US Army Corps
of Engineers

LITTLE DIOMEDE ALASKA
NAVIGATION IMPROVMENTS

VALUE ENGINEERING STUDY SUMMARY REPORT

PROJECT SPONSOR:
THE ALASKA DISTRICT

VALUE ENGINEERING TEAM STUDY

DOD SERVICE: USACE
CONTROL NO: CEPOA 2012-C-Diomede
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Value Engineering Study on

LITTLE DIOMEDE ALASKA NAVIGATION IMPROVMENTS

Final 09 November 2012
U.S. Army Engineer District, Alaska

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VALUE ENGINEERING TEAM STUDY

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PROJECT DESCRIPTION AND BACKGROUND

PROJECT TITLE: NAVIGATION IMPROVEMENTS
PROJECT LOCATION: LITTLE DIOMEDE, ALASKA

The community of Inalik, commonly known as Diomede or Little Diomede, is a traditional Eskimo village of approximately 115 people, located on the western shore of Little Diomede (locally known as Ignaluk) Island, Alaska. Residents of Little Diomede rely almost entirely upon a subsistence lifestyle, harvesting fish and crab, hunting whales, walrus, seals and polar bears. Little Diomede and its companion island, Big Diomede, lie at the center of the Bering Strait separating the Bering Sea from the Chukchi Sea, and Russia from the United States. The community is 2.5 miles from Big Diomede, which belongs to Russia; 0.6 miles from Russian waters and airspace; 27 miles from the Alaskan mainland; and about 685 air miles northwest of Anchorage. See picture next page.

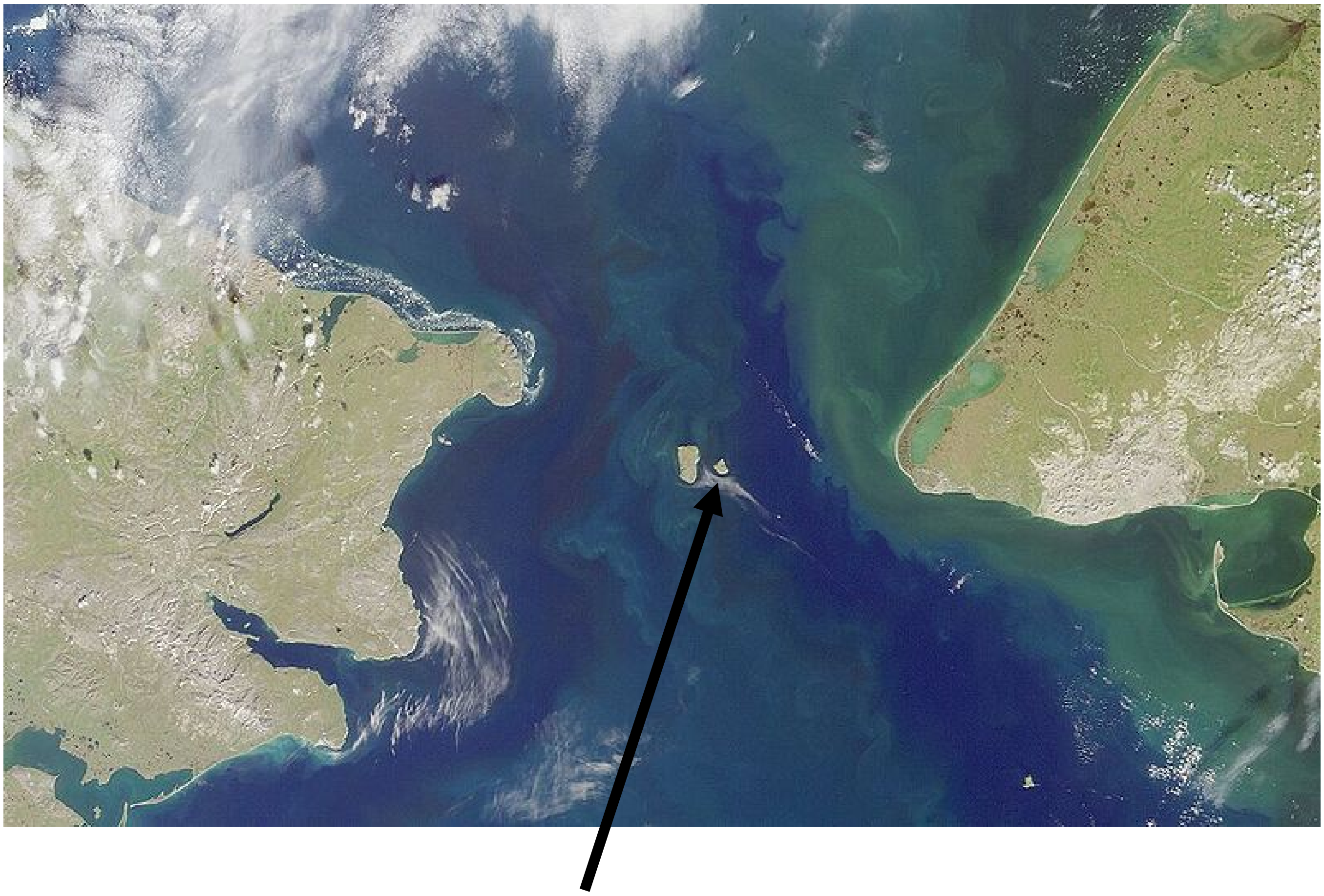
Diomede is an extremely remote community, perhaps the least accessible in the United States, based on its location, the time, cost, and difficulty/uncertainty associated with travel to and from the island, and the severe physical attributes of Little Diomede Island. Little Diomede Island rises abruptly from the sea at a 40-degree angle to a height of nearly 1,300 feet and is characterized by steep slopes littered with substantial amounts of rock and boulders. The community's location is the only area which does not have near-vertical cliffs to the water. The island is only 2-1/8 miles long and 1-7/8 mile wide, encompassing only 2.8 square miles. Little or no soil covers the side slopes of the island and many areas are barren of vegetation. The vegetation that does exist is alpine tundra composed of salmonberry, moss, greens, and some roots. The shoreline consists of large rock and boulders with no semblance of a beach.

The current preferred plan is S-3, and the report contents are based on that plan. The plan consists of two rubble mound breakwaters that would provide shelter from North storms and prevent shore side boulders from being transported into the landing area. The south breakwater was designed wider to provide a flat staging area for the community. The two breakwaters would require approximately 19,000 cubic yards of core rock, 23,100 cubic yards of b rock, and 36,400 cubic yards of armor stone. The plan would require a small near shore area to be dredged to -10 feet MLLW to provide boats a rock free approach to shore and room to turn around once launched. It is assumed that the dredging would include boulders and could possibly need blasting. Approximately 2,500 cubic yards would need to be removed for this alternative. The breakwater was not designed to provide protection from storm waves, rather; it was designed to make launching and retrieval safer in the average wave climate, not during storm events. This breakwater configuration would reduce waves with a maximum period of 8 seconds from the north to 3/10 of the wave height at the boat launch area

VALUE ENGINEERING TEAM STUDY

PROJECT DESCRIPTION AND BACKGROUND

PROJECT TITLE: NAVIGATION IMPROVEMENTS
PROJECT LOCATION: LITTLE DIOMEDE, ALASKA



Little Diomede

The Value Engineering team did identify the following issues. These issues were discussed in detail during the conduct of the study.

Destruction of Bird Habitat
Rock Fall Hazards
Overall Access
Constructability
Cost Estimate Risk
Contractor Lay Down Area
Construction Noise
Noise and Marine Mammals
Existing Graves
Heliport Access
Infrastructure
Lack of a Safe Harbor
Project Justification
Demobilization During Construction
Subsistence Species Viability
Existing Data

VALUE ENGINEERING TEAM STUDY
EXECUTIVE SUMMARY

Value Engineering is a process used to study the functions a project is to provide. As a result, it takes a critical look at how these functions are met and develops alternative ways to achieve the same function while increasing the value of the project. In the end, it is hoped that the project will realize a reduction in cost, but adding value over reducing cost is the focus of VE.

The Value Engineering Study was initiated during the week of 11 to 13 September 2012 at the Alaska District. The project was studied using the Corps of Engineers standard Value Engineering (VE) methodology, consisting of five phases:

Information Phase: The team studied drawings, figures, descriptions of project work, and cost estimates to fully understand the work to be performed and the functions to be achieved. Cost Models (see Appendix C) were compared to determine areas of relative high cost to ensure that the team focused on those parts of the project which offered the most potential for cost savings.

Speculation Phase: The team speculated by conducting brainstorming sessions to generate ideas for alternative designs. All team members contributed ideas and critical analysis of the ideas was discouraged (see Appendix B).

Analysis Phase: Evaluation, testing and critical analysis of all ideas generated during speculation was performed to determine potential for savings and possibilities for risk. Ideas were ranked by priority for development. Ideas which did not survive critical analysis were deleted.

Development Phase: The priority ideas were developed into written proposals by VE team members during an intensive technical development session. Proposal descriptions, along with sketches, technical support documentation, and cost estimates were prepared to support implementation of ideas. Additional VE team comments were included for items of interest which were not developed as proposals, and these comments follow the study proposals.

Presentation Phase: Presentation is a two-step process. The published VE Study Report is distributed for review by project supporters and decision makers. A briefing is later conducted to decide which proposals merit implementation into project design. The Summary of Proposals follows on the next page.

VALUE ENGINEERING TEAM STUDY

SUMMARY OF PROPOSALS

Fifty-three ideas for ways to improve the projects or reduce costs were generated during the Speculation Phase of this study. The Analysis Phase of the study reduced the number of ideas to eleven for development, of which nine ideas were designated as design comments and are included in this report.

Of all the ideas from the Analysis and Development Phases, two ideas became proposals as shown below. These ideas show a negative cost savings (cost increase) and are value added proposals that the team felt would improve the project.

NO.	PROPOSAL DESCRIPTION	(COST INCREASE)
1	Overbuild or Stockpile Rock for Future Maintenance	($1,475,000)
2	Use a Dolly Ramp on Piles	($200,000)

VALUE ENGINEERING PROPOSAL

PROPOSAL NO: 1 PAGE NO: 1 OF 2

DESCRIPTION: Overbuild or Stockpile Rock for Future Maintenance

ORIGINAL DESIGN:

The original design does not include an overage to compensate for rock loss during the life of the project.

PROPOSED DESIGN:

The proposed design is to add 20% of the volume of the "A" rock or armor stone to the project. This would be added to the existing slopes as a launch section or thickened section, or it would be stockpiled on site, in an area where it could be easily accessed.

ADVANTAGES:

Maintenance material is already on site.
Less risk that the project life will not be achieved.
Smaller mobilization cost for future work.

DISADVANTAGES:

Larger up-front cost.
Lack of sufficient stockpile area.
If added to the sides, it is in the deepest part of the structure foot print.

JUSTIFICATION:

The type of project and the type of funding are not usually accomplished by the Corps of Engineers on a regular basis. Since this may be a one time opportunity to add value and produce a safer environment, the team feels that maximizing the opportunity would be a benefit. For this reason, the team suggests adding additional "A" rock to the project for future use, as future maintenance funds may be limited.

DELETIONS				
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
None				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
		Total Deletions		$ -
ADDITIONS				
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
A Rock	CY	4,250	$ 181.98	$ 773,415
Mobilization Increase	LS	1	$ 178,000.00	$ 178,000
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
				$ -
		Total Additions		$ 951,415
	Net (Cost Increase)			$ (951,415)
	Mark-ups (Cost Increase)		55.00%	$ (523,278)
	Total (Cost Increase)			$ (1,474,693)

ORIGINAL DESIGN:

The original design does not include any equipment for the launch and retrieval of boats. The current mode of launch and retrieval is to carry the boats in and out of the water by hand. This is both dangerous and difficult.

PROPOSED DESIGN:

The proposed design is to use a “dolly ramp” to allow the boats to be winched up and down a specially designed ramp on rollers. This ramp would be founded on a total of 10 driven H-piles. For purposes of this value engineering study, it was assumed that there would be 5 piles per side. The most outward pile would be approximately 30 feet in length. The pile length would decrease by 5 feet as the structure approaches the shore. Therefore the piles would be 2 each at 30, 25, 20, 15, and 10 feet respectively. These piles would be drilled into the existing insitu material. Hardware would be added to the top of the piles to allow for a premanufactured “dolly system’ to be bolted on. Wing nuts would be used to allow for the swift assembly and disassembly of the structure. In this manner the local boaters could erect and launch quickly as the weather breaks. If the weather turns bad, the assembly could be removed and stored in a very short time frame. Please see the example pictures that follow.

ADVANTAGES:

- Faster launch and recovery.
- Improved safety.
- Heavier and longer boats could be utilized.

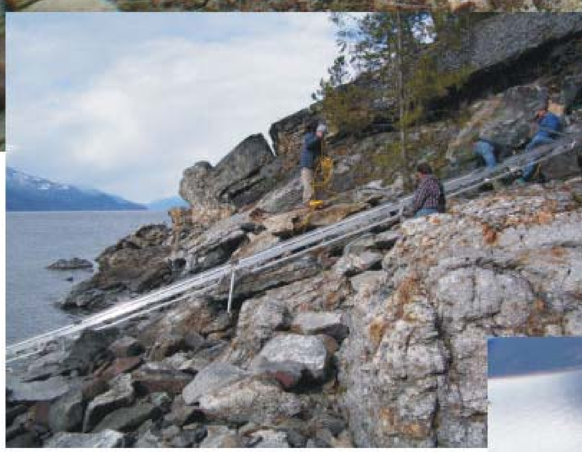
DISADVANTAGES:

- The exposed piles could be a hazard if a launch or recovery was done without the ramp in place. These rollers would need to be specially designed to maintain functionality from year to year. Local ice forces will rip out exposed piles.
- Deterioration of the ramp during storage.
- Increased cost.

JUSTIFICATION:

The project purpose as shown in the FAST diagrams higher order function is to sustain the community. Subsistence hunting and fishing from small boats is part of this culture and life style. This proposal helps accomplish the project purpose, and is a value addition. This can be accomplished by writing a generic specification for the ramp system, and requiring the contractor to submit a proposed design.

Installation Pictures

		DELETIONS		
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
None				$ -
				$ -
				$ -
				$ -
				$ -
		Total Deletions		$ -
		ADDITIONS		
ITEM	UNITS	QUANTITY	UNIT COST	TOTAL
Mobilization Increase	LS	1	$ 50,000.00	$ 50,000
Site work	LS	1	$ 3,000.00	$ 3,000
H Piles	LF	200	$ 200.00	$ 40,000
Ramp Hardware	LS	1	$ 25,000.00	$ 25,000
Ramp Shipping	LS	1	$ 5,000.00	$ 5,000
Ramp Labor	Hrs	40	$ 150.00	$ 6,000
				$ -
H pile cost assumes drilled and				$ -
installed cost per foot, for a				$ -
W 12x14				$ -
				$ -
				$ -
		Total Additions		$ 129,000
		Net (Cost Increase)		$ (129,000)
		Mark-ups (Cost Increase)	55.00%	$ (70,950)
		Total (Cost Increase)		$ (199,950)

1. ***Relocation of the Community (Collocation).*** Schweitzer and Marino (2005) examined the cultural impacts of collocation of Shishmaref, Alaska, to either Nome or Kotzebue. Their conclusions can be applied more broadly throughout the circumpolar North. The research indicates that many aspects of culture (e.g. language, dancing, festivals, carving and sewing, and cultural values), as well as subsistence practices and lifestyles, would be adversely affected in some way by collocation. Members of the collocating community generally maintain spatial, social, and cultural segregation from the surrounding community in an attempt to maintain their identity. This results in retention of a group identity for at least a few generations, but can cause social tension and eventually the collocating group assimilates into the surrounding community. Most importantly, the study concluded, if a community is unwilling or unenthusiastic about collocating, then that move must be considered forced. "Historical cases show that this scenario of 'forced relocation' would have dramatic negative cultural, economic, health, and social impacts…" (Schweitzer and Marino 2005:146). Peter P Schweitzer PhD and Elizabeth Marino 2005. *Coastal Erosion Protection and Community Relocation: Shishmaref, Alaska, Collocation Cultural Impact Assessment,* University of Alaska Fairbanks, prepared for U.S. Army Corps of Engineers, Alaska District.

2. ***Partner with Russia.*** Diomede is located on Little Diomede Island in the middle of the Bering Strait. Diomede is located on the West coast of Little Diomede Island in the Bering Strait, 135 miles northwest of Nome. It is only 2.5 miles from Big Diomede Island, Russia, and the international boundary lies between the two islands. The most common destination of travel from Diomede is Wales, Alaska, about 26 miles west, on the mainland of Alaska. The crossing between Little Diomede Island to Big Diomede Island (Ratmanova) can be done by foot or snow mobile during the winter and by skiff during the summer, while travel to Wales is done by helicopter (about $200 per round trip) or by a dangerous ride in a 16-foot skiff, when the weather is appropriate . The top of Ratmanova is at a lower elevation, and more accessible, than the top of Little Diomede, and would be more appropriate for development of infrastructure for fixed-wing air transport. To improve the value of life for the inhabitants of Diomede, improved access to the outside world, routine medical care, emergency care, and normal import of common items would be a great step forward. Access to Ratmanova on an as-needed basis for Diomede residents, or joint development of infrastructure on Ratmanova for joint use by residents of Diomede and Russian citizens would be valuable for the ongoing viability of Diomede as a community. Implementation of this idea is beyond the scope of this study. However, similar types of ideas, requiring Russia/USA cooperation for infrastructure development through the arctic, are being proposed on the Russian side. Support for closer ties with Russia from the Native Village of Diomede and the regional Alaska Native Corporations from the Bering and Chukchi Sea areas could only encourage the Federal Government to develop the mechanism for these types of ventures to take place.

3. ***Use a Two Layer Section.*** A breakwater core layer is necessary to dissipate the wave energy. If the core rock size is too great, the wave energy will pass through the breakwater and provide minimal protection. The average armor stone for the proposed breakwater configuration is 15.7 tons. The difference between the large size of the armor and the smaller stone size needed for the core results in the need for a B layer to act as a filter between the armor and the core. Therefore this is not recommended.

4. ***Use Smaller or Bigger Rock.*** Hudson's equation was used to obtain an average armor size. The armor size needed could be adjusted by manipulating the Kd value used in the equation. In order to minimize the armor size, a Kd of 4 was used. A higher Kd value would require selective placement of the stone. The environment for selective stone placement will be minimal at best with rain, fog, and no protection from storms. Selective placement will be difficult to achieve, so the highest Kd for random placement was used. Therefore this is not recommended. Bigger rock could be used for the armor; however there will not be a substantial cost savings or a noticeable increase in value.

5. ***Use a Two Stone or One Stone Rock Crest.*** The breakwater structure is designed to be an overtopping structure. Corps guidance is that overtopping structures should be, at a minimum, the combined width of three armor units. The wave climate to which this breakwater will be exposed is extreme, so minimum Corps guidelines should be followed.

6. ***Use Local Rock.*** The team considered the use of rock from the island itself. This would be accomplished be establishing a quarry on the Island. The team felt that the establishment, and continued maintenance of a quarry on the island was very problematical. The slopes are shown as 40% in the documentation. Any quarry would be subject to rock falls during its life. There are also no existing access roads. The team does not recommend this option.

7. ***Investigate Sources of Rock.*** The team considered use of alternate materials. Throughout the design process it is suggested that any and all available rock sources be considered. If a new rock source becomes available, it is suggested that the viability of using that source be investigated.

8. **Build More Roads.** It is noted that roads on the island are nonexistent. The team also noted that there did not seem to be room for expansion. Since this may be a one time opportunity for heavy construction, the establishment of roads, in conjunction with the desires of the local populace should be considered.

9. ***Build Additional Infrastructure Concurrently.*** While the construction is taking place and a large amount of equipment and materials are being hauled to the island, the opportunities for infrastructure work should be investigated. If any new infrastructure work is being considered, cost for construction of same could be lessened since a contractor is on site.

SUPPORTING DOCUMENTS

CONTACT DIRECTORY

APPENDIX A: CONTACT DIRECTORY & VE STUDY TEAM MEMBERS

Ron Burkhard	Certified Value Specialist burkhardvalue@hotmail.com	808-982-8213
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APPENDIX B:

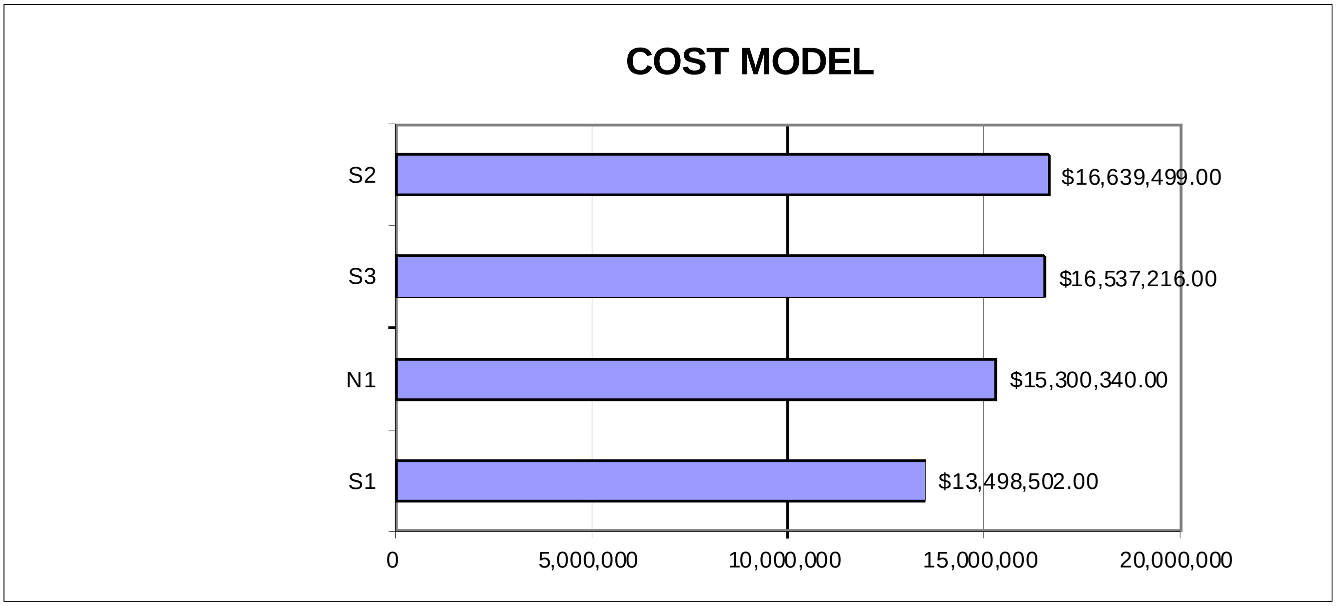
SPECULATION LIST

		Proposal
C		Comment
P		Proposal
X		Deleted
BD		Being done
X	1	Blast it all
BD	2	Do nothing
X	3	Create Land Bridge
X	4	Sunken Vessel as Reef
C	5	Use Aircraft Carrier
C	6	Construct Alternative S3
X	7	Allow Russians to Construct as part of Bering Strait Bridge/Tunnel Project
C	8	Move the Community
X	9	Use a Catamaran
X	10	Use a Landcraft Ramp
X	11	Use a Forklift Boat Lift
C	12	Build More Roads
X	13	Dolos
C	14	Use Local Rock
X	15	Purchase Construction Equipment, Train Local Folks in Construction
X	16	Build Land to Reduce Slope
C	17/14	Investigate Sources of Rock
X	18	Use Overburden on Island for Core
X	19	Purchase Local Helicopter
P	20	Use a Dolly Ramp on Piles
X	21	Use a Design Build and no more design
X	22	Build North End, Wait a Season and Build South End
C	23	Build Additional Infrastructure Concurrently

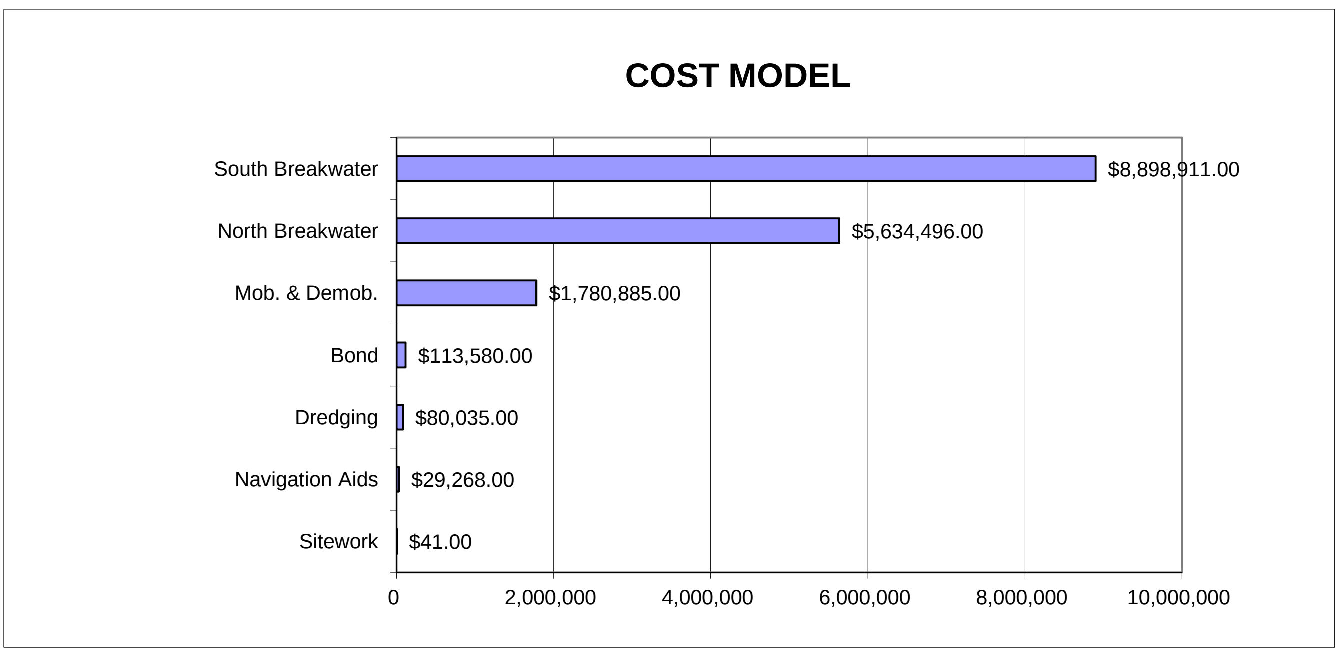
X	24	Use a Falkirk Lock
X	25	Open a Quarry
C	26	Use a Two Layer Breakwater
C	27	Use Smaller Rock
C	28	Use Bigger Rock
X	29	Floating Breakwaters
X	30	Use Other Transportation Options
C	31	Use a Two or One Rock Crown
X	32	Use Slush and Treme Concrete Cover and Lighter Rock
X	33	Use an Offshore Reef Breakwater
X	34	Offshore Mooring Facility
X	35	Causeway off of Helipad
P	36	Add Overbuild Rock for Maintenance
X	37	Build Dynamically Stable Breakwater
X	38	Build Bridge to Wales
X	39	Build Tunnel to Wales
X	40	Add a Tag Line
X	41	Reef Balls
X	42	Use Pile Clump and Cable
X	43	Use a Conveyor to Move Skiffs
X	44	Use a Vertical Wall and Sling
X	45	Eliminate the Need for Skiffs
X	46	Develop an Alternate Food Source
X	47	Introduce Animals to Island
X	48	Use Partial Evacuation
X	49	Develop an Airdrop Supply System
C	50	Partner with Russia
X	51	Defense Against Russia
X	52	Use a Bulkhead and Lifeboat Davits
X	53	Add a Rock Stockpile

COST MODELS

Alternatives



Preferred Alternative S-3



FUNCTION ANALYSIS SYSTEM TECHNIQUE (FAST) DIAGRAM

FAST DIAGRAM
Little Diomede