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# **Akutan Harbor Navigational Improvements Study**

## **Appendix D: Cost Engineering**

### **Akutan, Alaska**



**May 2023**



**U.S. Army Corps  
of Engineers**  
Alaska District

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## **1. APPENDIX 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 pile supported docks, 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 split scow barge, and disposing in open water within 5 nautical miles of the project site. A large portion of the dredged material in Alternative B and Alternative C is assumed to require blasting before dredging may be completed.
- **Local Service Facilities (LSF): Fill material, rock for roads, and upland structure are assumed to require quarry sourcing.**
- Schedule: The construction is assumed to require 2 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
- Pre-Construction Engineering and Design (PED) and Supervision, Inspection, and Overhead (SIOH) are allowances
- The estimated index (date of development) is April 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. An abbreviated risk analysis (ARA) will be prepared for the different alternatives.

### **3.5. Summary**

The three alternatives evaluated were estimated to range in costs from approximately \$57 million to \$87.5 million as seen in Table 1.

Table 1. Alternatives and Total Costs

<b>Cost Description</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>
Mobilization and Demobilization	\$1,927,838	\$3,701,876	\$3,701,876
Dredging (Drill/Blast/Dredge)	\$786,000	\$7,908,400	\$5,441,300
Breakwater	\$41,501,072	\$15,763,920	\$21,124,025
LSF Uplands	\$5,961,440	\$4,793,130	\$3,383,852
Archaeological Monitoring & Mitigation	\$566,340	\$566,340	\$391,684
Akutan Side: Dock	\$1,000,000	\$1,000,000	\$1,000,000
S&A (7.5%)	\$3,880,702	\$2,530,025	\$2,628,205
PED (5.0%)	\$2,587,135	\$1,686,683	\$1,752,137
Contingency (50%)	\$29,105,263	\$18,975,187	\$19,711,540
<b>Total</b>	<b>\$87,315,789</b>	<b>\$56,925,561</b>	<b>\$59,134,619</b>

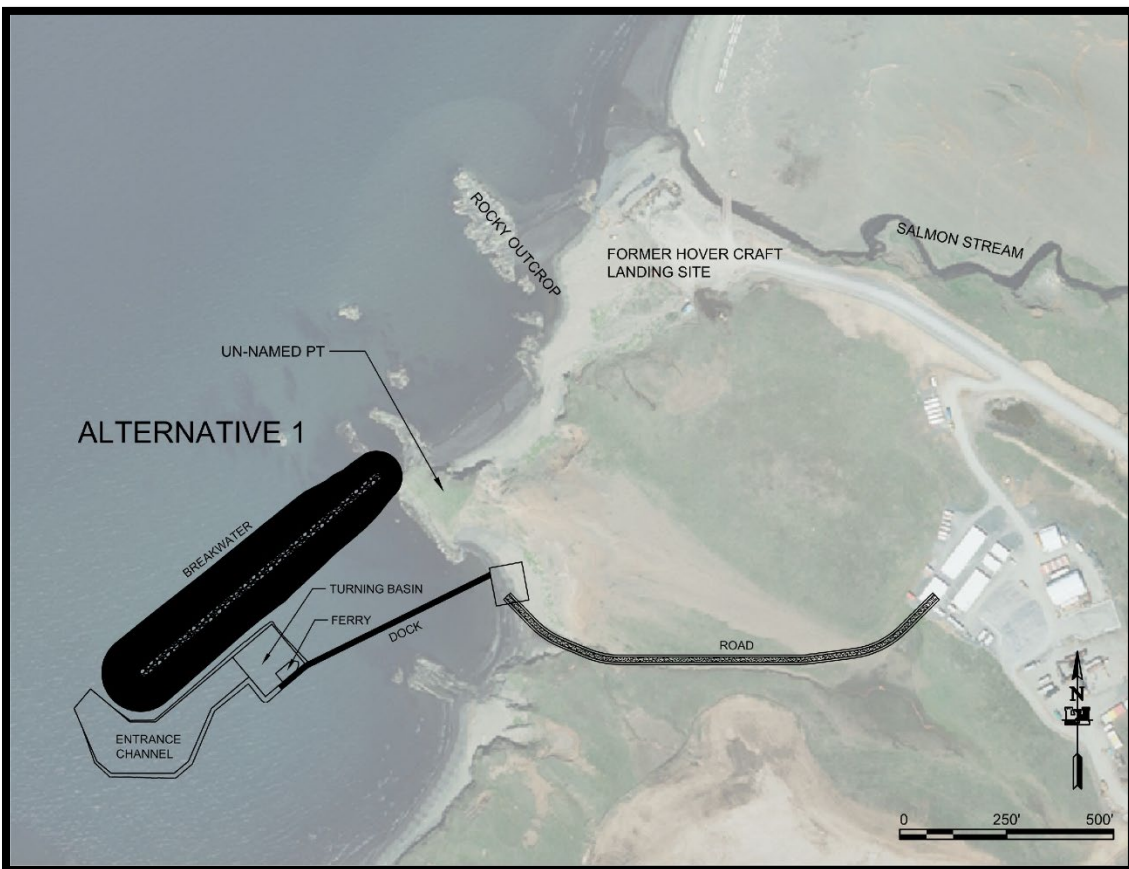
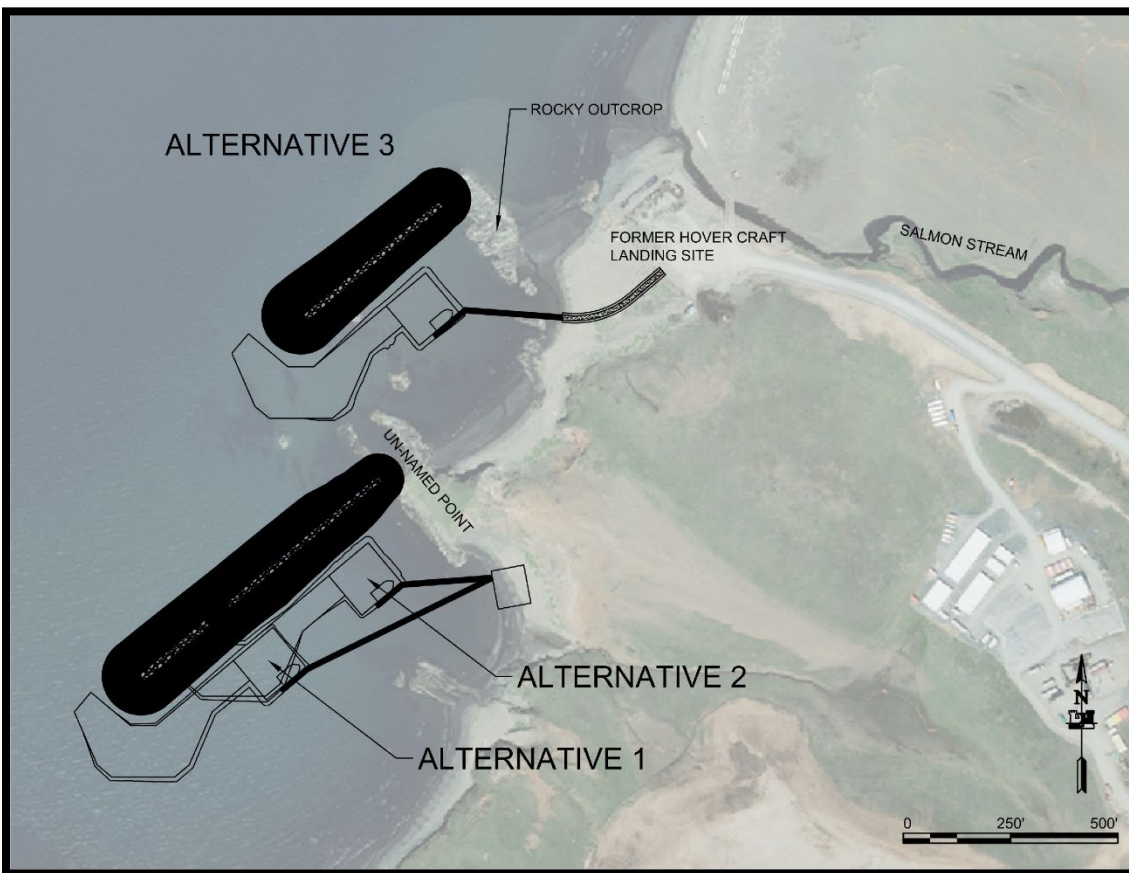


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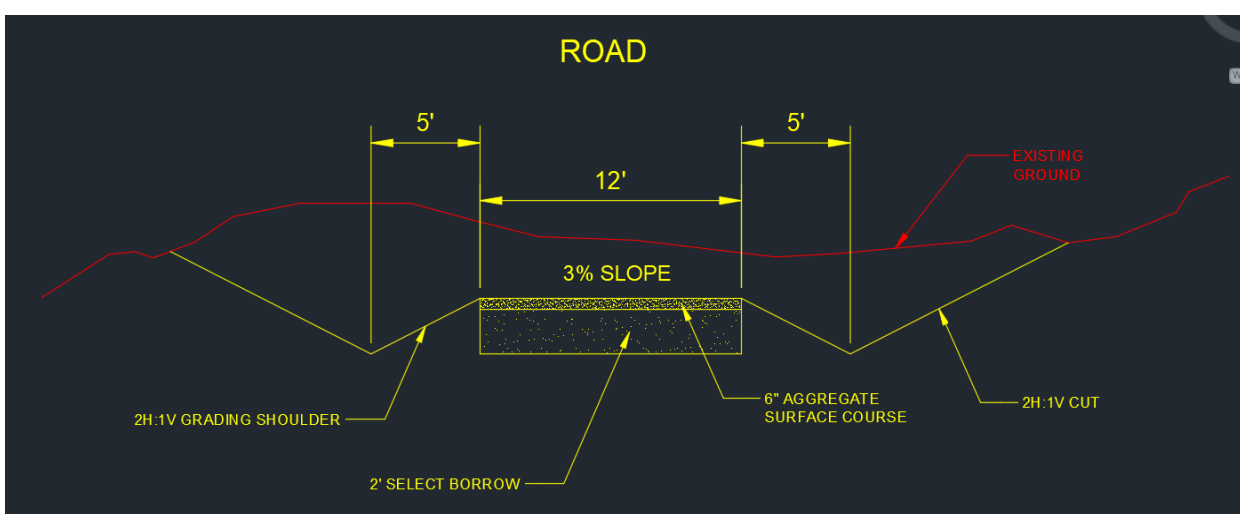
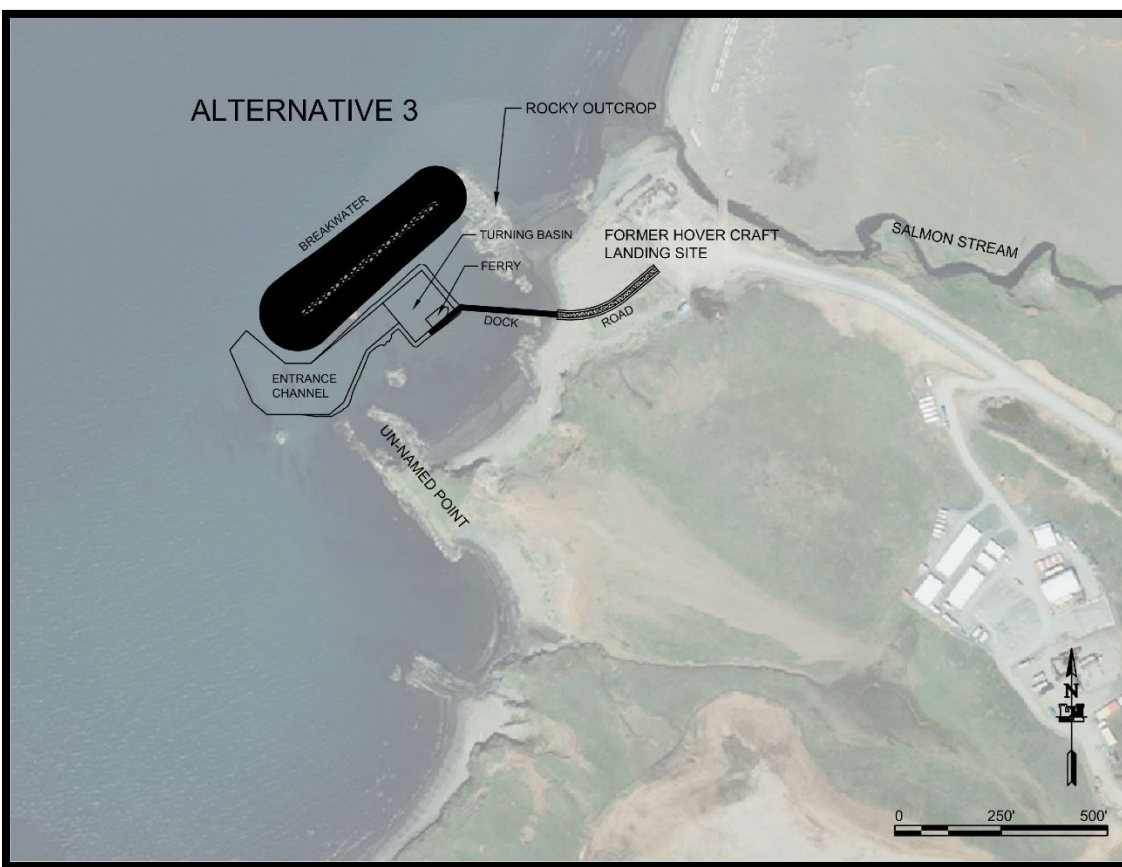
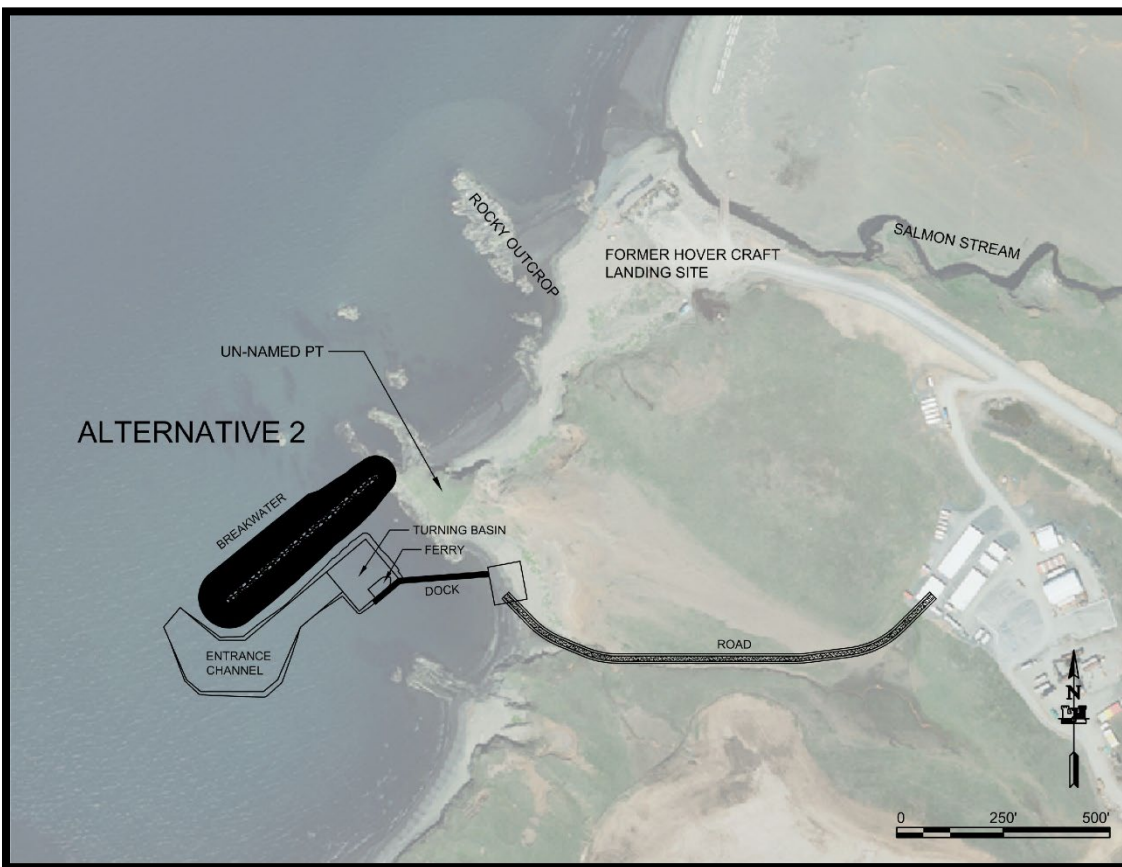
**Exhibit 1 – Feasibility Study Sketches**

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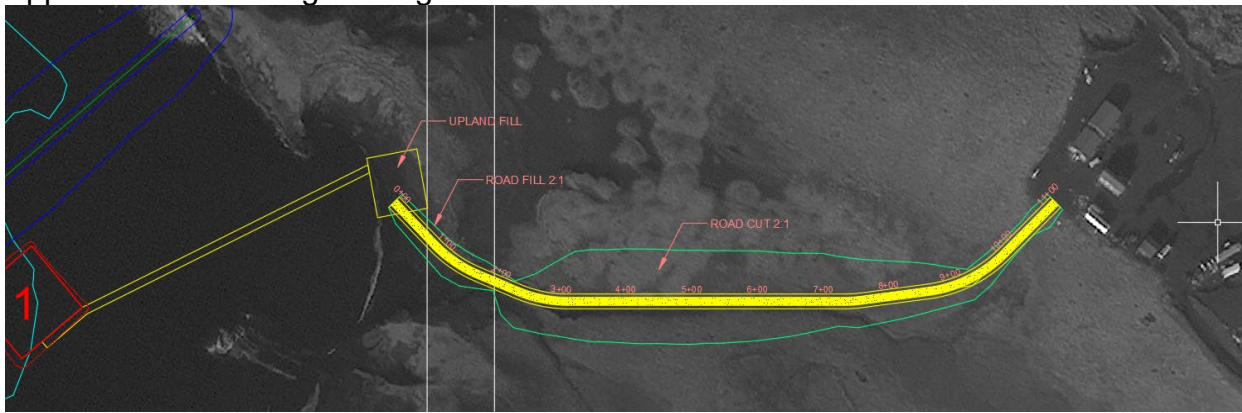
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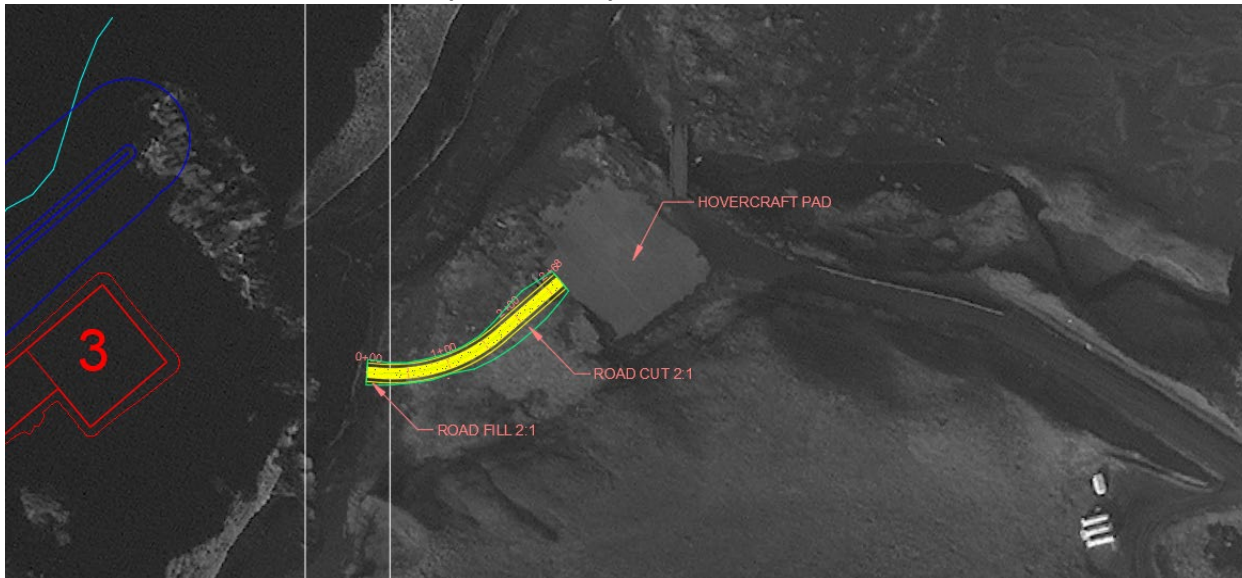
Road Cross Section for Alternatives 1-3

Road Plan View for Alternatives 1 & 2 (8.5% Grade)

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Road Plan View for Alternative 3 (1.5% Grade)



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**Exhibit 2 – Preliminary Alternative Quantities**

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			Breakwater Stone Quantity (cubic yards)		
	Stone Size (lbs)	Breakwater Length (ft)	Alternative 1	Alternative 2	Alternative 3
Armor Rock (Alternative 1)	26,000	715	33,592		
B Rock (Alternative 1)	2,600		20,352		
Core Rock (Alternative 1)	130		16,998		
Armor Rock (Alternative 2)	12,000	450		14,042	
B Rock (Alternative 2)	1,200			8,387	
Core Rock (Alternative 2)	60			7,940	
Armor Rock (Alternative 3)	20,000	400			18,439
B Rock (Alternative 3)	2,000				10,875
Core Rock (Alternative 3)	100				8,931
			Geotextile Quantity (square feet)		
			Alternative 1	Alternative 2	Alternative 3
Geotextile Fabric			135,217	69,777	88,087
			Harbor Basin + Entrance Channel Dredging (various units)		
			Alternative 1	Alternative 2	Alternative 3
Dredging (cy)		8,703	9,840	8,180	
Area needing blasting (sq ft)			-	48,800	35,500
Blasting Average Depth (ft)			-	5	6
			LSF Dock (various units)		
			Alternative 1	Alternative 2	Alternative 3
Pile supported dock width (ft)			12	12	12
Pile supported dock length (ft)			560	290	325
Mooring dolphins (#)			2	2	2
Pile (#)			60	30	40
Socketed 16" steel piles, spaced every 20', driven to to - 30'MLLW, elevation +8'MLLW, pile length 38'.					
Upland Fill (cy)			907	907	*Existing hovercraft pad
Area for loading/unloading freight from dock.					
			LSF Road to Connect to Harbor Alternative (various units)		
			Alternative 1	Alternative 2	Alternative 3
Road Length (ft)			1100	1100	270
Road Width (ft)			12	12	12
Excavation (cy)			45,000	45,000	600
Fill Material (cy)			3,100	3,100	300
6" Aggregate Surface Course (cy)			244	244	60

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<b>2' Select Borrow Fill (cy)</b>			<b>978</b>	<b>978</b>	<b>240</b>
			<b>Operation and Maintenance (cubic yards)</b>		
			<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>
<b>Maintenance Dredging (10% every 10 years)</b>			<b>870</b>	<b>984</b>	<b>818</b>
<b>Armor Rock replacement (5% every 25 years)</b>			<b>3,359</b>	<b>1,404</b>	<b>1,844</b>
			<b>LSF Conversion of Akutan City Dock</b>		
			<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>
<b>Conversion</b>					