Akutan Harbor Navigational Improvements Study
Appendix D: Cost Engineering
Akutan, Alaska

May 2024

U.S. Army Corps of Engineers
Alaska District

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1. SEQ CHAPTER * ALPHABETIC \R 5EAPPENDIX OVERVIEW

This Cost Engineering Appendix will be consolidated into the decision document, Integrated Feasibility Report and Environmental Assessment (IFR/EA), for Akutan, Alaska. The purpose of the feasibility study is to evaluate alternatives for a potential construction contract. The Appendix discusses the cost assumptions, methodology, materials, labor, and equipment utilized in the contract construction cost estimates.

2. PROJECT TYPE, FEATURES, AND ALTERNATIVES

Three alternatives were evaluated for this report. All the alternatives included breakwater construction and unique local service facilities (LSF), including causeways, mooring points, and upland improvements.

3. PRELIMINARY ALTERNATIVES COST ESTIMATE BASIS

This section summarizes the development of planning level cost estimates for the final array of action alternatives. The estimates were developed in Q1 2022 prices.

3.1. Purpose

There were a variety of alternatives for which costs were developed during the planning and alternative decision stages. Based on the design development, these estimates would be considered Class 4 for accuracy.

3.2. Quantities and Assumptions

This estimate is based on quantities and design sketches provided by the United States Army Corps of Engineers (USACE) CEPOA-EC-CW (Oliver) design engineer and included at the end of this Appendix in Exhibit 2.

3.3. Unit Prices

The unit prices used in Class 4 alternative estimates were, for the most part, determined using historical bid data, cost models used in similar types of project estimates, and current pricing for large cost items such as breakwater rock. These unit costs were adjusted to factor freight and local area mark-ups. The following assumptions were made during the formation of this estimate:

- Breakwater construction: Due to the potential construction site's remote location, all materials are required to be brought in by barge. Rubble mound breakwater

and fill material are assumed to be sourced from the Sand Point quarry located nearly 300 miles from the town of Akutan. Once materials are barged to Akutan, it will be placed using a barge-mounted crane and excavator. Two barge scows will be utilized during the construction due to the relatively long towing distance from Akutan to the Sand Point quarry.

- Dredging: Dredge will be completed via a mechanical method by using a crane on a floating barge using clamshell, placing material in a dump truck, and disposing in a stockpile within 2 miles of the project site. A large portion of the dredged material is assumed to require blasting before dredging may be completed.
- Schedule: The construction is assumed to require 3 seasons to construct.

Rock pricing is based on quotes from Nome Quarry dated May 2022:

- A-Rock: $170/Ton
- B-Rock: $110/Ton
- C-Rock: $70/Ton

As this is a Class 5 estimate, the following assumptions were made:

- Includes a 50% contingency – will change following completion of the cost and schedule risk analysis.
- Pre-Construction Engineering and Design (PED) and Supervision, Inspection, and Overhead (SIOH) are allowances.
- The estimated index (date of development) is October 2023. No escalation is included.

3.4. Contingencies

Project risks include difficulty dredging in shallow water, difficulty dealing with rocky/consolidated material, weather, encountering marine mammals, and sourcing rock for the breakwater. Contingencies represent allowances to cover unknowns, uncertainties, and/or unanticipated conditions that cannot adequately evaluate the data on hand when the cost estimate is prepared. Still, it must be represented by a sufficient cost to cover the identified risks. A cost and schedule risk analysis is being produced for the chosen alternative, alternative 2.

3.5. Summary

The three alternatives evaluated were estimated to range in costs from approximately $63.2 million to $98.3 million as seen in Table 1.

Table 1. Alternatives and Total Costs

Cost Description	Alternative 1	Alternative 2	Alternative 3
Mobilization and Demobilization	$3,139,560	$6,125,320	$6,125,320
Dredging (Drill/Blast/Dredge/Dispose)	$1,907,810	$10,239,710	$12,013,400
LSF: Dredge (Dredge/Dispose)	$65,520	$330,460	$1,007,100
Breakwater	$43,097,000	$14,052,100	$16,985,030
LSF: Uplands (Causeway/Access Road)	$5,970,000	$3,521,400	$3,093,900
Archaeological Monitoring & Mitigation	$566,340	$566,340	$391,684
LSF: Akutan Side: Dock	$1,000,000	$1,000,000	$1,000,000
Real Estate	$75,000	$75,000	$75,000
S&A (17.0%)	$9,476,859	$6,092,006	$6,904,794
PED (13.8%)	$7,692,980	$4,945,276	$5,605,068
Contingency (50%)	$36,495,534	$23,073,806	$26,600,648
Total	**$109,486,604**	**$70,421,417**	**$79,801,944**

4.0 Recommended Plan Design Cost Estimate

This section summarizes the development of a class 3 cost estimate for the Alternative 2 into the Recommended Plan. The estimates were developed in Q4 2023 prices.

4.1. Purpose

Once alternative 2 was selected as the project TSP and the Agency Decision Milestone (ADM) was secured, the team reviewed the alternative with more scrutiny to optimize the project scope and cost.

4.2. Quantities and Assumptions

This estimate is based on revised quantities and design sketches provided by the Unites States Army Corps of Engineers (USACE) CEPOA-EC-CW (Oliver) design engineer and included at the end of this appendix. For information on how the project design and scope was revised please see the H&H appendix.

4.3. Unit Prices

The unit prices used in the Class 3 Recommended Plan development estimate were determined by a combination of historical data, current material quotes, and cost models used in similar types of project estimates. These unit costs were adjusted to factor freight and local area mark-ups. A detailed breakdown of the costs can be viewed in attached item x. The following assumptions were made during the formation of this estimate:

- **Mobilization and Demobilization:** Assume mobilization and demobilization will occur April 2031 after award.
- **Breakwater construction:** Breakwater will be constructed first to protect the area that is assumed to require drilling and blasting prior to dredging. The material used to construct the breakwater is assumed to be sourced from Sand Point, Alaska. During PED the rock source will need to be verified.
    - **Rock Price Updates (based on recent historical bid data):**
        - A-Rock: $129/Ton
        - B-Rock: $93/Ton
        - Core Rock: $87.50/Ton
- **Drilling/Blasting:** Assume material will be taken from the LSF access road to build the causeway and a pad to drill and blast from.
- **Dredging:** Assumed that the dredging will be completed with an excavator from barge, following drilling and blasting. The dredging will include removing the built-up blast pad in addition to the blasted material. The unit cost for dredging was calculated using CEDEP spreadsheet.
- **LSF:** Assume access road will be excavated at the same time as the breakwater is being built. Assume material from excavation will be useable and used to build causeway, as well as building up a pad from which blasting will occur.

- **Project Markups:** The JOOH was changed from 30% running to a calculated percentage of 29.25%. Sub profit was increased from 8% to 10%. Project Markups are as follows.
    - Overtime Markups - 22.22%
    - Job Office Over Head - JOOH (calculated) – 29.25%
    - Home Office Overhead - HOOH (running) - 8%
    - Profit (running) - 8%
    - Sub Profit (running) - 10%
    - Bond - 2%

4.4. Contingencies

Once Alternative 2 was selected at the ADM, the team held a Cost and Schedule Risk Analysis meeting to discuss and further develop the risk involved with this alternative. The final contingency percentage was determined to be 50% and was applied to the project costs. The CSRA file can be viewed in attachment item.

4.5. Summary

The scope required in the recommended plan resulted in cost of $87,671,000 with a summary breakdown seen in the Certified Cost.

Note that LSF are shown in the Estimated Costs but are not included in the Project First Cost or the Fully Funded Cost because LSF costs are the responsibility of the sponsor.

WALLA WALLA COST ENGINEERING MANDATORY CENTER OF EXPERTISE

COST AGENCY TECHNICAL REVIEW

CERTIFICATION STATEMENT

For Project No. 495160

POA – Akutan Harbor Navigational Improvements Study

The Akutan Harbor Navigational Improvements Study, as 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 March 13, 2024, the Cost MCX certifies the estimated total project cost:

FY24 Project First Cost: $69,751,000
Fully Funded Amount: $87,671,000

Cost Certification assumes Efficient Implementation (Funding). 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 through the period of Federal Participation.

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Michael P. Jacobs, PE, CCE
Chief, Cost Engineering MCX
Walla Walla District

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: **Akutan Harbor Navigational Improvements Study**
PROJECT NO: 495160
LOCATION: Akutan, Alaska

DISTRICT: Alaska District **PREPARED: 3/6/2024**
POC: CHIEF, COST ENGINEERING, Karl Harvey

This Estimate reflects the scope and schedule in report; 0

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)						TOTAL PROJECT COST (FULLY FUNDED)			
						Program Year (Budget EC): 2024									
						Effective Price Level Date: 1 OCT 23									
WBS NUMBER	Civil Works Feature & Sub-Feature Description	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	ESC (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	Spent Thru: 1-Oct-23 ($K)	TOTAL FIRST COST ($K)	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J		K	L	M	N	O
10	Mob/Demob, Dredge/BW Const.	$3,677	$1,839	50.0%	$5,516	0.0%	$3,677	$1,839	$5,516	$0	$5,516	26.9%	$4,665	$2,332	$6,997
12	Mob/Demob, Drill/Blast	$3,576	$1,788	50.0%	$5,364	0.0%	$3,576	$1,788	$5,364	$0	$5,364	26.9%	$4,536	$2,268	$6,804
10	Breakwater	$14,380	$7,190	50.0%	$21,570	0.0%	$14,380	$7,190	$21,570	$0	$21,570	23.6%	$17,775	$8,888	$26,663
12	Dredge	$6,980	$3,490	50.0%	$10,470	0.0%	$6,980	$3,490	$10,470	$0	$10,470	26.9%	$8,855	$4,427	$13,282
12	Drill and Blast	$6,317	$3,158	50.0%	$9,475	0.0%	$6,317	$3,158	$9,475	$0	$9,475	26.9%	$8,013	$4,006	$12,019
12	Surveys	$584	$292	50.0%	$875	0.0%	$584	$292	$875	$0	$875	26.9%	$740	$370	$1,110
15	LSF Features	$5,057	$2,528	50.0%	$7,585	0.0%	$5,057	$2,528	$7,585	$0		LSF - Not included in Total Project Cost			
	CONSTRUCTION ESTIMATE TOTALS:	$40,570	$20,285		$60,856	0.0%	$40,570	$20,285	$60,856	$0	$53,271	9.9%	$44,583	$22,292	$66,875
01	LANDS AND DAMAGES	$80	$20	25.0%	$100	0.0%	$80	$20	$100	$0	$100	26.9%	$101	$25	$127
30	PLANNING, ENGINEERING & DESIGN	$4,883	$2,442	50.0%	$7,325	0.0%	$4,883	$2,442	$7,325	$0	$7,325	17.8%	$5,751	$2,875	$8,626
30	PLANNING, ENGINEERING & DESIGN - LSF	$695	$348	50.0%	$1,043		$695	$348	$1,043			LSF - Not included in Total Project Cost			
31	CONSTRUCTION MANAGEMENT	$6,037	$3,019	50.0%	$9,056	0.0%	$6,037	$3,019	$9,056	$0	$9,056	33.0%	$8,028	$4,014	$12,043
31	CONSTRUCTION MANAGEMENT - LSF	$860	$430	50.0%	$1,289		$860	$430	$1,289			LSF - Not included in Total Project Cost			
	PROJECT COST TOTALS:	$53,126	$26,543	50.0%	$79,669		$53,126	$26,543	**$79,669**	$0	**$69,751**	10.0%	$58,464	$29,207	$87,671

ESTIMATED TOTAL PROJECT COST: **$87,671**
GENERAL NAVIGATION FEATURES: *$66,875*

PROJECT FIRST COST: **$69,751**
LOCAL SERVICES FACILITIES COST: *$9,917.22*
LERR: *$100*

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CHIEF, COST ENGINEERING, Karl Harvey

CHIEF, PM-CW, Bruce Sexauer

CHIEF, REAL ESTATE, Matt Des Forge

****** TOTAL PROJECT COST SUMMARY ******

****** CONTRACT COST SUMMARY ******

PROJECT: Akutan Harbor Navigational Improvements Study
LOCATION: Akutan, Alaska

DISTRICT: Alaska District
POC: CHIEF, COST ENGINEERING, Karl Harvey

PREPARED: 3/6/2024

This Estimate reflects the scope and schedule in report; 0

Civil Works Work Breakdown Structure		ESTIMATED COST				PROJECT FIRST COST (Constant Dollar Basis)				TOTAL PROJECT COST (FULLY FUNDED)				
		Estimate Prepared: 6-Mar-24 Effective Price Level: 1-Oct-23				Program Year (Budget EC): 2024 Effective Price Level Date: 1 OCT 23								
				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	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	GNF ACTIVITIES													
10	Mob/Demob, Dredge/BW Const.	$3,677	$1,839	50.0%	$5,516	0.0%	$3,677	$1,839	$5,516	2033Q2	26.9%	$4,665	$2,332	$6,997
12	Mob/Demob, Drill/Blast	$3,576	$1,788	50.0%	$5,364	0.0%	$3,576	$1,788	$5,364	2033Q2	26.9%	$4,536	$2,268	$6,804
10	Breakwater	$14,380	$7,190	50.0%	$21,570	0.0%	$14,380	$7,190	$21,570	2032Q2	23.6%	$17,775	$8,888	$26,663
12	Dredge	$6,980	$3,490	50.0%	$10,470	0.0%	$6,980	$3,490	$10,470	2033Q2	26.9%	$8,855	$4,427	$13,282
12	Drill and Blast	$6,317	$3,158	50.0%	$9,475	0.0%	$6,317	$3,158	$9,475	2033Q2	26.9%	$8,013	$4,006	$12,019
12	Surveys	$584	$292	50.0%	$875	0.0%	$584	$292	$875	2033Q2	26.9%	$740	$370	$1,110
0		$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0		$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$35,514	$17,757	50.0%	**$53,271**		$35,514	$17,757	$53,271			$44,583	$22,292	$66,875
01	LANDS AND DAMAGES	$80	$20	25.0%	$100	0.0%	$80	$20	$100	2033Q2	26.9%	$101	$25	$127
30	PLANNING, ENGINEERING & DESIGN													
1.3%	Project Management	$444	$222	50.0%	$666	0.0%	$444	$222	$666	2028Q1	13.5%	$504	$252	$756
1.0%	Planning & Environmental Compliance	$355	$178	50.0%	$533	0.0%	$355	$178	$533	2028Q1	13.5%	$403	$202	$605
6.0%	Engineering & Design	$2,131	$1,065	50.0%	$3,196	0.0%	$2,131	$1,065	$3,196	2028Q1	13.5%	$2,419	$1,209	$3,628
1.0%	Reviews, ATRs, IEPRs, VE	$355	$178	50.0%	$533	0.0%	$355	$178	$533	2028Q1	13.5%	$403	$202	$605
0.5%	Life Cycle Updates (cost, schedule, risks)	$178	$89	50.0%	$266	0.0%	$178	$89	$266	2028Q1	13.5%	$202	$101	$302
0.5%	Contracting & Reprographics	$178	$89	50.0%	$266	0.0%	$178	$89	$266	2028Q1	13.5%	$202	$101	$302
1.5%	Engineering During Construction	$533	$266	50.0%	$799	0.0%	$533	$266	$799	2033Q2	33.0%	$708	$354	$1,063
1.0%	Planning During Construction	$355	$178	50.0%	$533	0.0%	$355	$178	$533	2033Q2	33.0%	$472	$236	$708
0.5%	Adaptive Management & Monitoring	$178	$89	50.0%	$266	0.0%	$178	$89	$266	2033Q2	33.0%	$236	$118	$354
0.5%	Project Operations	$178	$89	50.0%	$266	0.0%	$178	$89	$266	2028Q1	13.5%	$202	$101	$302
31	CONSTRUCTION MANAGEMENT													
12.0%	Construction Management	$4,262	$2,131	50.0%	$6,392	0.0%	$4,262	$2,131	$6,392	2033Q2	33.0%	$5,667	$2,834	$8,501
2.0%	Project Operation:	$710	$355	50.0%	$1,065	0.0%	$710	$355	$1,065	2033Q2	33.0%	$945	$472	$1,417
3.0%	Project Management	$1,065	$533	50.0%	$1,598	0.0%	$1,065	$533	$1,598	2033Q2	33.0%	$1,417	$708	$2,125
	CONTRACT COST TOTALS:	$46,514	$23,237		$69,751		$46,514	$23,237	**$69,751**			$58,464	$29,207	**$87,671**

****** TOTAL PROJECT COST SUMMARY ******

PROJECT: Akutan Harbor Navigational Improvements Study
LOCATION: Akutan, Alaska

DISTRICT: Alaska District
POC: CHIEF, COST ENGINEERING, Karl Harvey

PREPARED: 3/6/2024

This Estimate reflects the scope and schedule in report; 0

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		Estimate Prepared: 6-Mar-24 Effective Price Level: 1-Oct-23				Program Year (Budget EC): 2024 Effective Price Level Date: 1 OCT 23								
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	INFLATED (%)	COST ($K)	CNTG ($K)	FULL ($K)
A	B	C	D	E	F	G	H	I	J	P	L	M	N	O
	LSF ACTIVITIES													
12	Drill and Blast - Mooring Basin	$337	$168	50.0%	$505	0.0%	$337	$168	$505	2033Q2	26.9%	$427	$213	$640
08	Access Road	$1,153	$577	50.0%	$1,730	0.0%	$1,153	$577	$1,730	2033Q2	26.9%	$1,463	$732	$2,195
12	Causeway	$2,309	$1,155	50.0%	$3,464	0.0%	$2,309	$1,155	$3,464	2033Q2	26.9%	$2,929	$1,465	$4,394
12	Akutan Side Dock	$1,000	$500	50.0%	$1,500	0.0%	$1,000	$500	$1,500	2034Q3	31.0%	$1,310	$655	$1,965
12	Dredge - Mooring Basin	$258	$129	50.0%	$386	0.0%	$258	$129	$386	2033Q2	26.9%	$327	$163	$490
0		$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0		$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
0		$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
	CONSTRUCTION ESTIMATE TOTALS:	$5,057	$2,528	50.0%	**$7,585**		$5,057	$2,528	$7,585			$6,456	$3,228	$9,684
01	LANDS AND DAMAGES	$0	$0	0.0%	$0	0.0%	$0	$0	$0	0	0.0%	$0	$0	$0
30	PLANNING, ENGINEERING & DESIGN													
1.3%	Project Management	$63	$32	50.0%	$95	0.0%	$63	$32	$95	2033Q2	33.0%	$84	$42	$126
1.0%	Planning & Environmental Compliance	$51	$25	50.0%	$76	0.0%	$51	$25	$76	2033Q2	33.0%	$67	$34	$101
6.0%	Engineering & Design	$303	$152	50.0%	$455	0.0%	$303	$152	$455	2033Q2	33.0%	$403	$202	$605
1.0%	Reviews, ATRs, IEPRs, VE	$51	$25	50.0%	$76	0.0%	$51	$25	$76	2033Q2	33.0%	$67	$34	$101
0.5%	Life Cycle Updates (cost, schedule, risks)	$25	$13	50.0%	$38	0.0%	$25	$13	$38	2033Q2	33.0%	$34	$17	$50
0.5%	Contracting & Reprographics	$25	$13	50.0%	$38	0.0%	$25	$13	$38	2033Q2	33.0%	$34	$17	$50
1.5%	Engineering During Construction	$76	$38	50.0%	$114	0.0%	$76	$38	$114	2033Q2	33.0%	$101	$50	$151
1.0%	Planning During Construction	$51	$25	50.0%	$76	0.0%	$51	$25	$76	2033Q2	33.0%	$67	$34	$101
0.5%	Adaptive Management & Monitoring	$25	$13	50.0%	$38	0.0%	$25	$13	$38	2033Q2	33.0%	$34	$17	$50
0.5%	Project Operations	$25	$13	50.0%	$38	0.0%	$25	$13	$38	2033Q2	33.0%	$34	$17	$50
31	CONSTRUCTION MANAGEMENT													
12.0%	Construction Management	$607	$303	50.0%	$910	0.0%	$607	$303	$910	2033Q2	33.0%	$807	$403	$1,210
2.0%	Project Operation:	$101	$51	50.0%	$152	0.0%	$101	$51	$152	2033Q2	33.0%	$134	$67	$202
3.0%	Project Management	$152	$76	50.0%	$228	0.0%	$152	$76	$228	2033Q2	33.0%	$202	$101	$303
	CONTRACT COST TOTALS:	$6,611	$3,306		$9,917		$6,611	$3,306	**$9,917**			$8,524	$4,262	**$12,786**

****** CONTRACT COST SUMMARY ******

Design Maturity Determination for Cost Certification

Date: 3/12/24
P2 Designation/Project Name: Akutan Harbor Navigational Improvement Tribal Partnership Project

The Chief of Engineering is responsible for the technical content and engineering sufficiency for all engineering products produced by the command. As such, I have performed the Management Control Evaluation per Engineer Regulation (ER) 1110-2-1150, Engineering and Design for Civil Works Projects, Appendix H, Internal Management Control Review Checklist.

The current design DOES NOT require HQ approval (i.e., engineering waivers), requiring a deviation from mandatory requirements and mandatory standards, as defined in ERs, Engineering Manuals, Engineering Technical letters, and Engineering Circulars.

The current hydrology and hydraulics modeling is at 10 % design maturity, per reference (h) below.

The current geotechnical data and subsurface investigations are at 15 % design maturity, per reference (h) below. Subsurface investigations shall also include investigations of potential borrow and spoil areas.

The current survey data is at 100 % design maturity, per reference (h) below.

Other major technical and/or scope assumptions and risks include the following, which will be refined as the design progresses.

A geotechnical site investigation, integrated numerical model, and flume study need to be performed, the results of which can significantly impact the harbor design. The design for the ferry dock, causeway, uplands, and harbor access road are at 0%. These are local service facilities (LSF) that are currently assumed to be designed and constructed by the non-Federal sponsor. The information used for the cost estimate of the LSF was cross sectional areas and cubic yards of material. The non-Federal spnsor needs information from the geotechnical site investigation before they can begin design for the local service facilities.

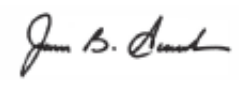
The aggregate for all features is 10 % design maturity. Therefore, per the CECW-EC memorandum dated 05-June-2023, I certify that the design deliverables used to generate the cost products for this project and the estimate meet the requirements for a CLASS 3 estimate, as per reference (a) below. Design risks, impacts and remaining efforts are summarized on page 2.

Considering risks and assumptions noted above, along with all other concerns documented in the Risk Register, the Cost and Schedule Risk Analysis has developed a contingency of 50 % at the 80 % confidence level for the defined project scope.

Chief of Engineering

James B. Sauceda, P.E.

Printed Name



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Signature

Design Maturity Determination for Cost Certification, Remaining Work

If an engineering waiver is required, list the risks and remaining design work needed to mitigate this issue in the current design. Identify remaining effort to complete the design required for 100% design.

N/A

Identify remaining effort to complete geotechnical design effort required for 100% design. List the risks and cost and schedule impacts needed to mitigate this issue in the current design.

An geotechnical site investigation is needed for the project. The site investigation will consisted of 20 off shore test borings and 5 onshore test borings. The site investigation will cost approximately 1.5 millions dollars and take 6 -12 months to complete. Results from the site investigation will be used to create a geotechnical data report and finalize geotechnical design requirements. The geotechnical report is required for the 30% design submittal so performing this effort during the PED phase could lead to delays in the project delivery. The current feasibility level design uses conservative estimates for the soil and rock characteristics within the proposed project site. There is a low risk to increasing project cost with the lack of geotechnical information.

Identify remaining effort required to complete H&H required for 100% design. List the risks and cost and schedule impacts needed to mitigate this issue in the current design.

An integrated numerical model such as ERDC Coastal Modeling System (CMS) coupled with ADCIRC will be performed in PED in order to determine a more accurate design wave and currents inside the harbor and at the toe of the breakwater for scour analysis. A flume study will be performed to verify breakwater armor stone size and stability, particularly for the lee side or rear slope armor stone. Results from the geotechnical investigation and numerical modeling can significantly affect the layout of the harbor, and results from the numerical modeling and flume study can significantly affect the breakwater cross section rock size and layer composition.

Identify remaining effort needed to complete survey data required for 100% design. List the risks and cost and schedule impacts needed to mitigate this issue in the current design.

N/A

If the project is anticipated to be executed in parts, provide a design assessment (percent complete) of each part/phase below.

N/A

References:

a. ER 1110-2-1302 – Civil Works Cost Engineering
b. CECW-EC memorandum dated 05-June-2023MFR, Guidance on Cost Engineering Products update for Civil Works Projects in accordance with Engineer Regulation 1110-2-1302 – Civil Works Cost Engineering
c. ER 1165-2-217 – Civil Works Review Policy
d. ER 1110-2-1150 – Engineering and Design for Civil Works Projects
e. ER 1110-3-12 – Quality Management
f. ER 1110-345-700 – Design Analysis, Drawings and Specifications
g. EM 5-1-11 – Project Delivery Business Process (PDBP)
h. Engineering and Construction Bulletin (ECB) 2023-9 – Civil Works Design Milestone Checklists

Design Maturity Determination for Cost Certification – Instructions

Paragraph 1 – Design Date: Use the drop-down menu to populate the date of the design.

Paragraph 1 – Project Information: Enter the P2 Project number and Project name.

Paragraph 3 – Engineering Waivers: Use the drop-down menu to populate this field with either "Does," or "Does not." If an engineering waiver is needed, or anticipated to be needed, provide the specific waiver required for the Project. A waiver is any deviation from current mandatory standards, as indicated.

Paragraph 4 – Hydrology and Hydraulics: Populate this field with the % design maturity.

Paragraph 5 – Geotechnical Information: Populate this field with the % design maturity.

Paragraph 6 – Survey Data: Populate this field with the % design maturity.

Paragraph 7 – Other Technical Assumptions and/or Scope: Enter any other major technical assumptions or scope assumptions here. Only include assumptions that pertain to design. Template discussion fields are provided as a courtesy. Please include additional pages as necessary.

Paragraph 8 – Signature: Print the name and title and provide the signature for the District's Chief of Engineering. This authority cannot be delegated; however, the Deputy Chief of Engineering and Design may sign the form in the absence of the Chief of Engineering. All fillable fields must be populated (use N/A if not applicable) in order for the document to be signed.

Page 2 – Remaining Work: Identify the current baseline design assumptions and the remaining design effort and risks to complete 100% design for the authorized project. If the project is to be broken into parts or phases, provide details on the aggregate design level of each phase and anticipated timeline for completion.

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Exhibit 1 – Feasibility Study Sketches

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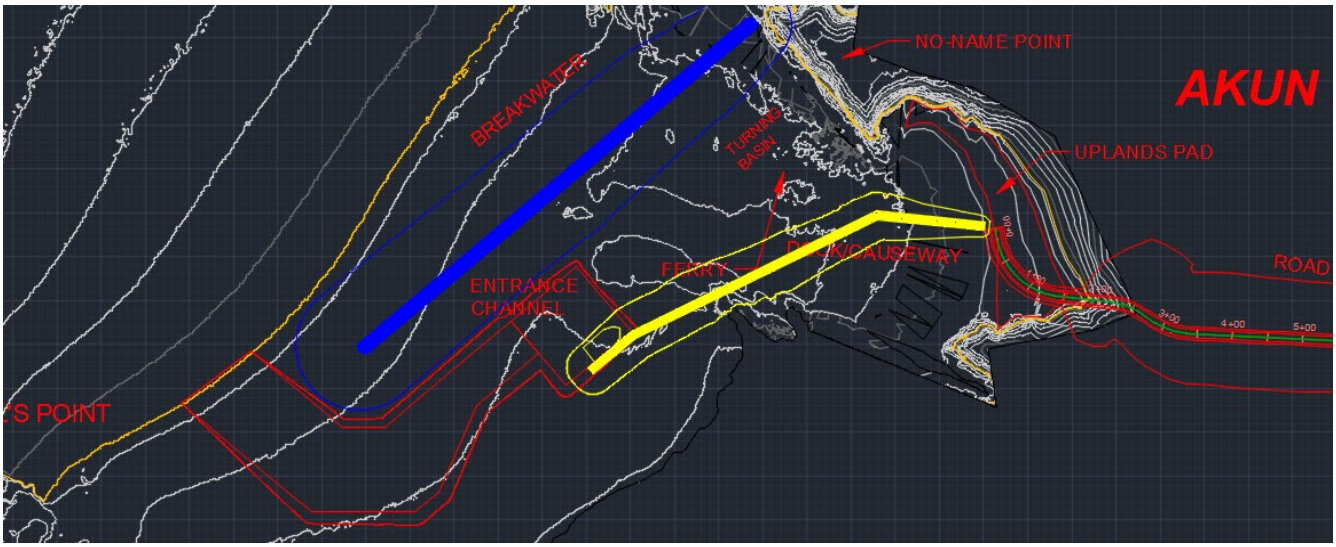
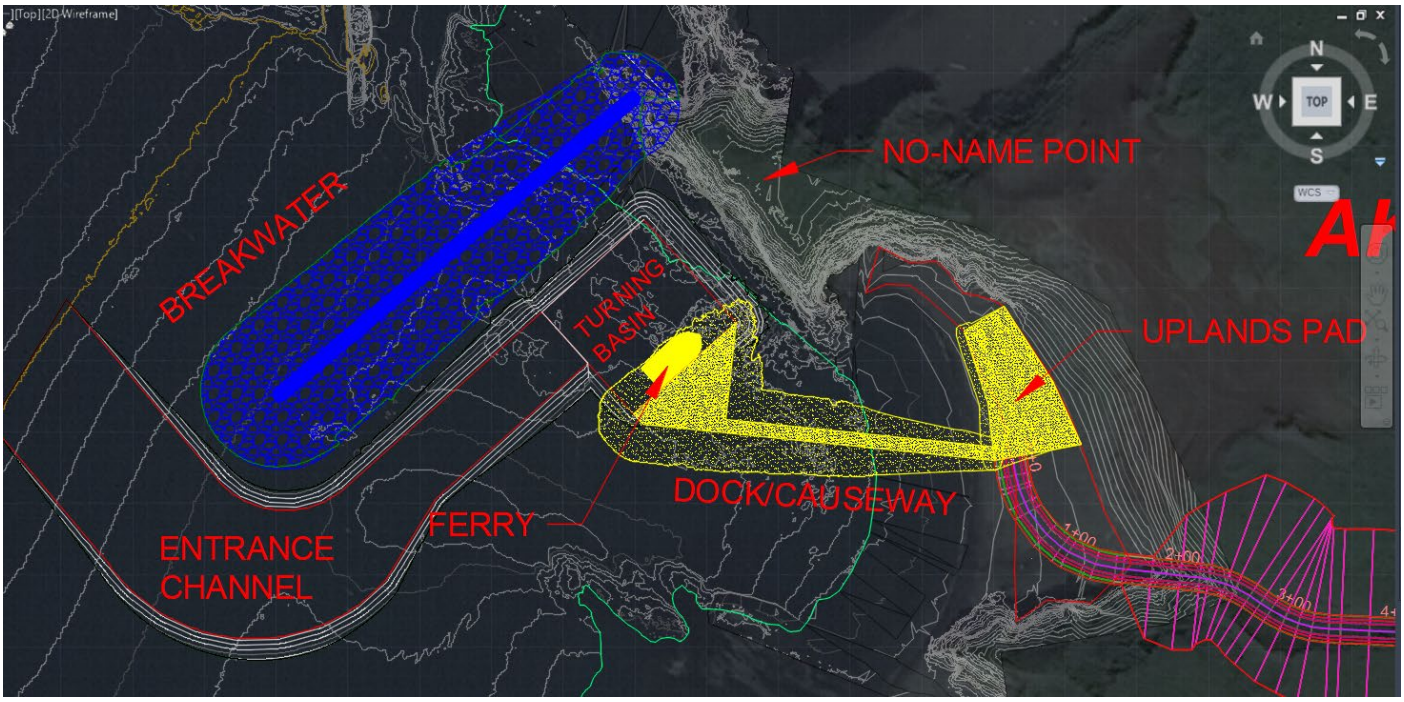
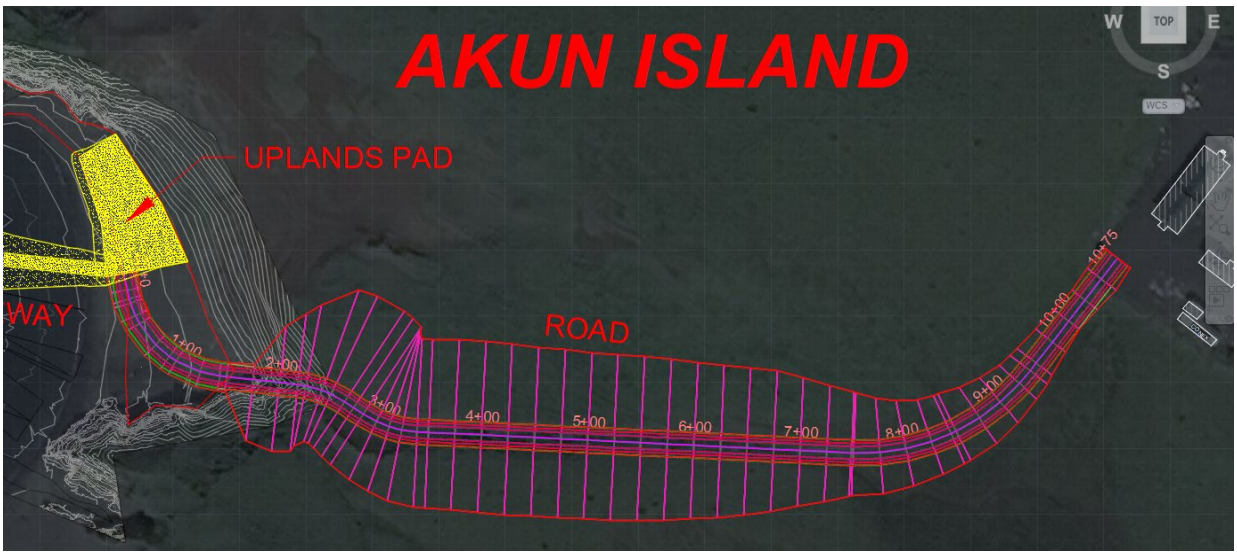
Road and Harbor Plan View for Alternative 1



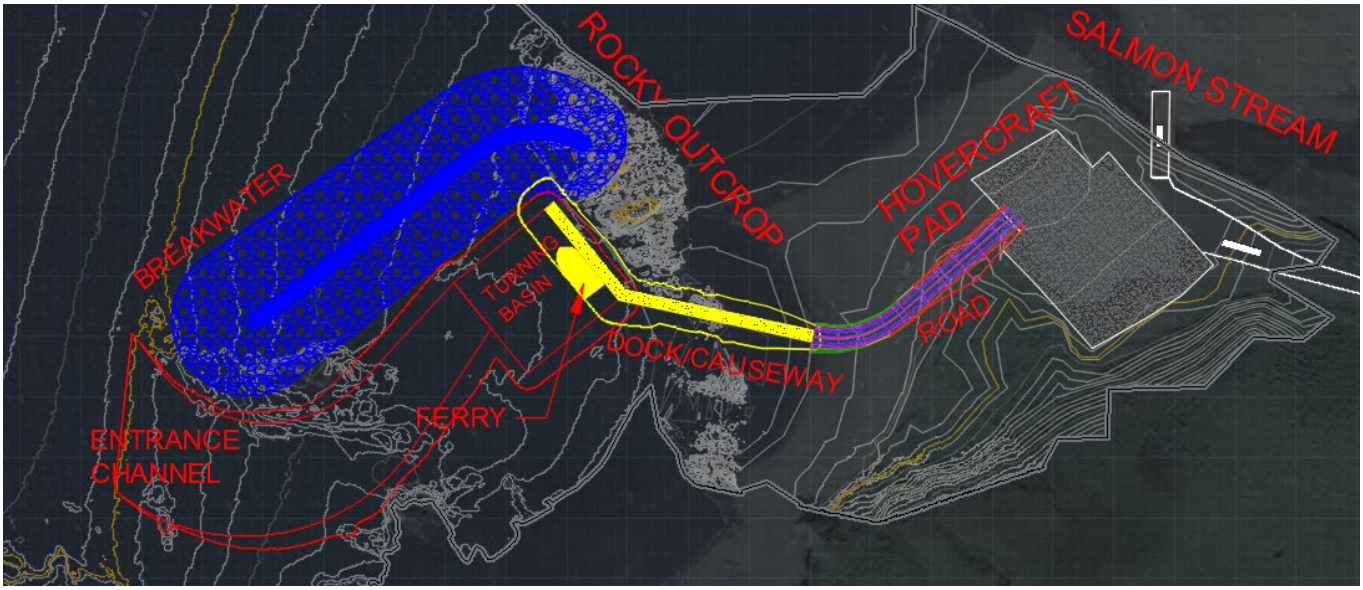
Harbor Plan View for Alternative 2



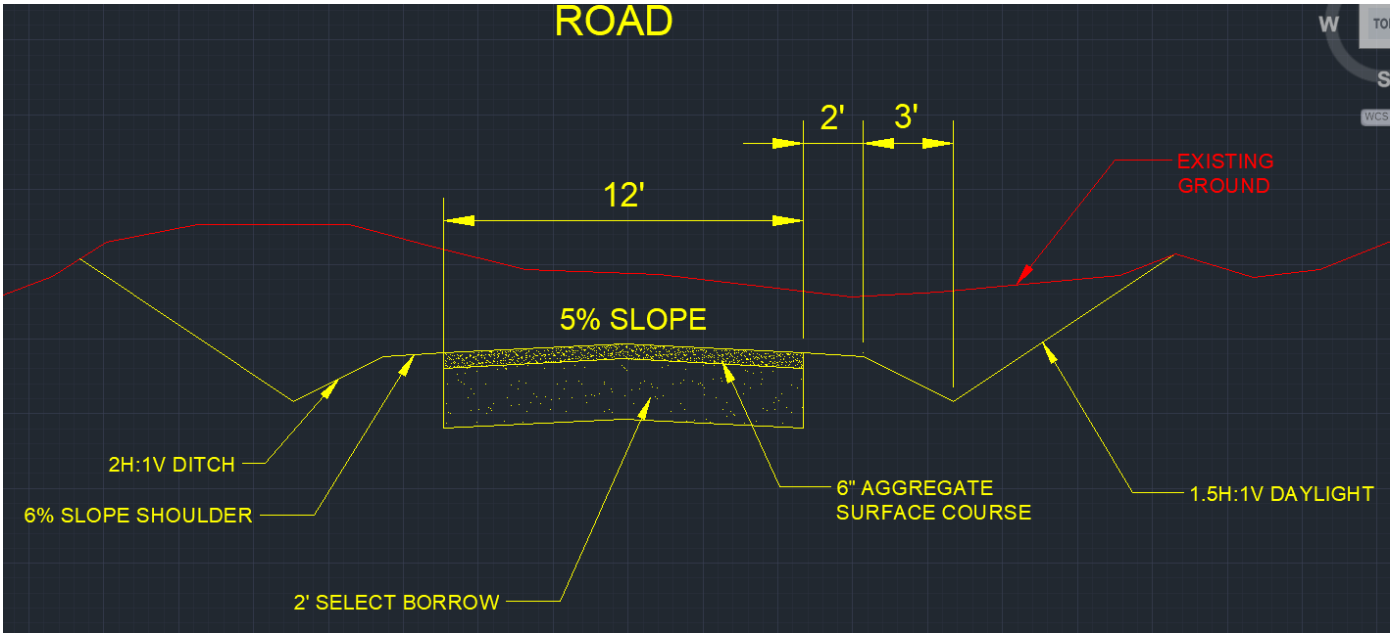
Road Plan View for Alternative 2



Road and Harbor Plan View for Alternative 2



Road Cross Section for Alternatives 1-3



Breakwater Cross Section for Alternatives 1 – 3

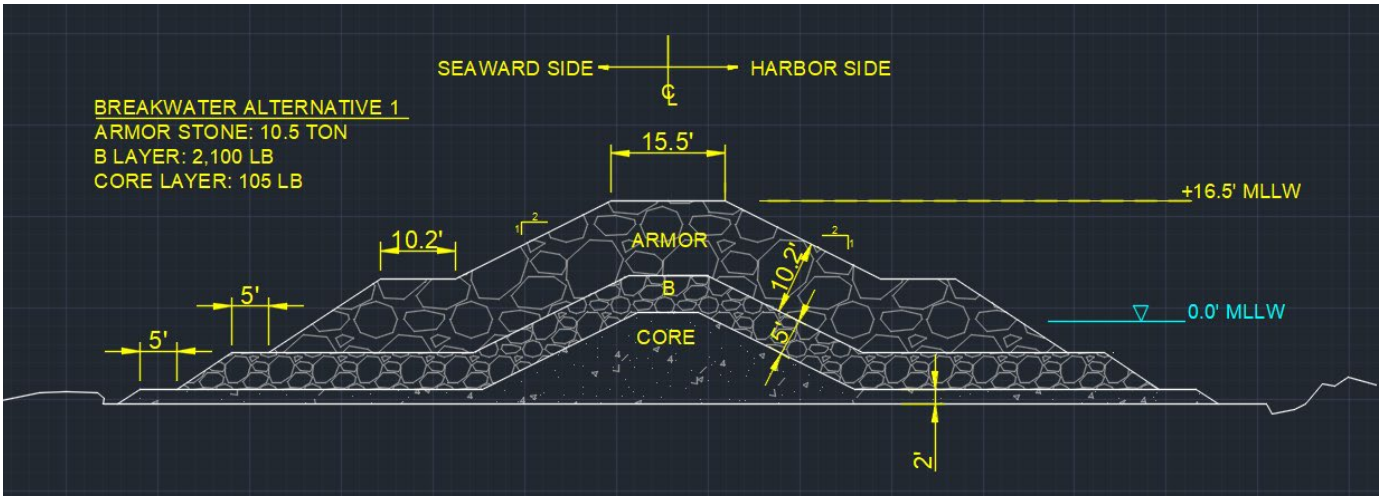


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Exhibit 2 – Preliminary Alternative Quantities

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Alternative 1 Preliminary quantities

Akutan Ferry Harbor Quantities (10/6/23)

Design condition in harbor	3ft allowable harbor wave
Entrance channel	-17ft MLLW + 2ft allowable overdepth (calcs to -19')
Turning basin	-14ft MLLW + 2ft allowable overdepth (calcs to -16')
Mooring basin	-14ft MLLW + 2ft allowable overdepth (calcs to -16')

Narrative: Alternative 1 breakwater would be constructed by water since blasting is not anticipated. Barge would enter entrance channel and begin dredging. Barge would continue to dredge to move through entrance channel and turning basin. Harbor material would be disposed of in water. Road materials would be stockpiled north of the salmon stream. Causeway and road would be constructed by sponsor to access harbor.

Breakwater (GNF)	**Stone Size** (lbs)	**Breakwater Length** (ft)	**Quantities**
Armor Rock (cy)	21,000		33,592
B Rock (cy)	2,100	715	20,352
Core Rock (cy)	105		16,998
Breakwater footprint (sqare feet)			68,140
Geotextile Fabric (not used)			

Dredging (GNF+LSF)	**Total Dredging**	**GNF (Entrance Channel)**	**GNF (Turning Basin)**	**LSF (Mooring Basin)**
Dredging (cy)	23,827	18,705	5,123	1,254
Dredging Area no grading (sq ft)	71,716	57,316	12,000	2,400
Dredge Area total incl 2H:1V grading (sq ft)	90,869	71,970	16,499	2,400
Dredge area needing blasting (sq ft)	-	-	-	-
Blasting Average Depth (ft)	-	-	-	-
Dredge material for in water disposal (cy)	8,697			

Causeway (LSF)	
Causeway width (ft)	12
Causeway Length (ft)	560
Causeway volume (cy)	14,630
Causeway surface area w/ 2:1 slope (sq ft)	45,760
Sheetpile bulkhead length (ft) for vessel mooring	120
Sheetpile bulkhead height (ft)	28
Driven to -20'MLLW	
Mooring dolphins (#)	2
Uplands Pad on beach (cy)	500
Uplands Pad on beach surface area (sq ft)	7,300
Area for loading/unloading freight from dock. Fill above mean higher high water of +4' MLLW to elevation +8' MLLW	

Road (LSF)	
Road Length (ft)	1075
Road Width (ft)	12
Shoulder Width (ft)	2
Earthwork excavation (cy)	59,494
Earthwork fill (cy)	500
Road earthwork excavation for temporary stockpile N of salmon stream (cy)	58,039
Distance material will need to be hauled from road to stockpile each way (miles)	0.5
6" Aggregate Surface Course (cy)	239
2' Select Borrow Fill (cy)	956

Maintenance Dreding (GNF)	
Maintenance Dredging (10% every 10 years)	2,383
Armor Rock replacement (5% every 25 years)	3,359

Alternative 2 Preliminary Quantities

Akutan Ferry Harbor Quantities (10/4/23)

Design condition in harbor	3ft allowable harbor wave
Entrance channel	-17ft MLLW + 2ft allowable overdepth (calcs to -19')
Turning basin	-14ft MLLW + 2ft allowable overdepth (calcs to -16')
Mooring basin	-14ft MLLW + 2ft allowable overdepth (calcs to -16')

Narrative: Alternative 2 breakwater would be constructed by water. Road would be excavated from the top pad down to the beach. Material from the road would be put in water to create a causeway. Material would continue to brought out along the causeway to fill the turning basin and area of entrance channel needing blasting to an elevation of mean higher high water (+4'MLLW). Blasting would occur "by land". Road material and new blasted material would be removed stockpiled north of the salmon stream. Causeway and road would be turned over from GNF to LSF to access harbor.

Breakwater (GNF)	**Stone Size** (lbs)	**Breakwater Length** (ft)	**Quantities**	
Armor Rock (cy)	13,000		12,669	Total vol xs calc
B Rock (cy)	1,300	400	6,111	29,452
Core Rock (cy)	65		7,292	Total vol measured CAD
Breakwater footprint (sqare feet)			57,330	23,960
Geotextile Fabric (not used)				

Dredging (GNF+LSF)	**Total Dredging**	**GNF (Entrance Channel)**	**GNF (Turning Basin)**	**LSF (Mooring Basin)**
Material generated by road brough in to build causeway to reach the turning basin and entrance channel	8,090			
Material generated by road brought in to fill the turning basin and entrance channel to MHHW (+4'MLLW) for blasting	48,808	35,705	8,630	2,237
Dredging (cy)	27,374	20,025	6,094	1,254
Dredging Area no grading (sq ft)	73,360	58,960	12,000	2,400
Dredge Area total incl 2H:1V grading (sq ft)	98,850	74,690	20,133	4,027
Dredge area needing blasting (sq ft)	59,310	39,177	20,133	4,027
Blasting Average Depth (ft)	7.5	7.2	8.2	8.4
Dredge material to be stored north of Salmon Stream	27,374			
Distance material will need to be hauled from beach up the road to the stockpile each way (miles)	0.75			

Causeway (GNF to LSF)	
Causeway width (ft)	12
Causeway Length (ft)	310
Causeway volume (cy)	8,090
Causeway surface area w/ 2:1 slope (sq ft)	29,700
Sheetpile bulkhead length (ft) for vessel mooring	120
Sheetpile bulkhead height (ft)	28
Driven to -20'MLLW	
Mooring dolphins (#)	2
Uplands Pad on beach (cy)	500
Uplands Pad on beach surface area (sq ft)	7,300
Area for loading/unloading freight from dock. Fill above mean higher high water of +4' MLLW to elevation +8' MLLW	

Road (GNF to LSF)	
Road Length (ft)	1075
Road Width (ft)	12
Shoulder Width (ft)	2
Earthwork excavation (cy)	59,494
Earthwork fill (cy)	500
Road earthwork excavation for temporary stockpile N of salmon stream (cy)	58,039
Distance material will need to be hauled from road to stockpile each way (miles)	0.5
6" Aggregate Surface Course (cy)	239
2' Select Borrow Fill (cy)	956

Maintenance Dreding (GNF)	
Maintenance Dredging (10% every 10 years)	2,737
Armor Rock replacement (5% every 25 years)	729

Alternative 3 Preliminary Quantities

Akutan Ferry Harbor Quantities (10/6/23)

Design condition in harbor	3ft allowable harbor wave
Entrance channel	-17ft MLLW + 2ft allowable overdepth (calcs to -19')
Turning basin	-14ft MLLW + 2ft allowable overdepth (calcs to -16')
Mooring basin	-14ft MLLW + 2ft allowable overdepth (calcs to -16')

Narrative: Alternative 3 breakwater would be constructed by land by bringing in fill to create a causeway from the hovercraft pad. Dredging of the harbor would be done by water. The barge would enter entrance channel and begin dredging. Blasting would occur in water as rock is encountered. Barge would continue to blast to move through entrance channel and turning basin. Harbor material would be disposed of in water. Causeway from hovercraft pad would be turned over to sponsor.

Breakwater (GNF)			
	Stone Size (lbs)	**Breakwater Length** (ft)	**Quantities**
Armor Rock (cy)	23,000		#DIV/0!
B Rock (cy)	2,300	400	#DIV/0!
Core Rock (cy)	115		#DIV/0!
Breakwater footprint (sqare feet)			68,140
Geotextile Fabric (not used)			

Dredging (GNF+LSF)				
	Total Dredging	**GNF (Entrance Channel)**	**GNF (Turning Basin)**	**LSF (Mooring Basin)**
Dredging (cy)	23,031	16,587	5,189	1,254
Dredging Area no grading (sq ft)	59,680	45,280	12,000	2,400
Dredge Area total incl 2H:1V grading (sq ft)	80,068	57,778	18,263	4,027
Dredge area needing blasting (sq ft)	64,054	45,791	18,263	4,027
Blasting Average Depth (ft)	7.8	7.8	7.7	8.4
Dredge material for in water disposal (cy)	19,306			

Causeway (LSF)	
Causeway width (ft)	12
Causeway Length (ft)	320
Causeway volume (cy)	3,725
Causeway surface area w/ 2:1 slope (sq ft)	18,190
Sheetpile bulkhead length (ft) for vessel mooring	120
Sheetpile bulkhead height (ft)	28
Driven to -20'MLLW	
Mooring dolphins (#)	2
Uplands Pad on beach (use existing hovercraft pad)	-
Uplands Pad on beach surface area (use existing hovercraft pad)	-
Area for loading/unloading freight from dock.	

Road (LSF)	
Road Length (ft)	250
Road Width (ft)	12
Shoulder Width (ft)	2
Earthwork excavation (cy)	550
Earthwork fill (cy) - use road earthwork excavation	100
Stockpile of leftover road material on hovercraft pad (cy)	228
20'x20'x15' stockpile	
6" Aggregate Surface Course (cy)	56
2' Select Borrow Fill (cy) - use road earthwork excavation	222

Maintenance Dreding (GNF)	
Maintenance Dredging (10% every 10 years)	2,303
Armor Rock replacement (5% every 25 years)	#DIV/0!

Exhibit 3 – Cost and Schedule Risk Analysis

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Cost Summary for Risk Register Development

Project: Akutan Harbor Navigational Improvements Study
Project Development Stage/Alternative: Report Update
Risk Category: Moderate Risk: Typical Project or Possible Life Safety
Meeting Date: 1/11/2024

Schedule Duration — Apr-2031 (From (Month/Year)) — Dec-2034 (From (Month/Year))

Schedule Duration: 44.0 Months — 53% (Schedule Contingency)

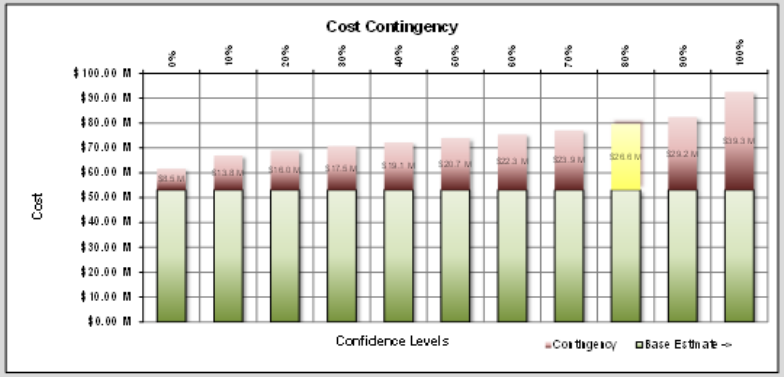
80% Finish Date: Nov-2036

	WBS	Feature of Work	Base Cost	80% Confidence	80% Confidence ($)	80% Total
	Risk Not included within CSRA Model					
	01 LANDS AND DAMAGES	Real Estate	$ 75,000	25%	$ 18,750	$ 93,750
	Risk included within CSRA Model					
1	32 01 MOB, DEMOB & PREPARATORY WORK	Mobilization and Demobilization (Fed)	$ 7,253,034	50%	$ 3,626,517	$ 10,879,551
2	10 BREAKWATERS AND SEAWALLS	Break Water Construction (Fed)	$ 14,380,101	50%	$ 7,190,051	$ 21,570,152
3	08 01 ROADS	Access Road (Non-Fed)	$ 1,153,327	50%	$ 576,664	$ 1,729,991
4	12 NAVIGATION, PORTS AND HARBORS	Drill/Blast and Excavate/Haul (Fed and Non-Fed)	$ 6,653,307	50%	$ 3,326,654	$ 9,979,961
5	12 NAVIGATION, PORTS AND HARBORS	Dredging (Fed and Non-Fed)	$ 7,237,960	50%	$ 3,618,980	$ 10,856,940
6	12 NAVIGATION, PORTS AND HARBORS	Survey	$ 583,565	50%	$ 291,783	$ 875,348
7	12 NAVIGATION, PORTS AND HARBORS	Causeway with Sheetpile Bulkhead (Non-fed)	$ 2,309,097	50%	$ 1,154,549	$ 3,463,646
8		Akutan Side Dock	$ 1,000,000	50%	$ 500,000	$ 1,500,000
9			$ -	0%	$ -	$ -
10			$ -	0%	$ -	$ -
11			$ -	0%	$ -	$ -
12			$ -	0%	$ -	$ -
13			$ -	0%	$ -	$ -
14			$ -	0%	$ -	$ -
15			$ -	0%	$ -	$ -
16			$ -	0%	$ -	$ -
17			$ -	0%	$ -	$ -
18			$ -	0%	$ -	$ -
19			$ -	0%	$ -	$ -
20			$ -	0%	$ -	$ -
21			$ -	0%	$ -	$ -
22			$ -	0%	$ -	$ -
23	DDC Costs	Planning, Engineering, & Design	$ 5,700,000	50%	$ 2,850,000	$ 8,550,000
24	S&A	Construction Management	$ 6,900,000	50%	$ 3,450,000	$ 10,350,000
XX	FIXED DOLLAR RISK ADD (EQUALLY DISPERSED TO ALL, MUST INCLUDE JUSTIFICATION SEE BELOW)				$ -	

Totals					
Real Estate	$ 75,000	25%	$ 18,750	$ 93,750.00	
Total Construction Estimate	$ 40,570,391	50%	$ 20,285,196	$ 60,855,587	
Total Planning, Engineering & Design	$ 5,700,000	50%	$ 2,850,000	$ 8,550,000	
Total Construction Management	$ 6,900,000	50%	$ 3,450,000	$ 10,350,000	
Total without Real Estate	$ 53,170,391	50%	$ 26,585,196	$ 79,755,587	
Total with Real Estate	$ 53,245,391	50%	$ 26,603,946	$ 79,849,337	
PROGRAMMED AMOUNT (IF KNOWN)				$0	

Project: Akutan Harbor Navigational Improvements Study **Overall Risk Level** Cost: High Schedule: Medium

Location: Akutan, Alaska



Contingency on Base Estimate		80% Confidence Project Cost
Base Estimate ->	$53,170,391	
Estimate Contingency ->	$26,585,196	50%
Base Estimate w/ Contingency (80% Confidence) ->	$79,755,587	

Contingency on Base Schedule		80% Confidence Project Schedule
Base Schedule Start Date ->	April 1, 2031	
Base Schedule Finish Date ->	December 1, 2034	
Base Schedule Duration ->	44.0 Months	53%
Schedule Contingency Duration ->	23.3 Months	
Base Schedule w/ Contingency (80% Confidence) ->	67.4 Months	
Base Finish Date w/ Contingency (80% Confidence) ->	November 11, 2036	

Project Description

Alternative 2 breakwater would be constructed by water. Road would be excavated from the top pad down to the beach. Material from the road would be put in water to create a causeway. Material would continue to brought out along the causeway to fill the turning basin and area of entrance channel needing blasting to an elevation of mean higher high water (+4'MLLW). Blasting would occur "by land". Road material and new blasted material would be removed stockpiled north of the salmon stream. Causeway and road would be turned over from GNF to LSF to access harbor.

TOP COST RISKS

	Risk/Opportunity Event	Risk Event Description	PDT Discussions on Impact and Likelihood	Risk Level: Cost	Risk Level: Schedule	Suggested Risk Reduction Measures (Avoid, Escalate, Exploit, Transfer/Share, Mitigate/Enhance, or Accept)
4	Solicitation Delays due to PLA Law	New law requiring Project Labor Agreements for thos >$35M will increase duration for solicitation process and could cause costs variations	The PLA law is new and if standing by the time this project is solicited, will be a requirement. This is known to require a longer solicitation duration but its' not known how it will impact project cost.	Medium	Medium	
5	Excess excavated material from entrance basin and road - disposal location	•Current assumption is excavated material from road will be hauled to placement area north of Salmon Stream. • This area will change during PED per PDT input. There is no definate location identified, but the preferred location is old quarry pit used for runway construction.	• The current estimate includes cost for a bridge upgrade to cross Salmon Stream and construction of a temporary haul road. This scope is not defined and its likely additional information will change cost assumptions during PED. • The preferred location north of the runway that may happend during PED has not been looked at for land acquistion, or studied as a permissible place to temporarily store excess cut material. • If quarry pit is approved during PED, the temporary haul road and bridge upgrades would not be needed but the haul distance may be greater, but the haul distance would be greater. • possible conflicts with active runway to use quarry pit could cause cost impacts	Medium	Low	
6	Manuvering basin is lacking geotech information	•Information pertaining to the near shore geotech conditions of the dredge material is still incomplete. • Baseline assumption is blasting will be required in at least part of the basin. -	No boreholes exist for the near shore geotech area and the geophysical survey does not cover the entire dredge prism. Once information is obtained it could affect dredging costs estimates during PED phase by redefining the geotech assumptions and requireing more blasting. Assume the area to blast could double increasing that cost by 50%	High	Medium	
7	Rock material costs and source	• Potential for rock costs to fluctuate from current unit price used in baseline estimate • Sand Point quarry is assumed source. Concern that a quarry farther away will be required if SP is not open or has material.	• Project construction is 5+ years out and forcasting rock costs is not guaranteed. • Other large civil works projects requiring armor rock are anticipated to be in demand of rock from the same quarry. • Shortage of operating quarries and pricing info, so cost impacts are likely. Variations in unit price of rock of just 20% could impact overall project cost • Quarry farther away would increase transport cost for rock	Medium	Low	
8	Low and Other Risks Not Modeled Elsewhere	Current Cost estimate is level 3.	This risk is intended to capture smaller risks that are not captured elsewhere in the estimate.	Medium	Low	
9	Additional Mob	Extra mob due to weather delay	assumed duration of project would require 3 seasons. Very possible due to weather, rock production supply chain, availability of personal, that an additional season would be needed. Assume additional mob.	Medium	Medium	
10	Unknown near shore bathymetry	Bathymetry cannot be collected in the nearshore zone due to the small tide range and safety concerns for operating a vessel in shallow waters near an apparent rocky shoreline. Bathymetry will be interpolated from deeper waters to the base of the shoreline where data can be collected by terrestrial methods.	This lack of data produces uncertainties in breakwater and dredging quantities and produces more uncertainty of the character of bottom materials. If interpolation/assumptions are incorrect, it could lead to increased project cost and non-performace of the project	High	Low	
15	In-water work delay due to weather (no where to hide)	the breakwater construction is assumed to be done via in-water equipment and placement for the core, C and B layers until above water level. Then place equipment on crest and place the remaining in the dry.	This site is not protected and any construction with equipment in-water will be subject to this exposure. There is high likelihood that placement in water will be delayed at times due to storms, sea conditions ect. This will cause delays in placement and additional costs for equipment to be moved to protection. This may also cause situations where rework will be required for placed material that is not protected that is moved due to storms.	High	High	

16	Access Pads for D/B and Dredging	The current assumed sequence is for contractor to use cut material from road construction to build causeway core, and access pads for drilling/blasting crews and for dredging after d/b is finished. Quantities of fill and effort is estimated and may be understated	The current assumed means and methods of construction is to use cut excess material for constructing the core of the Causeway and access pads in the mooring and entrance channel. This means and method will require a lot of double handling of material but will eliminate a lot of floating plant that may be subject to weather events and need to be protected. Estimates for quantities were made but depending on equipment available, quality of the material being used for this purpose, there is a likely risk that this quantity and level of effort could be underestimated during execution. Also the quality of the material has to be conducive to this method (ie it can't be high in fines that would not support equipment or wash away during storms and high current events). Without geotech this could require more material be imported from a quarry.	High	High	
17	Entrance Channel Size/Width	The size, width, depth of the current concept designed Entrance Channel may be optimized during PED. Changes may result in increased quantities of dredging required	Dredge quantities are based on the current design configuation shown but it's likely that it will need to be raised and quantities will increase.	Medium	Low	

TOP SCHEDULE RISKS

Risk/Opportunity Event		Risk Event Description	PDT Discussions on Impact and Likelihood	Risk Level		Suggested Risk Reduction Measures (Avoid, Escalate, Exploit, Transfer/Share, Mitigate/Enhance, or Accept)
				Cost	Schedule	
4	Solicitation Delays due to PLA Law	New law requiring Project Labor Agreements for thos >$35M will increase duration for solicitation process and could cause costs variations	The PLA law is new and if standing by the time this project is solicited, will be a requirement. This is known to require a longer solicitation duration but its' not known how it will impact project cost.	Medium	Medium	
6	Manuvering basin is lacking geotech information	•Information pertaining to the near shore geotech conditions of the dredge material is still incomplete. • Baseline assumption is blasting will be required in at least part of the basin. •	No boreholes exist for the near shore geotech area and the geophysical survey does not cover the entire dredge prism. Once information is obtained it could affect dredging costs estimates during PED phase by redefining the geotech assumptions and requiring more blasting. Assume the area to blast could double increasing that cost by 50%	High	Medium	
9	Additional Mob	Extra mob due to weather delay	assumed duration of project would require 3 seasons. Very possible due to weather, rock production supply chain, availability of personal, that an additional season would be needed. Assume additional mob.	Medium	Medium	
15	In-water work delay due to weather (no where to hide)	the breakwater construction is assumed to be done via in-water equipment and placement for the core, C and B layers until above water level. Then place equipment on crest and place the remaining in the dry.	This site is not protected and any construction with equipment in-water will be subject to this exposure. There is high likelihood that placement in water will be delayed at times due to storms, sea conditions ect. This will cause delays in placement and additional costs for equipment to be moved to protection. This may also cause situations where rework will be required for placed material that is not protected that is moved due to storms.	High	High	
16	Access Pads for D/B and Dredging	The current assumed sequence is for contractor to use cut material from road construction to build causeway core, and access pads for drilling/blasting crews and for dredging after d/b is finished. Quantities of fill and effort is estimated and may be understated	The current assumed means and methods of construction is to use cut excess material for constructing the core of the Causeway and access pads in the mooring and entrance channel. This means and method will require a lot of double handling of material but will eliminate a lot of floating plant that may be subject to weather events and need to be protected. Estimates for quantities were made but depending on equipment available, quality of the material being used for this purpose, there is a likely risk that this quantity and level of effort could be underestimated during execution. Also the quality of the material has to be conducive to this method (ie it can't be high in fines that would not support equipment or wash away during storms and high current events). Without geotech this could require more material be imported from a quarry.	High	High	

Akutan Harbor Navigational Improvements Study
January 2024
Confidence Level Being Reported -> 80%

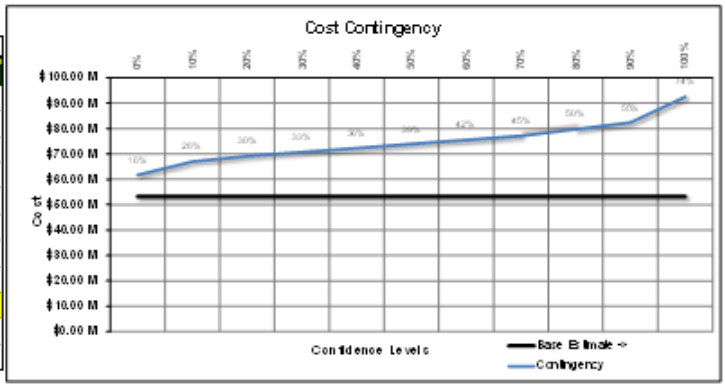
Contingency on Base Estimate	80% Confidence Project Cost	
Base Estimate ->	$53,170,391	
Estimate Contingency ->	$26,585,196	50%
Base Estimate w/ Contingency (80% Confidence) ->	$79,755,587	

Contingency on Base Schedule	80% Confidence Project Schedule	
Base Schedule Start Date ->	April 1, 2031	
Base Schedule Finish Date ->	December 1, 2034	
Base Schedule Duration ->	44.0 Months	
Schedule Contingency Duration ->	23.3 Months	53%
Base Schedule w/ Contingency (80% Confidence) ->	67.4 Months	
Base Finish Date w/ Contingency (80% Confidence) ->	November 11, 2036	

- PROJECT CONTINGENCY DEVELOPMENT -

INITIAL CONSTRUCTION
Contingency Analysis

Base Estimate ->	$53,170,391	
Confidence Level	Contingency Value	Contingency
0%	8,507,263	16%
10%	13,824,302	26%
20%	15,951,117	30%
30%	17,546,229	33%
40%	19,141,341	36%
50%	20,736,452	39%
60%	22,331,564	42%
70%	23,926,676	45%
80%	26,585,196	50%
90%	29,243,715	55%
100%	39,346,089	74%



- SCHEDULE CONTINGENCY (DURATION) DEVELOPMENT -

Contingency Analysis

Base Schedule Duration ->	44.0 Months	
Confidence Level	Contingency Value	Contingency
0%	3.1 Months	7%
10%	10.6 Months	24%
20%	12.8 Months	29%
30%	14.5 Months	33%
40%	16.3 Months	37%
50%	17.6 Months	40%
60%	19.4 Months	44%
70%	21.1 Months	48%
80%	23.3 Months	53%
90%	26.4 Months	60%
100%	39.6 Months	90%