little integrity and recommend that removal of the pier will not adversely affect the eligibility of CRG-721 to the National Register.

Consistent with the Department of Defense's American Indian and Alaska Native Policy of 1998, and pursuant to 36 CFR 800.2(c)(2), tribal scoping letters were sent to Alaska Native tribes that have indicated they have concerns with the Craig Small Harbor Project. One tribe, the Craig Tribal Association responded. Extensive tribal consultation is ongoing in an effort to plan the project to minimize, or if possible, avoid any significant impact to CRG-721 and CRG-728, and to the extent possible preserve the sites. The Craig Tribal Association (CTA) has indicated a desire to learn more about prehistoric site CRG-728 through excavation and site boundary delineation. The CTA has also expressed a desire to avoid negatively impacting intact portions of this site through alteration of the project design via access routes for heavy equipment. The Corps plans to incorporate these concerns into the project design as construction plans become more concrete. Changes made to the initial design based on tribal input include: keeping the breakwater in the intertidal zone again the existing seawall so as to avoid adversely impacting potential prehistoric properties in the uplands. Active, ongoing consultation will afford the CTA additional opportunity to comment on the project as the memorandum of agreement (MOA) is developed.

The proposed project will adversely affect a feature of NRHP-eligible site CRG-721, and potentially adversely affect NRHP-eligible prehistoric site CRG-728. The Corps archaeologist contacted AKSHPO on December 26, 2014 to discuss project updates and mitigation for adverse effects pursuant to 36 CFR 800.5(a)(2)(i). The Corps continues to engage in constructive and positive consultation on a resolution to the adverse effects to CRG-721 and CRG-722, and the potential adverse effect to CRG-728 with the AKSHPO and the CTA. A memorandum of agreement will be drafted and filed with your office pursuant to 36 CFR 800.6(b)(1)(iv).

In sum, the Corps requests that they Council review the information outlined in this letter for the purpose of determining if the Council wishes to join the consultation process for this undertaking. If the ACHP chooses to participate, we would appreciate a response within 15 days of receipt of this notice. If you have any questions or concerns regarding the proposed construction of a breakwater and removal of historic Pier CRG-722 in Craig, Alaska please contact Shona Pierce, Archaeologist at (907)753-5670 or shona.d.pierce@usace.army.mil.

Sincerely,

Shona Pierce

Shona Pierce
Archaeologist

References

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*Preserving America's Heritage*

January 3, 2015

Ms. Shona Pierce
Archaeologist
Environmental Resources Section
U.S. Army Engineer District, Alaska
P.O. Box 6898
Joint Base Elmendorf-Richardson, AK 99506-0898

***Ref:*** ***Proposed Construction of Small Boat Harbor at Ward's Cove***
***City of Craig, Alaska***

Dear Ms. Pierce:

On January 16, 2014, the Advisory Council on Historic Preservation (ACHP) received your notification and supporting documentation regarding the adverse effects of the referenced projects on properties listed on and eligible for listing in the National Register of Historic Places. Based upon the information you provided, we have concluded that Appendix A, *Criteria for Council Involvement in Reviewing Individual Section 106 Cases,* of our regulations, "Protection of Historic Properties" (36 CFR Part 800) does not apply to this undertaking. Accordingly, we do not believe that our participation in the consultation to resolve adverse effects is needed. However, if we receive a request for participation from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or another party, we may reconsider this decision. Additionally, should circumstances change, and you determine that our participation is needed to conclude the consultation process, please notify us.

Pursuant to 36 CFR 800.6(b)(1)(iv), you will need to file the final Memorandum of Agreements (MOAs), developed in consultation with the Alaska State Historic Preservation Officer (SHPO) and any other consulting parties, and related documentation with the ACHP at the conclusion of the consultation process. The filing of the Agreements and supporting documentation with the ACHP is required in order to complete the requirements of Section 106 of the National Historic Preservation Act.

Thank you for providing us with your notification of adverse effect. If you have any questions or require further assistance, please contact Brian Lusher at 202-606-0221, or via email at blusher@achp.gov.

Sincerely,

Raymond V. Wallace

Raymond V. Wallace
Historic Preservation Technician
Office of Federal Agency Programs

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 6898
Joint Base Elmendorf-Richardson, ALASKA 99506-0898

REPLY TO
ATTENTION OF:

Environmental Resources Section

FEB 11 2015

Ms. Judith Bittner
State Historic Preservation Officer
Alaska Department of Natural Resources
Office of History and Archaeology
550 West 7th Avenue, Suite 1310
Anchorage, AK 99501-3565

Subject: Corps Small Boat Harbor Project in Craig, Alaska: Reevaluation of CRG-722 DOE

Dear Ms. Bittner:

The U.S. Army Corps of Engineers (Corps) proposes to reevaluate an Alaska Heritage Resources Survey (AHRS) determination of eligibility (DOE) for the Pier at Wards Cove Cannery (CRG-722). A literature review was conducted on the Wards Cove Cannery Site (CRG-721) and CRG-722 in November 2014 as part of a Corps-led small boat harbor project in the city of Craig, Alaska. The Corps determined that CRG-721 was eligible for the National Register of Historic Places (NRHP) under Criteria A, C, and D. As a contributing feature of CRG-721, CRG-722 was determined eligible for the NRHP under Criterion A (Figure 1; Pierce November 28, 2014 correspondence to SHPO). The Corps originally determined that the removal of CRG-722 and its associated free-standing pilings would alter the essential physical features that allow CRG-721 to convey its historic significance and would therefore constitute an adverse effect to CRG-721 and CRG-722. On January 20, 2015, new information was provided to the Corps suggesting that CRG-722 had previously been modified to a greater extent than originally assumed (Figure 2). The following is a reevaluation of the Corps' previous 2014 DOE on CRG-722 based on the new information and a discussion of the direct, indirect, and cumulative effects of the proposed Corps project to historic properties within and adjacent to the project's area of potential effect (APE).

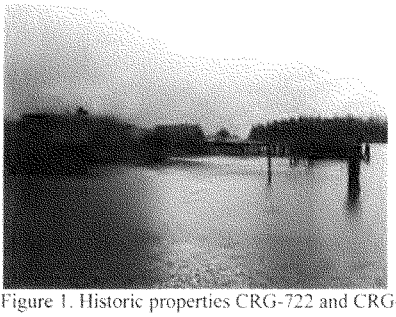


Figure 1. Historic properties CRG-722 and CRG-721 (USACE 2014)

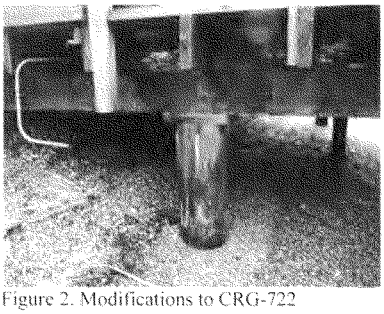


Figure 2. Modifications to CRG-722 (USACE 2015)

***Discussion of Integrity: CRG-722***

On January 15, 2015, the Corps conducted a site visit to the proposed Craig Small Boat Harbor project in Craig, Alaska. Corps Archaeologist, Shona Pierce, conducted a visual survey of CRG-722 and a pedestrian survey of the junction between the gangway and the uplands. The archaeologist noted that the gravel roadbed at the head of the gangway extended 1 to 2 feet off the ground surface and was very compacted. The pier's gangway had been modified to lie flush with the new road elevation. Visual survey of the underside of the gangway and pier revealed that a majority of the cross-sections and decking were in moderately good shape and that portions of the decking appeared to be of newer construction. The pier deck was supported on assorted blocks of cut wood that were stacked on top of the original pilings (Figure 2). A cement platform was embedded into the upper bank beneath and alongside the gangway, running parallel with the pilings. It is assumed that the cement "platform" surrounding the current pier gangway may actually be the foundation of CRG-722's original gangway (Figure 3).

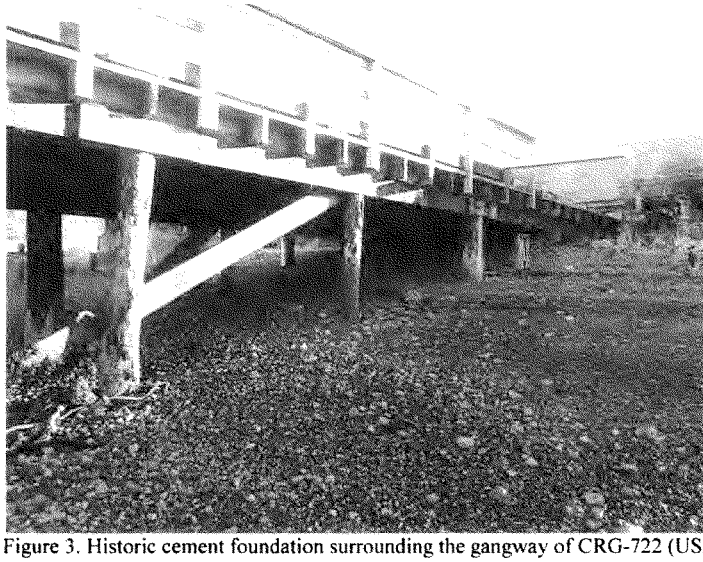


Figure 3. Historic cement foundation surrounding the gangway of CRG-722 (USACE 2014)

In a recent email exchange on January 20, 2015, Craig City Administrator, Jon Bolling, related that CRG-722 had undergone modifications over the past decade. In 2007, the City of Craig redecked most of the cannery pier and gangway. As per Mr. Bolling's January 20th correspondence, "We [the city] hired temporary laborers to apply new spruce planks over the existing decking. The city redecked about 80 percent of the existing pier structure to accommodate the need for a barge-based seafood processor (Astoria Seafood) to run totes and forklifts from the face of the pier to a loading facility on the property uplands (see photos in Enclosures). I think we [the city] also had the laborers cross brace some of the support piling beneath the pier's deck" (Figure 3).

Craig City Planner, Brian Templin, clarified the city's redecking procedure, stating that "most of the improvement was overlaying the existing decking with new decking. The preferred construction method was to build across the grain from the existing decking. This provided the greatest strength to the old structure" (personal communication with Templin 2015).

A second construction modification occurred to CRG-722 in 2007 when the city partnered with the Corps for navigation improvement maintenance. The Corps hired a private contractor to drive steel pilings along the pier face and add two, 4-piling mooring dolphins, one at each end of the pier (see documentation in Enclosures). Around this time, the city also replaced the old piling and wooden decking platform between the cannery's Administration Building and the Web Loft with rock fill (personal communication Bolling 2015). Access to the gravel road along the Cannery waterfront is currently via Main Street (directly south of CRG-721). The gravel road is approximately 1 to2 feet deep along the water front and heavily compacted due to use (Figure 4).



Figure 4. Road fill from the City of Craig's 2007 construction activities (USACE 2015)

Historical records have also indicated that the pier has been modified. In the winter of 1956, marine transcripts and oral literature tell of a fire that destroyed a large portion of the old Craig Cannery. The fire was ruled "spontaneous combustion" by local law enforcement; however, local speculation suggests that the property owners caused the fire in order to collect the insurance policy as the economy and fish market were dwindling at the time (Personal communication with K. Head 2014). The fire occurred on the pier and consumed the processing buildings and pier decks. The Web Loft was the only structure in the uplands that burned. The only structures remaining from the original pier system seem to be the pilings. Some of these pilings still exhibit

marks from the fire. The footprint of the original pier processing area can be seen today via the free-standing pilings that dot the Cannery's waterfront. The Web Loft was rebuilt shortly after the fire and served as the boat maintenance facility for Columbia Wards Fisheries. It appears that the same construction technique and original footprint was used for the new building.

Due to new information suggesting a lack of integrity at CRG-722, the Corps reevaluated the original NR determination of eligibility and determined that CRG-722 is still eligible for the NR under Criterion A. Structural modifications over the past decade have altered CRG-722; however, these modifications are largely superficial. The 1956 pier is still largely intact underneath the 2007 redecking work and the pilings seem to have maintained their original settings.

***Direct, Indirect and Cumulative Effects of the Proposed Corps Project to Historic Properties***

*Direct Effects*

Direct effects of the proposed undertaking to historic properties include (1) removal of the Cannery's pier (CRG-722) and associated free-standing pilings along the Cannery water front, and (2) construction of an armor rock breakwater on the northwestern point of the Cannery's intertidal zone. Removal of the pier would constitute an adverse effect to the CRG-722 as documentation shows that the pier still has integrity despite recent overlying construction modifications, fire damage, and repeated wear-and-tear from heavy machinery. Heavy equipment and vehicles were used on the pier to load and unload cargo from the Russian fish processor that was moored at the pier in 2007. The vessel itself left minor stress features on the pier over the duration of its moorage. A majority of the pilings and 1956 decking is still present at the site. Overall, CRG-722 still retains enough vestiges of its historic significance to be a contributing feature to CRG-721. For these reasons, the Corps has determined that removal of CRG-722will constitute an adverse effect to CRG-721.

Construction of the breakwater will impact historic sites by further necessitating the removal of CRG-722, as its presence impedes future construction plans for the city's proposed dock. Concern was mentioned for possible petroglyphs that were once located in the proposed breakwater footprint. Petroglyphs are not uncommon around Craig and have been reported on nearby Fish Egg Island (an island approximately 200 meters west of the Cannery point). There are two documented prehistoric/historic village sites on Fish Egg Island, CRG-063 and CRG-103. An undocumented petroglyph is located in the lower intertidal zone of CRG-103. Additionally, two petroglyph sites are located on Fish Egg. One site is on the western side of the island (CRG-574) and the other is on the eastern side (CRG-572). Petroglyphs have also been documented on nearby San Juan Bautista Island, San Fernando Island, Suemez Island, and Wadleigh Island. Oral reports from 1972 have also indicated that a cluster of petroglyphs (CRG-024) used to line the bays at Shelter Cove (now Shelter Cove, and North and South Harbor), before the channel was dredged and the road elevated (Gardner 2011).

Craig resident Debbie Head, who grew up in Craig, recalled a series of smaller petroglyphs residing along the intertidal zone of the Cannery property when she was a young girl. She mentioned that they were small enough for childhood friends to carry home and suggests that several of the petroglyphs may have been removed from the site in this manner (personal

communication with Head 2014). It is speculated that the remainder of the petroglyphs at the Cannery site may have been overlooked during construction, being overturned or buried by heavy machinery when contractors were constructing the memorial park and seawall at the northwest point of the Cannery property around 2006. A pedestrian survey of the intertidal zone surrounding the property turned up negative for petroglyphs (Pierce November 28, 2014 correspondence to SHPO).

*Indirect Effects*

Indirect effects of the proposed Corps undertaking to historic properties include (1) increased pedestrian traffic, (2) potential of increased vandalism at CRG-721 and CRG-728 (Old Craig Historic Site), and (3) potential future development on city owned Cannery property. The Corps anticipates that there will be increased pedestrian traffic at CRG-721, not only during the construction of the breakwater and removal of CRG-722, but also from future harbor users. People may access more of the Cannery site to get better views of the project and may be more apt to roam the property. Vandalism has already been noted during several site visits to the Cannery, where individuals have broken through locked building doors, spray painted graffiti on walls, and dumped trash. An increase of harbor users has the potential to raise this type of vandalism. Vandalism also has the potential to spread to the Old Craig Historic Site (CRG-728). Though its location is known amongst many locals, to date there have been no disturbances reported at CRG-728.

The likelihood of potential future development at the city-owned Cannery property also exists. Future development at CRG-721 is outlined in the 2008 Summary of Capitol Projects and is completely contingent on local, city and/or state funding. Potential development plans include removing the cannery buildings that pose a safety risk to visitors, removing cannery features that impede development of the dock, developing local businesses at the Cannery site, leasing portions of the Cannery land, and developing harbor facilities in the lower portion of the Cannery site. The Corps has determined that the city's prospective development plan would potentially adversely affect part, if not all, of CRG-721, and has the potential to adversely affect CRG-728. Future development at CRG-721 will be conducted by the City of Craig and is completely contingent on outside funding. At this point in time, future city site development is undetermined and unfunded, and therefore currently not being planned.

*Cumulative Effects*

Cumulative effects of the proposed Corps undertaking to historic properties include removal of CRG-722 and associated pilings, construction of an armor rock breakwater in the intertidal zone on the northwestern tip of the Cannery property, and possible development of the Cannery property that has the potential to adversely affect CRG-721 and CRG-728. If plans are carried out to their fullest extent, the Corps will remove the pier and then install the breakwater. The city would then begin installation of the boat dock system and gangway. With increased boat traffic and harbor use, there will be a need for harbor facilities within the immediate area. Facilities are likely to include restrooms, showers, garbage and hazardous material disposal areas, and possibly a satellite harbor master building. Additional future development may also occur at the Cannery site. Potential development plans include removing buildings at CRG-721 that pose a safety risk to harbor users/visitors, removing cannery features that impede dock development, developing

local businesses at CRG-721, leasing portions of the Cannery land, and developing harbor facilities in the lower portion of CRG-721. The Corps has determined that the city's future potential development plan would potentially adversely affect part, if not all, of CRG-721, and has the potentially to adversely affect CRG-728. CRG-722 would be removed completely, an action that will constitute an adverse affect to historic properties. Future development at CRG-721 will be conducted by the City of Craig and is completely contingent on outside funding. At this point in time, future city site development is undetermined and unfunded, and therefore currently not being planned.

***Recommendations***

The Corps finds that there is the potential for adverse effects at CRG-721 and CRG-728 with future city development plans; however, perspective site development is undetermined and unfunded, and therefore currently not being planned. It would be erroneous for the Corps to make further assumptions of future site development at CRG-721 and CRG-728 without additional input from the City of Craig.

If petroglyphs are present and buried in the intertidal zone, it is assumed that a decade's worth of tides and constant abrasion of sand, gravel, and other materials have likely worn away many discernible features on the petroglyphs. In order to locate the potentially buried petroglyphs, the Corps would need to create a larger footprint of disturbance within the intertidal zone. The plan is therefore to "cap" the potential petroglyphs in the intertidal zone by placing the armor rock at the surface of the beach and ocean floor. This action would create compaction underneath the breakwater footprint, but would otherwise exert no additional adverse effects beyond what is already taking place naturally.

Removal of the pier will constitute an adverse effect to CRG-722 as documentation shows that the pier still retains integrity despite recent overlying construction modifications, fire damage, and repeated wear-and-tear from heavy machinery. The Corps has determined that CRG-722 is still eligible for the NR under Criterion A, and continues to be a significant contributing feature to CRG-721. Removal of CRG-722 will constitute an adverse effect to CRG-722 and CRG-721, as removal of the property will alter an aspect of CRG-721's setting that contributes to its historical significance.

At this time, the Corps' proposed Craig Small Harbor scope of work only includes basic removal of CRG-722 at the ground level and construction of an armor rock breakwater. Due to compacted gravel overburden at the mouth of CRG-722's gangway and the improbable nature of opening test pits within that APE, the Corps recommends having an archaeological monitor in place during the removal of CRG-722 and construction of the intertidal breakwater so as to mitigate adverse effects to potential cultural resources. No ground disturbing actions are planned for the uplands at this time. Further development of the work plan may require a reassessment of the APE and the need for a formal site investigation. A site investigation will be required if heavy machinery is used to conduct work off the existing road surface in the uplands. Additional testing will also be recommended if removal of CRG-722 extends beyond the ground surface or outside previously disturbed areas.

Based on new information, the Corps has reevaluated CRG-722's previous determination of eligibility and determined that CRG-722 is still eligible for the NR under Criterion A. As part of CRG-721, eligible under Criterion A, removal of CRG-722 and its associated, free-standing pilings will alter the essential physical features that allow the Cannery to convey its historic significance. According to 36 CFR 800.5(a)(2)(i), this constitutes an adverse effect to a historic property. Therefore, following the process outlined in 800.6(a-c), the Corps will proceed with their original plan to construct a draft Memorandum of Agreement (MOA) for review by your office and all other interested parties prior to the planned construction. The Advisory Council (ACHP) was invited to join the MOA consultation and has declined the invitation (Letter from ACHP received February 3, 2015). The Corps seeks your concurrence on this assessment of effect and determination of eligibility for CRG-722. If you have any questions, please call me at (907)753-5670 or at shona.d.pierce@usace.army.mil.

Sincerely,

Shona D. Pierce

Shona Pierce
Archaeologist

**References**

Advisory Council on Historic Preservation Correspondence to Corps
2015 Letter to Corps about invitation for consultation in Craig Small Harbor MOA. Signed January 3, 2015. Received February 3, 2015.

City of Craig
2008 *Summary of Capitol Projects*. Produced by the City of Craig. February 2008.

Corps Correspondence to SHPO
2014 Letter to SHPO about proposed Craig Small Harbor project at Craig, Alaska. November 28th.

Gardner, Pat
2011 *Growing Up in Craig Alaska*. Audio recording of Mr. Gardner's childhood in Craig Alaska. On record with Craig Elementary School, Craig, Alaska.

Personal Communication, Jon Bolling
2015 January 20th email correspondence between City Administrator, Jon Bolling, and Corps Archaeologist, Shona Pierce, on construction modifications at the Craig Cannery site.

Personal Communication, Debbie Head
2014 November 20th conversation between lifetime Craig resident and S.E.A.L.S. (SouthEast Alaska Lifestyles Studies) teacher, Debbie Head, and Corps Archaeologist, Shona Pierce, on history of the Craig Cannery.

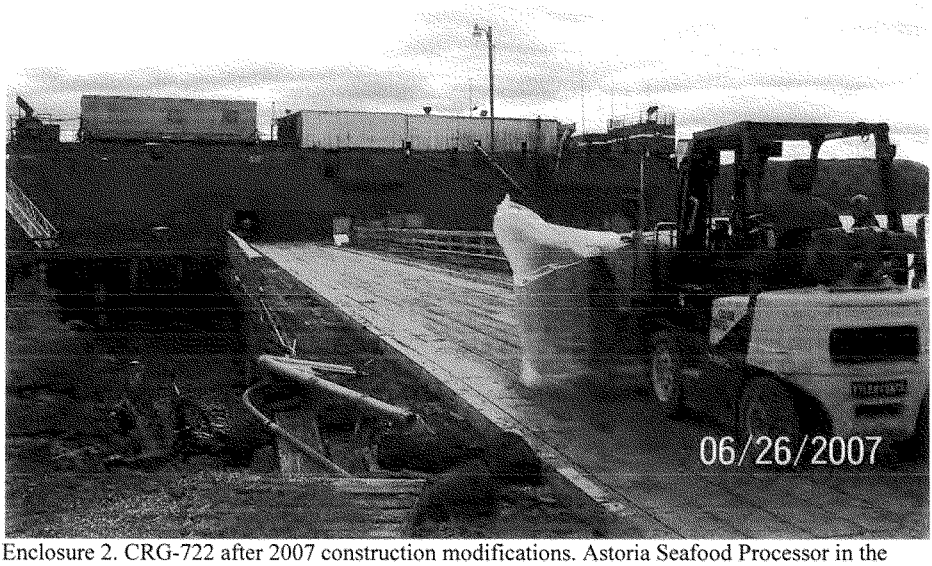
Personal Communication, Karen Head
2014 November 20th conversation between Craig resident and retired school teacher, Karen Head, and Corps Archaeologist, Shona Pierce.

Personal Communication, Brian Templin
2015 February 9th email correspondence between City Planner, Brian Templin, and Corps Archaeologist, Shona Pierce, on construction modifications at the Craig Cannery Site.

***Enclosures***



Enclosure 1. CRG-722 prior to 2007 construction modifications. (City of Craig 6/29/2006)




Enclosure 2. CRG-722 after 2007 construction modifications. Astoria Seafood Processor in the background (City of Craig 2007)




Enclosure 3. Redecked 2007 CRG-722 mooring area. Astoria Seafood Processor in the background (City of Craig 2007)

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FISH AND WILDLIFE SERVICE
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8/13/2014

Chris Floyd
U.S. Army Engineer District, Alaska
P.O. Box 6898
Joint Base Elmendorf-Richardson, Alaska 99506-0898

Subject: Planning Aid Letter, Craig Navigation Improvement Project

Dear Mr. Floyd,

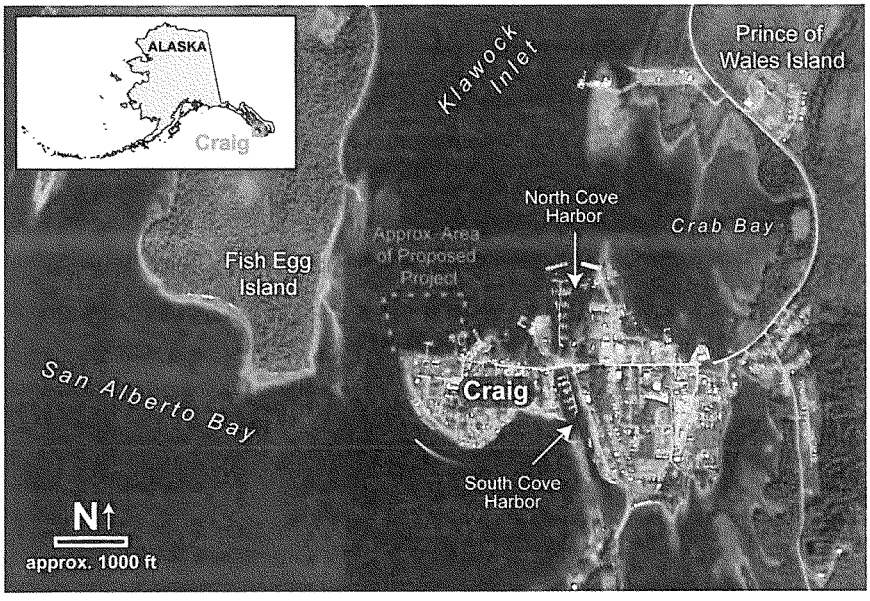
This Planning Aid Letter is provided for your consideration as you proceed with the Craig Navigation Improvement Project. We have reviewed several draft project alternatives and excerpts from your draft environmental assessment. We offer the following comments and recommendations.

Project description
The U.S. Army Corps of Engineers (Corps) is evaluating several different design configurations for construction of a new boat harbor at the site of a former cannery in Craig, Alaska, on Prince of Wales Island (Figure 1). Designs currently under consideration include various arrangements of rubble-mound breakwaters (Figure 2). Some alternatives incorporate dredging of near-shore sediments to provide adequate harbor basin depth; others use larger breakwaters extending into deeper water to accomplish that objective. Breaches are provided in some alternatives to facilitate movement of small fish and other aquatic organisms along the shoreline.

Threatened and Endangered Species
There are no species under the jurisdiction of the Fish and Wildlife Service (Service) listed as threatened or endangered in the project area. Yellow-billed loons, which spend winter in marine waters throughout Southeast Alaska, are currently a candidate for listing as either threatened or endangered. This species likely feeds in waters near the proposed project site during winter, and during spring and fall migrations.

Site Considerations
Fish and wildlife habitat values at the proposed project site are moderate. The site has been impacted by past uses, and wildlife use is currently limited by ongoing disturbance from commercial and residential use at and near the site. The nearshore marine environment at the project site is likely to support lower biological diversity (number of species) and productivity (abundance) than nearby sites that are not

Figure 1. Location of proposed new harbor in Craig, Alaska.

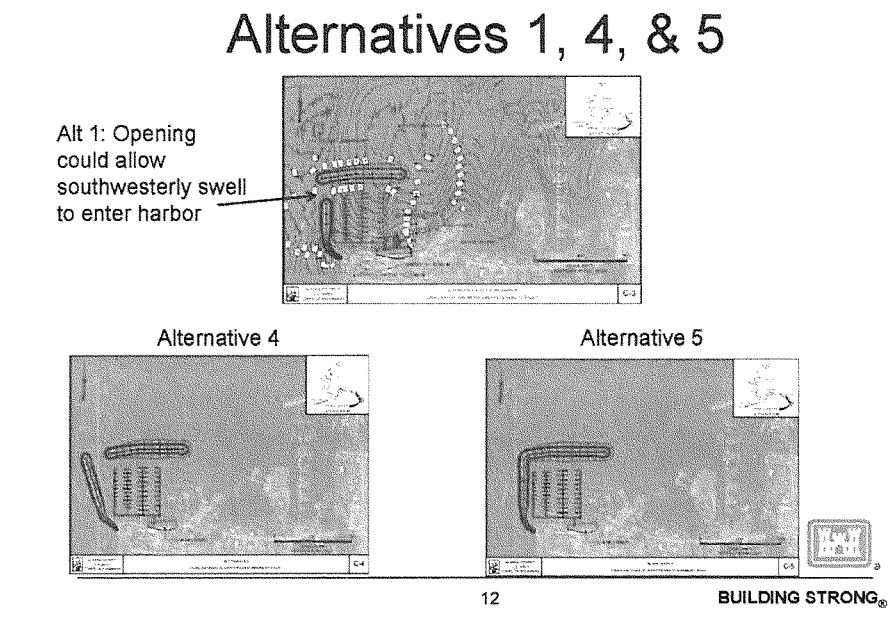


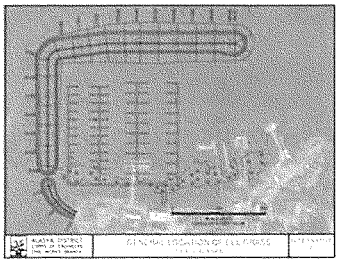

influenced by as much human activity, but the shoreline does provide habitat for many plants, invertebrates, and fish. These species are fed upon by larger fish and various human-tolerant wildlife species such as gulls and crows. Maintenance of this productivity should be an objective in design of the harbor.

Uplands and groundwater immediately adjacent to the proposed project site are contaminated by petroleum from former cannery and fuel storage operations at the site; sediments within the proposed harbor basin are also likely contaminated (USACE 2014, draft EA). To avoid liberating these contaminants, the Corps is currently favoring alternatives that do not require dredging. The Service supports this strategy as a way to minimize impacts to shoreline biota, unless a more complete cleanup of contaminated soil and groundwater can be completed (which would be preferable).

Intertidal sediments are primarily cobble and gravel, with varying amounts of sand. There are bands of rockweed (*Fucus gardneri*) across the middle elevation of the intertidal zone, with eelgrass (*Zostera marina*) and various kelp species at the lower intertidal and shallow subtidal zones (USACE 2014, draft EA). These plant communities typically support a diverse community of invertebrates and small fish, which in turn serve as prey to larger species.

Figure 2. Design alternative provided by Corps, July, 2014.



## Alternative 6

(with nearshore breach to allow fish passage)

Dredging would remove most or all of the intertidal and shallow-water vegetation, and the invertebrate community that is dependent on it. Loss of this shoreline plant and animal community would reduce the value of the harbor for nearshore fishes, many of which rely on intertidal and shallow subtidal productivity for food and habitat. Retention of this community will help reduce impacts of the harbor on fish in the Craig area, which is a sound reason to avoid dredging.

Design Considerations for Nearshore Fish Passage

Many species of fish and invertebrates follow the shoreline during seasonal migrations or as less-predictable movements in search of food and habitat. This is true for juvenile salmon, rockfish, halibut, and other species. Breakwaters and other structures that direct these small fish away from the shore may subject them to mortality risks from predators that live in the deeper waters along the outside of the breakwater. Two design modifications are believed to reduce these risks: breaches in the breakwater to allow fish to stay close to the natural shoreline and use the cover provided by the harbor structure, and shallow-water benches along the outside of the breakwater, to provide more suitable habitat for small fish that do not enter the harbor.

Published recommendations for sizing these features are not readily available, but based on observations of schools of juvenile salmon and other species, we recommend that breakwater breaches be designed to keep a channel of water at least 3 feet deep and 6 feet wide (at the water surface) during 95 percent of low tides. Any such breaches must not compromise the ability of the breakwaters to protect the boats and other assets within the harbor. One possible way to do this while creating an adequate breach is with overlapping breakwaters, as recently evaluated for the Valdez harbor (Figure 3). We recommend that an overlapping stub breakwater, inside the main breakwater, be evaluated for the Craig harbor

Benches of relatively shallow water around the outside of the breakwater (Figure 4) are believed to provide better habitat for smaller fish that do not enter the harbor as they move along the shoreline. Such benches could also increase the area for establishment of various invertebrates and macro-algae (kelp) and possibly eelgrass, depending on water depth (and thus light penetration) and substrate.

Maximum kelp growth in the Craig area is likely to occur from about -2 to -15 feet Mean Lower Low Water (MLLW), on rocky substrates. Eelgrass is typically shallower, from about 0 to -10 feet MLLW, on sand or sand/silt substrates. Benches between 0 and -10 feet MLLW are therefore recommended, as a way to encourage development of kelp and possibly eelgrass habitat, which would benefit many species.

To encourage eelgrass, benches could be covered with clean sand or a sand/silt mixture, and eelgrass shoots could be transplanted to into the sediments. Transplanting would be most cost-effectively done during low tides, when shallow benches could be reached by planters without scuba gear. Techniques for transplanting eelgrass are described elsewhere (see, for example, Thom, R.M. 1990. A review of eelgrass (*Zostera marina* L.) transplanting projects in the Pacific Northwest. *The Northwest Environmental Journal* 6:121-37).

Figure 3. An overlapping stub breakwater, as considered for the west end of the proposed Valdez Harbor expansion, may provide passage for fish while providing adequate wave protection at Craig.

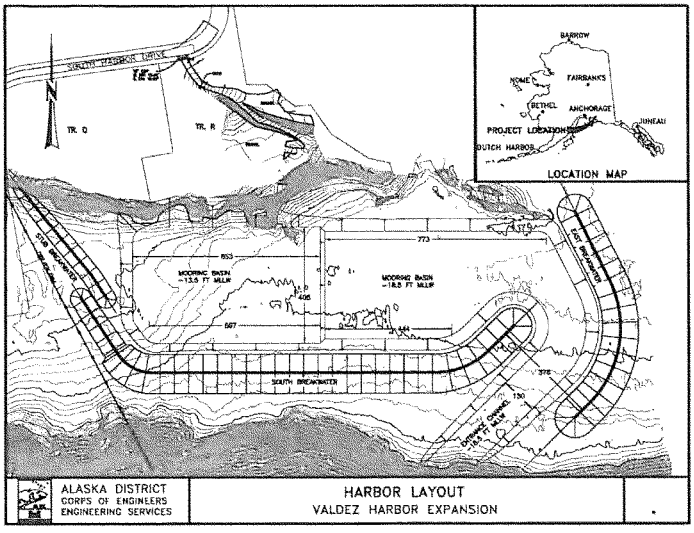
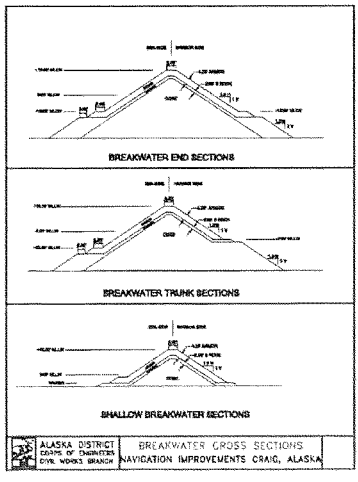



Figure 4. Benches along the outside of the proposed breakwater could provide enhanced habitat for small fish and invertebrates, especially if built in the photic zone between 0 to -15 feet MLLW.



Some breakwaters and armored banks seem to be colonized by kelp and other aquatic vegetation much more quickly than others. This may be related to toxicity in the rock used as riprap. Toxic rock is available from some quarries on Prince of Wales Island, so caution is warranted. For example, acid-generating rock used on roads in the Coffman Cove area of Prince of Wales Island has caused fish kills and accelerated corrosion of culverts. We recommend that the Corps require toxicity testing of both fill material and armor rock, to insure that only nontoxic material is used in construction of the breakwaters.

These comments are provided under the authority of the Fish and Wildlife Coordination Act. We appreciate your interest in developing a harbor that minimizes impacts to the environment while providing a functional harbor for the community of Craig, Alaska. If you have any questions about these comments, please contact me at (907) 780-1181 or email steve_brockmann@fws.gov.

Sincerely,

Steve Brockmann
Southeast Alaska Coordinator

Cc: Mark Minillo, ADF&G, Craig
Cindy Hartmann-Moore, NMFS, Juneau