

Shaktoolik Evacuation Road Project

ROUTE RECONNAISSANCE REPORT



Prepared For:



The Native Village of Shaktoolik
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Prepared By:



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In Cooperation With:



16515 Centerfield Drive, Suite 101
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December 2008

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Executive Summary

On behalf of the Native Village of Shaktoolik, Kawerak, Inc., in cooperation with Rodney P. Kinney Associates, Inc. (RPKA), developed a Route Reconnaissance Report for the Shaktoolik Evacuation Road. The project is presented in three main segments. Figures 1 - 12 show the segments investigated in this report. This report outlines the design concepts for each segment within the project and compares the feasibility of each alternative. The Denali Commission, Bureau of Indian Affairs (BIA) Indian Reservation Roads (IRR) Program, and Kawerak, Inc. allocated funding and are working together on the development of this project.

Kawerak collected data from site visits, the Shaktoolik IRA Council, the City of Shaktoolik, and the public. This information was used to prepare the Route Reconnaissance Report, which was generated to assist in the preparation of the Environmental Document.

After conducting preliminary engineering investigations, it is anticipated that the new road will be constructed as a one-lane 14-foot wide travelway with turnouts. The side slopes are expected to be 3:1, but can be steeper where needed. Initially 42-inches of select borrow will be placed above a stabilization and/or separation fabric. Based on subsurface information, the embankment height may be reduced during the design. The road will be topped with 6-inches of crushed aggregate and treated with a dust palliative. Segment 1 will require reconstruction of the existing Beach Road that starts in town and terminates near where the Tagoomenik River is close to North Sound. This portion of the project includes upgrades such as raising the first 1,300 feet of the road, drainage improvements, and resurfacing with 6-inches of crushed aggregate and dust treatment. The total project length is approximately 14.6 miles. The design information for the entire project is presented in the data sheet in Section 4.0.

Based on the preliminary investigation all of the segments analyzed have specific issues that will require different solutions for successful construction. None of the segments are perceived to have significant environmental impacts and they each have relatively equal cost values. A segment summary comparing the alternatives can be viewed in Appendix A.

Introduction

The purpose of the Route Reconnaissance report is to evaluate the feasibility and cost for constructing an evacuation road in Shaktoolik, Alaska. This report presents the project as several segments and alternatives. Figures 1 - 12 show the segments investigated in this report. Cost design criteria, environmental considerations, and construction feasibility for each proposed action within the project were analyzed and are presented in the report.

As part of the reconnaissance process, public meetings were held on April 30, 2008 and June 24, 2008. Information to assess the transportation goals for the Shaktoolik Evacuation Road Project collected from the Council Members, the City and the public is incorporated in this report. The Route Reconnaissance Report was generated to assist in the preparation of the environmental documentation and associated documents as well as securing safe moment out of Shaktoolik in case of evacuation.

Purpose and Need

The purpose and need for the construction of an evacuation road is to provide the residents of Shaktoolik with a dependable evacuation route in the event of a natural disaster. Large westerly storms cause annual coastal flooding. Recent storms have been eroding the only road out of town, Beach Road, which heads south to the Old Shaktoolik site, a location along the beach.

The all weather evacuation route would provide access to Foot Hill southeast of Shaktoolik. Currently there is no road to the area, just a maze of trails produced by ATVs crossing the tundra. The land bounding Shaktoolik is barely above mean sea level. The proposed evacuation road will provide access to the Foot Hill, which provide elevational relief from large storm surge events.

The proposed evacuation road will also provide access to subsistence fishing, hunting, and gathering areas, as well as a gravel source. The proposed road will consolidate the ATVs to one primary route, rather than destroying the vegetation at several locations.

The ultimate goal to be achieved by the construction of this project is to provide a safety route for evacuation. A subsistence lifestyle, the need for material, and storm conditions requiring community evacuations cause residents to travel outside the city to seek resources and shelter they need.

Community Location and Description

Location

Shaktoolik is located on the east shore of Norton Sound. It lies 125 miles east of Nome and 33 miles north of Unalakleet. The Community lies at approximately 64 degrees, 33 minutes, 39 seconds North Latitude and 161 degrees, 15 minutes, 39 seconds West Longitude (Section 23, Township 13 South, Range 13 West, Kateel River Meridian). The area encompasses 1.1 square miles of land.

Government

The Federally recognized IRA Council conducts tribal government affairs for the Native Village of Shaktoolik. The community has a city government, which was incorporated as a second-class city in 1969. The Shaktoolik Native Corporation and the Volunteer Shaktoolik Search, Rescue, and Fire Department also serve the community. Shaktoolik has a Village Police Officer.

History

Shaktoolik was the first and southernmost Malemiut settlement on Norton Sound, occupied as early as 1839. The history of the area's inhabitants dates back at least 5,000 years. The name Shaktoolik is derived from the Unaliq dialect word "suktuli", which means "scattered things". Twelve miles northeast of Shaktoolik at Cape Denbigh is Iyatayet, an archeological site that is 6,000 to 8,000 years old, and is a national landmark.

The village was originally located 6 miles up the Tagoomenik River, but was moved to the river mouth in 1933. This site was prone to severe storms and winds, forcing the village to relocate to a more sheltered location in 1967, referred to as "old site". The community relocated a final time in 1976 to its current location following the 1974 flood. Shaktoolik continues a traditional subsistence lifestyle.

Soils and Topography

Shaktoolik is located on a narrow strip of land between the ocean and the Tagoomenik River. The narrow strip or flat sand bar is only 200 feet wide at its northern end. The elevation of the highest ground in the Shaktoolik area is approximately 14' above mean high tide. The soils around Shaktoolik are poorly drained with a peaty surface layer. Gray sand and gravel extends below the organic mat to a depth of 10 feet and bedrock is estimated to be below that at depths exceeding 100 feet. Drainage on the wave-formed barrier bar where the townsite is located is excellent. The warming effect of water bodies on both sides of Shaktoolik's sand bar combined with the underlying well-drained gravel keeps the area virtually free of permafrost, although it is occasionally present.

Shaktoolik has been subject to major coastal flooding and stream overflow several times in the past. Storms are frequent in the spring and fall, and coastal erosion is still occurring.

Climate

Shaktoolik has a sub-arctic climate with maritime influence when Norton Sound is ice-free, usually from May to October. The freezing of the sound causes a change to a colder, more continental climate. Winter is cold and relatively dry, with an average of 43 inches of snowfall. Winds from the north and northeast predominate. Winter temperatures average between -4 degrees Fahrenheit and 11 degrees F, with an extreme low of -50 degrees F. Summers are cool, with most precipitation occurring in July, August, and September. The average annual precipitation is 14 inches. Summer temperatures average between 47 degrees F and 62 degrees F, with a record high of 87 degrees F.

Housing

According to the 2000 U.S. Census there were 66 housing units; 60 (91%) of these were occupied. Thirty-four units (57%) of occupied units are owner occupied, and 26 units (43%) are renter occupied. The median value of owned homes is \$126,900 and the median monthly rent is \$425.

School/Education

Shaktoolik schools are included in the Bering Strait School District. According to the 2000 US Census, there are 57 students enrolled.

Existing Transportation System

Shaktoolik is not accessible by any road system and is isolated from any community hubs. Aircraft is the only mode of transportation to Shaktoolik that can be used throughout the year. A 4,000 foot gravel airstrip, which is owned by the ADOT&PF, allows for regular air service from Nome. For transportation, residents utilize ATVs, trucks, and boats in the summertime. Snowmobile and dog sled are the community's main sources of transportation during the winter season. Cargo is barged to Nome, and then lightered to shore, as the community has no docking facilities for large vessels. The community has a system of roads within its own townsite, most of which were constructed by the ADOT&PF. The village is surrounded by a network of unimproved subsistence and economic routes that lead to cabins, hot springs, seasonal camps, and subsistence areas.

The existing roadways within the city limits are owned by the City of Shaktoolik. The ADOT&PF owns the roadway that leads to the airport.

Water and Sewer

Water is pumped 3 miles from the Tagoomenik River to the pump house, where it is treated and stored in an 848,000-gallon insulated tank. A piped water and sewage collection system serves most homes. Ninety-five percent of residences have complete plumbing and kitchen facilities. The school is connected to the city water supply system. The community has a sewage treatment system as well.

Solid Waste

Shaktoolik has a Class 3 landfill. The landfill is not permitted and is almost full. Furthermore, it is located within 5,000 feet of the recently constructed airport runway, which poses a potential hazard to aircraft using the airport. The City burns refuse in an incinerator. The ADOT&PF awarded a project to construct a Shaktoolik Landfill Road from the village to a location approximately 2,000 feet south of the village; in the same location as would be a beach evacuation road.

Power

Electricity is provided by AVEC, who also owns the power plant tanks.

Communications

Telephone service is provided by Tel Alaska. Long distance telephone service and the Internet are provided by GCI. Shaktoolik Native Corporation serves as the cable provider.

Utilities

Within the village power and the majority of phone lines are overhead. Water and sewer systems are below the surface. The subsistence and economic routes within the area are generally void of underground or overhead utilities. Construction for these routes would be convenient due to the absence of existing utilities.

Population

The 2000 U.S. Census recorded a population of 230 people. Alaska Natives represented 94% of the population. There were 60 households with an average household size of 3.83. The percent of population by age group follows:

Employment and Economy

The Shaktoolik economy is based on a subsistence economy that is supplemented by part-time wage earnings. The commercial fishing industry is growing and continues to provide a major source of income, with 33 residents holding commercial fishing permits. Development of a new fish processing facility is a village priority. Reindeer herding also provides income and meat. Salmon, moose, whale, seal and rabbit provide other food sources.

Shaktoolik's first store was started in 1938 and managed by Simon Bekoalok, Sr. Commercial fish buyers came to Shaktoolik in 1960 to buy salmon and continue to provide a major summer enterprise for local households. The Shaktoolik Native Corporation has an enrollment of 205 shareholders and is entitled to 115,200 acres of land under the Alaska Native Claims Settlement Act of 1971.

Project Description

Previous work completed

Long Range Transportation Plan

The Shaktoolik IRA Council, in cooperation with the Kawerak Transportation Program and RPKA developed the Shaktoolik Long Range Transportation Plan in March 2007. The Shaktoolik IRA Council's number one priority is to construct an evacuation road.

Scoping Report

Kawerak Transportation in cooperation with the Shaktoolik IRA Council retained RPKA to prepare a Scoping Report for an evacuation route. Based on consultation with the Shaktoolik IRA Council representatives, a corridor was developed starting at a location approximately ½ mile south of the existing village and heading east across the Tagoomenik River. Segment A of the report would be a 1.5 mile road crossing the Tagoomenik River in two locations, which requires two bridges approximately 200' and 100' long respectively.

At this point, two alternate routes were considered: Segment B, Alternate A and Segment B, Alternate B. Alternate A would go directly east for 11.7 miles to the Nulato Hills to an elevation of approximately 250 feet. Alternate B would require another bridge approximately 300 long and the will run north approximately 3.5 miles to a hill 250 feet above sea level. The estimated costs for these three road segments are \$8.5 million, \$29.3 million, and \$12.1 million, respectively. The scoping report is included in Appendix C.

During the spring of 2008, Kawerak Transportation held meetings with the IRA in Shaktoolik to discuss the April 30, 2008, Scoping Report and obtain their input on an evacuation route. Instead, the IRA expressed interest in a route that leads to the Foothills area.

Design Criteria

The controlling design criterion for this project is based on the policy from the American Association of State Highway and Transportation Officials (AASHTO) with the Alaska State Highway Preconstruction Manuel used as a supplementary reference source. Typically, design standards for roads are based on the amount of traffic use experienced over a full day, or the Average Daily Traffic (ADT). The design parameters of a road are established based on the type, speed, and amount of traffic that a particular route generates. Similar to most villages in rural Alaska, the ADT in Shaktoolik was not recorded for the existing roads or any other roadway in the village.

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Segment 1 will require reconstruction of the existing beach road that starts in town and terminates near where the Tagoomenik River is close to North Sound. This portion of the project includes upgrades such as raising the first 4.1 miles of the road, smoothing out the existing alignment, reconstructing sections that are washed out, installing new culverts, replacing old culverts, resurfacing with 6-inches of crushed aggregate, and applying dust treatment. The design information for the entire project is presented in the following data sheet.

A major issue concerning gravel roads in all rural communities is the need for dust control. Safety and health concerns for residents and pedestrians of all ages increased due to the excessive dust from the roadways. The village would like to see a dust suppressant incorporated into both the upgrades and new construction segments of this project.

Project Design Criteria

Segment:	Segment 1	Segment 2 & 3,
Construction Type:	Reconstruction or Rehabilitation	New Construction
Design Classification:	Rural Local Road	Rural Local Road
Design Life:	20 Years	20 Years
Present ADT & Year:	ADT < 400	ADT < 400
Design ADT & Year:	ADT < 400	ADT < 400
Design Vehicle:	All Terrain Vehicles	All Terrain Vehicles
Design Loading:	H20	H20
Design Speed:	30 mph	30 mph
Stopping Sight Distance:	200 feet	200 feet
Passing Sight Distance:	1090 feet	1090 feet
Maximum Allowable Grade:	10%	10%
Minimum Allowable Radius:	353 feet	353 feet
Minimum K-value:	37	37
Sag:	(ft/%)	(ft/%)
Crest:	19	19
	(ft/%)	(ft/%)

Project Design Criteria

Number of Lanes:	One	One
Width of Traveled Way:	14 feet	14 feet
Width of Shoulders:	0 feet	0 feet
Surface Treatment:	EnviroKleen (Dust Control)	EnviroKleen (Dust Control)
Side Slope:	3:1, can go steeper where needed up to 1:1	3:1, can go steeper where needed up to 1:1
Cross Slope:	3%	3%
Minimum Borrow Height:	Resurfacing, minor adjustments	3.5 feet (minimum cover)
Surface Cover:	6 inches select topping	6 inches select topping
Curb Usage and Type:	N/A	N/A
Illumination:	N/A	N/A
Pedestrian/Bicycle Provisions:	N/A	N/A

Design Segments

Figures 1 - 12 show the proposed evacuation road in the form of three segments. The overall project, is approximately 14.6 miles in length. Each segment and alternative was evaluated for feasibility, safety, environmental impacts, and cost. Figure 13 shows a typical section for both the rehabilitation (Segment 1) and the new construction, Segments 2 and 3. The following sections describe each segment and summarize benefits and drawbacks. Cost estimates for the total project are presented in Appendix B.

Segment 1 (4.2 miles)

Segment 1 begins north of the school site and follows the existing road to the south to old Shaktoolik. The road parallels Norton Sound and terminates where the Tagoomenik River is close to North Sound. After which Segment 2 begins. Segment 1 will require upgrades that include minor alignment adjustments, drainage improvements, and resurfacing. The road needs to be raised and possibly armored to ensure it is above the positional flood elevation. Segment 1 needs minor upgrades with the majority of the work focused on improving the current drainage conditions. Upgrades will improve travel conditions by smoothing the surface and decreasing excess dust. Minor alignment adjustments maybe needed to upgrade the roadway to ADOT&PF standards. There is platted Right-Of-Way through the City of Shaktoolik townsite. The remaining portion of the project will need Right-Of-Way easements to be obtained. Regardless of which alternative is chosen the existing road will be completely rehabilitated from the beginning of Segment 1 to where the Tagoomenik River is close to North Sound.

Segment 2, (5.7 miles)

Segment 2 deviates from the shoreline and heads southeast direction approximately 2.7 miles before it swings to the south paralleling Beeson Slough for approximately 3 miles until it intersects Segment 3. Right-Of-Way easements need to be acquired for this segment of the proposed road.

Segment 3 (4.7 miles)

Segment 3 traverses higher ground on the southern end of Beeson Slough for approximately 3.3 miles before it swings to the west to terminate at an existing gravel source near Norton Sound. The bay has a sandy gravel shore, which could be used for a barge landing. Right-Of-Way easements need to be acquired for this segment of the proposed road.

Soil Conditions

Shaktoolik is at the tip of the large peninsula on the east side of Norton Sound. The community is located on a gravel spit composed of loose, medium coarse granular sand and gravel with little or no vegetation. Further geotechnical studies should be performed along the alignments to determine if permafrost is present within the proposed roadway corridor. Immediately surrounding the thaw wag of the coast the soils should be assumed to be fine-grained ice rich organic soils. Aerial photo interpretation reveals polygons, which are clearly visible between the lake and rivulets east of Beeson Slough. At area on the southern end of the project as the road approaches Foot Hill, the soils are assumed to be soft slate /greywacke bedrock with minimum overburden. The gravel spit where the community sits ranges in elevation from sea level to about 30 feet above sea level. The nearby Nulato Hills rises approximately 1200 feet above sea level and borders the community's eastern perimeter. The mountain is composed of cretaceous quartz monzonite, a gray rock rich in quartz and feldspars

Vegetation in the Evacuation Road project area is limited to moist tundra species dominated by grasses, sedges, mosses, and lichens. Shrubs that include bearberry, dwarf birch, narrow-leaf Labrador tea, willow, bog blueberry, and crowberry are in this area. Vegetation typically grows in 1 to 3 feet of organic mat over saturated or frozen soil. Shaktoolik Bay, located adjacent to the community, and Beeson Slough, south of Shaktoolik bay are large, permanent saltwater lagoons close to the community. Other small ephemeral ponds are present throughout the flat tundra terrain east of the community.

Hydraulic Design

The community of Shaktoolik was evacuated in the past due to large western storms. Residents reported that in September of 1974 a western storm overtopped the beach ridge and flooded the community. Several times storms washed debris on top of the beach ridge that protects the community. The Corps of Engineers believed that the maximum wave height from the west should not exceed 30-feet. The maximum storm surge is not yet known but is believed to be less than 25-feet. The western portion of Shaktoolik is surrounded by a beach ridge that has an elevation of 25-feet MLLW. However, the elevation of the peninsula drops to 14-feet MLLW just east of the beach ridge.

Riprap will be required for armoring a portion of the evacuation road and the road prism needs to be raised for portions of Segment 1. Additional study is needed to determine the total length of road that will need to be armored. Initial estimates indicate that approximately 2000-feet of road will need to be armored near where the Tagoomenik River is close to North Sound

Segment 1 will require drainage upgrades; therefore, obtaining observational information and field data about the flow patterns along the existing road will be useful in remedying the current drainage problems. Segment 2 and 3 will require cross drainage. Segment 2 crosses many rivulets and small streams, which will need culverts. Segment 3 will side hill the base of Foot Hill and will require cross drainage at natural stream and rivulet crossing as well as cross drainage periodically to reduce erosion of the ditch line. Preliminary design work suggests that Segment 1 would require the least amount of culverts due to its location along the beach ridge. Segment 2 would require numerous small culverts to catch all of the drainage that eventually collects in the basin. Segment 3 would also require numerous small culverts to maintain natural drainage patterns.

Further hydrological studies will be required to determine the type and size of culverts needed to compensate for drainage and road crossings. It is recommended that drainage for the proposed roads be sustained by culverts placed at definite locations to maintain positive drainage throughout the project and limit the amount of standing water along the base of the new roads.

Erosion and Sediment Control

Construction activities may result in temporary increases of total suspended solids, turbidity, and total solids caused by surface erosion from construction equipment. The construction contractor shall provide all temporary erosion control measures necessary to prevent water pollution, erosion, and sediment during construction. These pollution, erosion, and sediment control measures would protect all water bodies in the project area. Prior to construction, an Erosion Sediment Control Plan outlining the best management practices to be employed will be prepared for the selected segments that will make up the final Evacuation Road Project.

Right-Of-Way Requirements

New Right-Of-Way easements need to be acquired for any new construction and possibly for a portion of the existing road. Considering the footprint of the road after preliminary design, it is estimated that the Right-Of-Way will vary between 50 and 100 feet. The proposed Right-Of-Way widths for each segment can be viewed in the Segment Summary found in Appendix A.

Portions of Segment 1 are located within the City of Shaktoolik townsite. The remaining portions of the project are located within the surface estate is owned by Shaktoolik Native Corporation. The subsurface estate is owned by Bering Strait Regional Corporation. Right-Of-Way agreements are needed from both the Shaktoolik Native Corporation and Bering Straits Regional Corporation prior to construction of the project.

Two Native Allotments are located near the terminus of the portion, which are not anticipated to be impacted by the construction of the road.

Utilities

Both new construction and upgrades for the Evacuation Road will be convenient due to the absence of existing utilities. Almost all of the utilities are within the Shaktoolik townsite and do not extend past the community's infrastructure. The only concern is an underground waterline to the community's water intake that parallels the beginning portion of Segment 1. However, it is not anticipated that this waterline will be an issue. Improvements to Segment 1 only include raising the road and no excavation is required. Regardless, the waterline's location should be noted and clearly marked especially during drainage improvements. No other utility conflicts were identified within the limits of the project, nor do any of the proposed alternatives require utility modifications.

Environmental and Archaeological

As part of the design and environmental process, field investigations will be required as part of the environmental and archeological process. Field studies are required in order to prepare a Wetland Delineation and the Phase 1 Environmental Site Assessment.

The purpose of the Preliminary Wetlands Delineation is to evaluate the presence of wetlands in the project area. Wetlands are regulated by the U.S. Army Corps of Engineers (ACOE) and defined as "*those 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. The field crew examined all proposed and existing road alignments plus the potential material sites and investigated the area for wetlands based on the three wetland parameters of vegetation, soils, and hydrology. It will be determined if wetlands dominate the Evacuation Road corridors. It should be assumed that a majority of Segments 2 and 3 will be considered wetlands

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The purpose of the Phase 1 Environmental Site Assessment is to review available site records for the proposed project site and note adjacent land use to identify the presence or likely presence of contamination from hazardous substances or petroleum products at the site. Federal records were reviewed and investigation of the project site performed. All of the routes will be examined for the presence of contaminants. The material and disposal sites were also investigated. The presence of commercial or residential fuel tanks adjacent to the existing or proposed road corridors need to be determined and investigated to determine if there are signs of contamination including fuel odors, sheens, or stains.

Threatened or endangered species that may occur near Shaktoolik include the threatened spectacled eider and the endangered Steller Sea Lion. However, their habitat is in marine waters and thus should not be impacted by any part of this project. Eastern Norton Sound off shore waters is designated as a critical habitat for the spectacled eider.

The waters around Shaktoolik are inhabited by numerous migratory birds. In early June, vast numbers of bird species pass by Shaktoolik when either migrating to their Arctic breeding grounds or to nest.

In the general vicinity of Shaktoolik and the proposed Evacuation Road, there are archaeological and historic sites listed on the Alaska Heritage Resource Survey maintained by the State Office of History and Archaeology. This includes the historic Iditarod Trail, which parallels or runs concurrently with Segment 1. The primary archaeological concerns are the upgrades to the existing road, which could be in close proximity of sites. While most of the road construction activities in this area will consist primarily of minor smoothing and resurfacing, some drainage upgrades will be necessary in this area. Therefore, it is recommended that construction activities in some areas be archaeologically monitored. A completed archeological review of the project will be required along with a 106 determination by the Lead Federal Agency and concurrence by the State Office of History and Archaeology

The preliminary environmental review of the project indicated that an environmental assessment will most likely be needed to document the project's effects on the human environment. Additional public involvement and coordination, along with consultation with Federal, State and local agencies will be required to determine the full depth of the environmental document. It should be assumed that this will be a multiple agency funded project therefore early coordination with the funding agencies will be required to determine which agency will be the "Lead Agency" and which will be cooperating agencies.

Maintenance

The City of Shaktoolik assumes responsibility for road maintenance within its municipal boundaries and the ADOT&PF maintains the roadways that lead to the airport.

It remains undetermined whether the City of Shaktoolik or the Native Village of Shaktoolik will be responsible for the operation and maintenance of the Shaktoolik Evacuation Road. All of the existing and proposed segments will require regular maintenance. It is the responsible party's objective to provide a smooth surface, free of potholes, vegetation, and debris, as well as providing adequate maintenance to drainage structures to avoid roadway washout.

Material Sources, Disposal Site, and Staging Area

An existing material source was developed at the terminus of the project and can be viewed in Figure 12. The quantity or quality of material at the site is unknown and further investigation is required. Generally, the material should be acceptable for embankment material, but our experience indicates that local materials in the region do not meet the specifications for crushed aggregate or riprap. The material at this site is rocky in nature and will require further testing. Blasting should be anticipated at this location.

Subsurface rights for the site belong to both Shaktoolik Native Corporation (Surface) and Bering Straits Regional Corporation (Subsurface).

The community's solid waste disposal site is also the proposed disposal site for construction of this project. Preliminary design recommends minimal excavation. Therefore, very little earthen waste is anticipated to be generated from this project.

The anticipated staging area for the construction of the evacuation road will most likely be the existing material site at the terminus of the project.

Cost Estimate

Cost estimates will vary in part due to the soil stabilization options and drainage issues associated with each segment and alternative. The unit costs are based on state bid tab results and past projects in the Bering Straits Region. A 15% contingency was added to account for some of the unknown site conditions. Detailed cost estimates are included in Appendix B.

Conclusion

The primary factors being examined are the feasibility, cost, and environmental impact of each route. Site considerations that directly affect these factors are steepness of terrain, amount of fill, quantity and size of culverts required to handle the flow capacity, archaeological impacts, and biological surroundings. Based on the preliminary investigation, the segments analyzed have specific issues that will require different solutions for successful construction. None of the segments are perceived to have high environmental impacts and they each have a relatively equal cost value.

Limitations

This report was prepared for the exclusive use of the Denali Commission, Kawerak, and the U.S. Department of the Interior, Bureau of Indian Affairs, Alaska Regional Office, Branch of Transportation for specific application to the Shaktoolik Evacuation Road Project.

This report was generated to assist with the preparation of the environmental assessment and is intended to assist design professionals during the future design of this project. The opinions and conclusions expressed in this report are based on surface conditions revealed by field investigations, guidance presented by the Community of Shaktoolik, and the result of our analyses and studies. The study was made for the specific project described and any changes should be brought to our attention. The data reported may not be adequate to provide all the information needed by a contractor.

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U.S. Army Corps of Engineers, *Community Flood Hazard Data*, available online at:

www.poa.usace.army.mil/en/cw/fld_haz/shaktoolik.htm

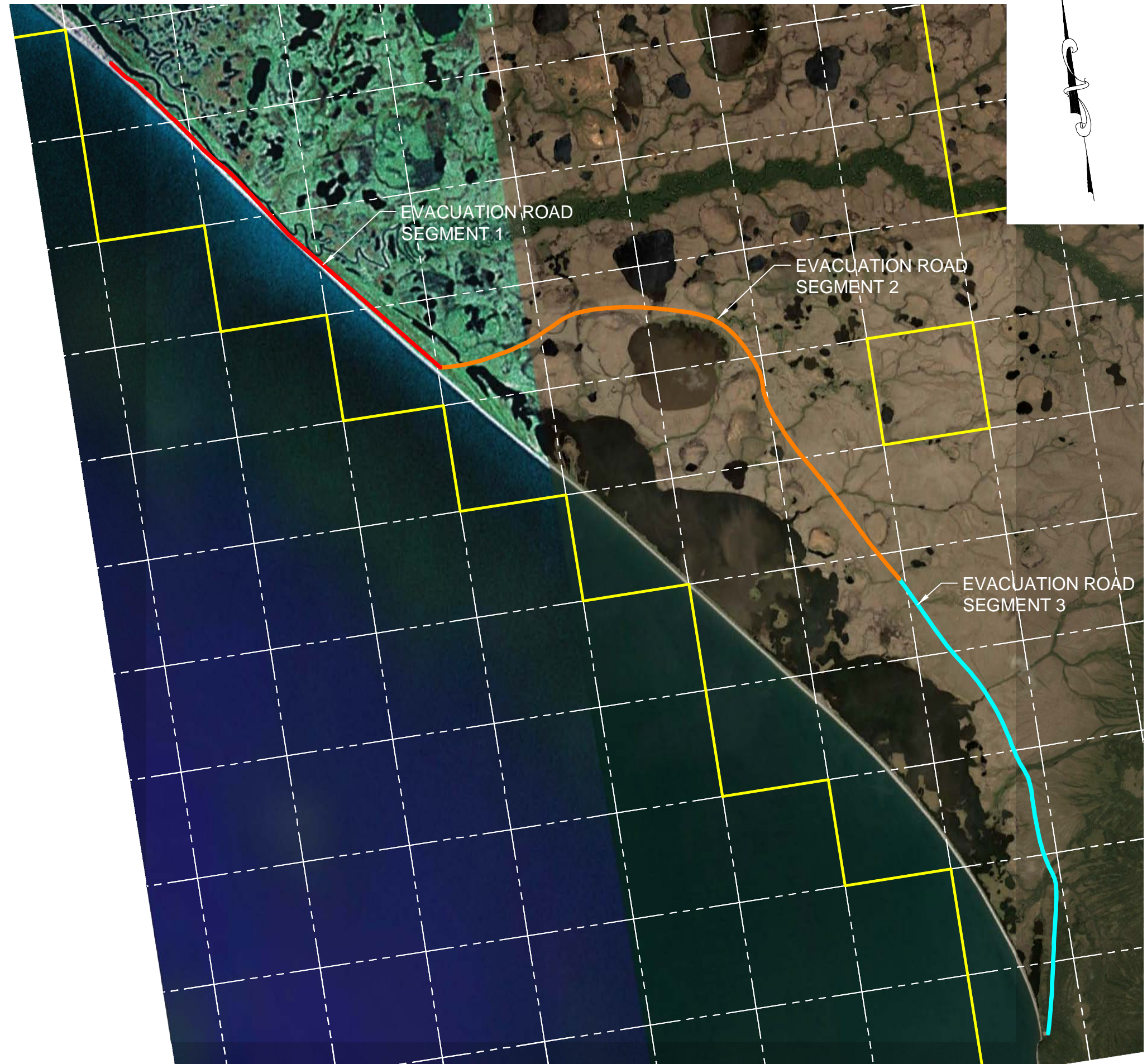
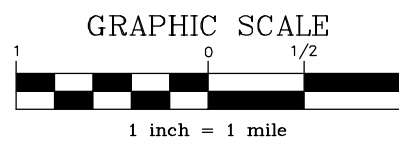


IMAGE SOURCE: GOOGLE EARTH PRO

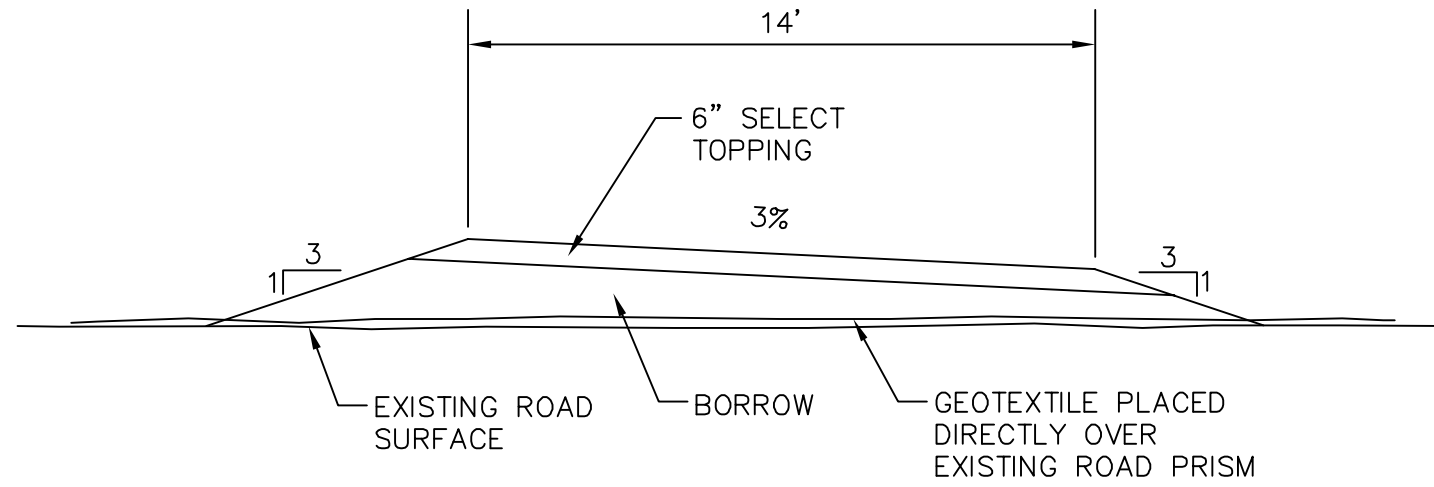
PROJECT LOCATION MAP

DECEMBER 12, 2008

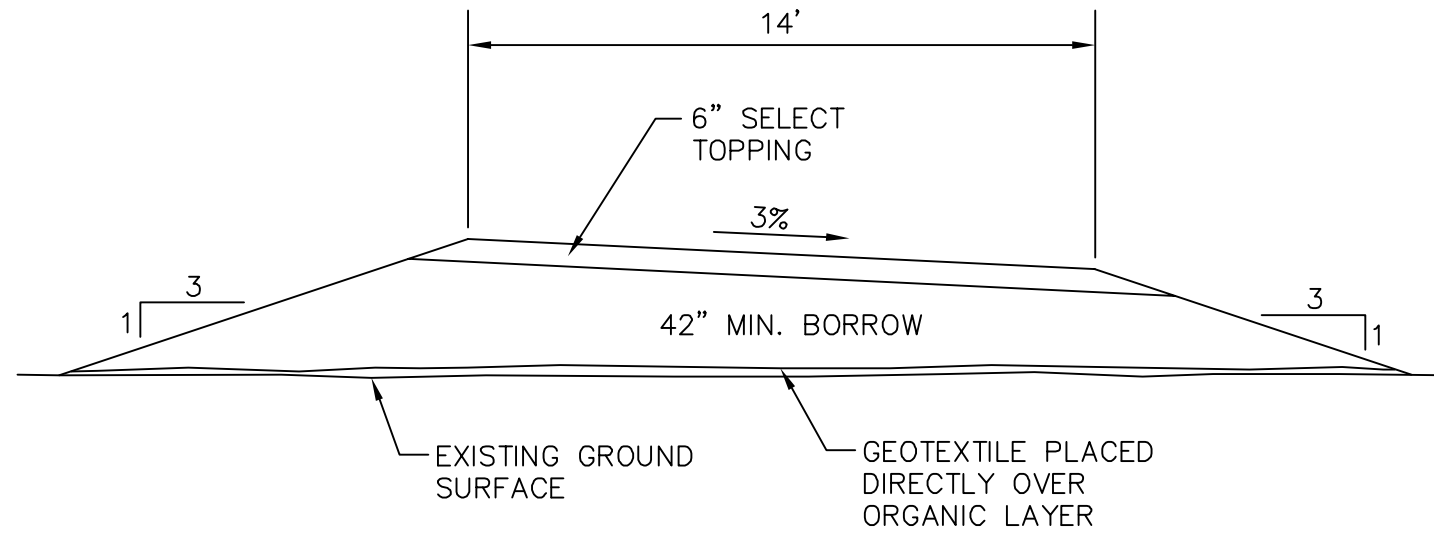
FIGURE 1

SHAKTOOLIK EVACUATION ROAD

Rodney P. Kinney Associates, inc.
Consulting Engineers & Surveyors



TYPICAL ROADWAY SECTION
UPGRADES TO EXISTING ROADS -NTS-



TYPICAL ROADWAY SECTION
NEW CONSTRUCTION -NTS-

APPENDIX A

SEGMENT SUMMARY TABLE

Table 1: Segment Summary

		Segment 1	Segment 2	Segment 3
Current Condition		Existing Road	Proposed Road	Proposed Road
Construction Type		Rehabilitation: Upgrades, Resurfacing, Raising Road	New Construction	New Construction
Surface Width (ft)		14	14	14
Length (miles)		4.2	5.7	4.7
Acquire Right-Of-Way		Varies	Varies	Varies
Hydrology Assessment		Replace damaged and undersized culverts, install additional culverts	Will require multiple (12"-36") culverts	Will require multiple (12"-36") culverts
Impacted Wetlands (Acres)		0.0	26.5	21.5
Biological Wildlife		Migratory and nesting birds	Migratory and nesting birds	Migratory and nesting birds
Hazardous Waste		Low potential for hazardous materials or contaminants	Low potential for hazardous materials or contaminants	Low potential for hazardous materials or contaminants
Cost (all costs include a 15% contingency)	Individual Segment Cost	\$4,015,536	\$8,550,878	\$6,913,405
	Base Construction Cost		\$2,990,000	

APPENDIX B

COST ESTIMATES

Engineers Estimate

Shaktoolik Evacuation Road Project Route Reconnaissance Report

Base Construction & Design Cost

Item No.		Description	Pay Unit	Quantity	Unit Price	Total
640	1	Mobilization & Demobilization	Lump Sum	1	\$1,500,000	\$1,500,000
641	1	Erosion & Pollution Control Administration	Lump Sum	1	\$50,000	\$50,000
641	4	Temporary Erosion & Pollution Control	Lump Sum	1	\$250,000	\$250,000
642	1	Construction Surveying	Lump Sum	1	\$750,000	\$750,000
643	2	Traffic Maintenance	Lump Sum	1	\$50,000	\$50,000

Project Subtotal: \$2,600,000

Contingency (15%): \$390,000

Construction Subtotal: \$2,990,000

Segment 1

Item No.		Description	Pay Unit	Quantity	Unit Price	Total
201	1B	Clearing	Acres	19	\$5,000	\$96,497
203	5	Borrow	Cubic Yards	37,710	\$50	\$1,885,500
301	4	Aggregate Surface Course, Grade E-1	Cubic Yards	6,704	\$75	\$502,800
603	21	24 inch CPE Pipe	Linear Foot	125	\$100	\$12,500
615	1	Standard Sign	Square Foot	50	\$85	\$4,250
618	1	Seeding	Acres	12	\$7,000	\$85,323
624	1	EnviroKleen Dust Control	Tons	58	\$1,100	\$64,219
630	1	Geotextile Separation	Square Foot	840,682	\$1	\$840,682

Project Subtotal: \$3,491,770

Contingency (15%): \$523,766

Segment 1 - Construction Subtotal: \$4,015,536

Engineers Estimate

Shaktoolik Evacuation Road Project Route Reconnaissance Report

Segment 1-Armoring

Item No.		Description	Pay Unit	Quantity	Unit Price	Total
301	2	Aggregate Base Course, Grading C	Cubic Yards	13,333	\$75	\$999,975
611	1a	Riprap, Class 5	Cubic Yards	16,296	\$280	\$4,562,880
611	1b	Riprap, Class 2	Cubic Yards	9,260	\$280	\$2,592,800
Project Subtotal:						\$8,155,655
Contingency (15%):						\$1,223,348
Segment 1 - Construction Subtotal:						\$9,379,003

Segment 2

Item No.		Description	Pay Unit	Quantity	Unit Price	Total
201	1B	Clearing	Acres	27	\$5,000	\$132,654
203	5	Borrow	Cubic Yards	103,680	\$50	\$5,184,000
301	4	Aggregate Surface Course, Grade E-1	Cubic Yards	9,216	\$75	\$691,200
514	1	Rock Stabilization Anchors	Linear Foot	910	\$18	\$16,380
603	21	24 inch CPE Pipe	Linear Foot	125	\$100	\$12,500
603	21	36 inch CPE Pipe	Linear Foot	90	\$120	\$10,800
611	1	Riprap, Class 3	Cubic Yards	150	\$150	\$22,500
615	1	Standard Sign	Square Foot	50	\$85	\$4,250
618	1	Seeding	Acres	17	\$7,000	\$117,294
624	1	EnviroKleen Dust Control	Tons	80	\$1,100	\$88,282
630	1	Geotextile Separation	Square Foot	1,155,686	\$1	\$1,155,686
Project Subtotal:						\$7,435,546
Contingency (15%):						\$1,115,332
Segment 2 - Construction Subtotal:						\$8,550,878

Engineers Estimate

Shaktoolik Evacuation Road Project Route Reconnaissance Report

Segment 3

Item No.		Description	Pay Unit	Quantity	Unit Price	Total
201	1B	Clearing	Acres	22	\$5,000	\$107,781
203	5	Borrow	Cubic Yards	84,240	\$50	\$4,212,000
301	4	Aggregate Surface Course, Grade E-1	Cubic Yards	7,488	\$75	\$561,600
603	21	24 inch CPE Pipe	Linear Foot	50	\$100	\$5,000
611	1	Riprap, Class 3	Cubic Yards	100	\$150	\$15,000
615	1	Standard Sign	Square Foot	50	\$85	\$4,250
618	1	Seeding	Acres	14	\$7,000	\$95,301
624	1	EnviroKleen Dust Control	Tons	65	\$1,100	\$71,729
630	1	Geotextile Separation	Square Foot	938,995	\$1	\$938,995

Project Subtotal: \$6,011,657

Contingency (15%): \$901,749

Segment 3 - Construction Subtotal: \$6,913,405

Total Project Cost

Total Base Cost:	\$2,990,000
Segment 1 - Construction Subtotal:	\$4,015,536
Segment 1 Armoring - Construction Subtotal:	\$9,379,003
Segment 2 - Construction Subtotal:	\$8,550,878
Segment 3 - Construction Subtotal:	\$6,913,405
Project Development	\$650,000
Construction Administration	\$900,000
Total Project Cost :	\$33,398,822

APPENDIX C

SCOPING REPORT

Scoping Report

DATE: April 30, 2007

TO: J. Sean McKnight, P.E., Program Director

FROM: Brian Pederson, P.E, P.L.S. 

RE: Shaktoolik Main Street Rehabilitation Project & Evacuation Road Project

Introduction:

Shaktoolik is located on the east shore of Norton Sound. It lies 125 miles east of Nome and 33 miles north of Unalakleet. The community lies at approximately 64.333890° North Latitude and -161.15389° West Longitude. (Sec. 23, T013S, R013W, Kateel River Meridian.) The area encompasses 1.1 sq. miles of land and 0.0 sq. miles of water.

Kawerak Transportation identified two projects in Shaktoolik in their Transportation Priority List. On September 24, 2005, a site investigation was conducted with the purpose of defining the scope of various projects in the community that need to be completed and to identify specific engineering alternatives for design and environmental review.

Project Description:

The two main projects proposed in Shaktoolik are the Evacuation Road, and Main Street Rehabilitation. Both projects are described in the following sections:

Evacuation Road:

For the community the evacuation road is the top priority. Currently the village has no access to higher ground in case of a High Water Storm (HWS) event. Recent storms have been eroding the only road that heads south to the Old Shaktoolik site which is insufficient to hold the residents safely during a HWS event.

Two alignments were prepared using USGS mapping and are presented in Figure 1. Numerous deviations of the alternatives are available and a field reconnaissance should be completed to determine at least two viable alternatives.

- Segment A, as shown in Figure 1, is 1.5 miles long and will cross Tagoomenik River. The crossing of Tagoomenik River will require two bridges; the first bridge is approximately 200 feet long and the second is approximately 100 feet long as shown in Figure 2. The existing ground consists of mainly tundra and marsh conditions. As noted before an additional site visit is required. Segment B, Alternate A and B, will begin at the termination of this segment.

Shaktoolik Project Scoping

Main Street Rehabilitation Project and Evacuation Road Project

- Segment B has two alternatives, A and B. Alternative A generally parallels the Shaktoolik River to the east for 11.7 miles until the road reaches the Nulato Hills. Alternate B generally heads north 3.5 miles to a hill, which has an elevation of approximately 250 feet above sea level. Alternative B requires a 300 foot long bridge crossing the Shaktoolik River. As noted before and additional site visit is required.

The road is estimated to be a single lane (14 feet) road with turnouts. The embankment will consist of geotechnical stabilization and separation fabric under the road prism, 2:1 side slopes, select borrow, and 6" crushed aggregate treated with a dust palliative. The bridge(s) are assumed to be reinforced concrete bulb tee's. It was stated that the road needs to be built so its finished elevation is 50 feet above mean sea level. This criteria needs to be verified during project development and for estimating purposes this elevation was used. A number of sloughs, creeks, and lakes will be crossed so further hydrological studies will be required to determine the type and size of culverts needed to compensate for drainage.

Main Street Rehabilitation:

This project consists of resurfacing approximately 0.93 miles of existing roadway through the center of Shaktoolik with 6" of crushed aggregate and dust palliative. Local traffic patterns widened the existing roads with efforts to avoid potholes and ruts. Transferring the community streets into typical roadway would include rebuilding through the middle of the street and reseeding excess roadways. The road is estimated to be reconstructed to 24 feet in width. Some minor vertical realignment may be required and will be dependent on further field surveys.

Material Sources:

Material source(s) to construct the evacuation road and local projects is an issue in Shaktoolik. Materials will be available at the terminus of the proposed evacuation road. The road may need to be constructed from the materials source in Shaktoolik. A material source investigation is an integral part of project and should be completed prior to selecting the preferred evacuation route alternative.

Design Guidelines:

The design for the reconstructed and new roadways will be completed in accordance with the American Association of State Highways and Transportation Officials' (AASHTO): *A policy on Geometric Design of Highway and Streets*, AASHTO's *Guidelines for Geometric Design of Very Low-Volume Local Roads*, and AASHTO's *Standard Specification for Bridge Design*.

Initial Project Estimate:

A preliminary estimate of the construction cost based on our scoping efforts was completed. The cost on the evacuation roads and bridges is based on working from the terminus of the evacuation road to back to Shaktoolik. The costs presented in Table 1 are planning level estimates; additional work is required for the 20% PS&E submittal.

Work Tasks Required:

The work tasks required to develop the Evacuation Road and Main Street Rehabilitation are summarized in the following sections:

Shaktoolik Project Scoping

Main Street Rehabilitation Project and Evacuation Road Project

Surveying:

Surveying will be required for the project. As a cost effective way to survey the area it is anticipated that LIDAR will be used for the evacuation road. A detailed search for existing property corners will be needed in order to perform the right-of-way work needed for the projects.

Right-of-Way:

Based on the survey work, right-of-way documents will be prepared that document and reserve a public right-of-way easement. The preferred method of securing a right-of-way is through the use of fee simple acquisition rather than an easement. Because the right-of-way acquisition is being contemplated using Kawerak transportation dollars, it will be considered a Federal undertaking. This requires that any right-of-way acquired on real property follow the Uniform Relocation Assistant and Real Property Acquisition Policies Act.

Geotechnical/Material Source Investigation:

A geotechnical investigation will be required for the Evacuation Road. A material source investigation will also be required to determine the types and quality of the materials. Bridges are anticipated for the project; therefore detailed geotechnical information near the proposed abutments is needed include drilling.

Bridge Design:

Several bridges will be required as part of the evacuation road, which will be designed in accordance with AASHTO Standard Specification for Bridge Design latest edition.

Hydrology/Flood Levels

A determination of the 100 year flood level will be required for the evacuation road and bridges. It was stated that the road needs to extend 50 feet above MSL; this value needs to be verified. Additionally a study of the local hydrology will be needed for the evacuation road to determine the size and location of drainage structures along its length.

Environmental/Permits:

A review under NEPA will be required for the project. Due to right-of-way acquisition, the environmental documentation needed will most likely be an Environmental Assessment. A full gamut of permits will be required for this project. This will include the requirements for a public hearing.

Plans Specifications and Estimate (PS&E):

PS&E submittal will be required at the 20%, 70%, and 100% completion stages.

Shaktoolik Project Scoping
Main Street Rehabilitation Project and Evacuation Road Project

Table 1: Shaktoolik Planning Level Estimate

Item		Description	Pay Unit	Quantity	Unit Price	Total
201	1B	Clearing	Acres	8	\$5,000	\$41,818
203	5	Borrow	Cubic Yards	53,973	\$40	\$2,158,933
301	4	Aggregate Surface Coarse, Grade E-1	Cubic Yards	2,053	\$80	\$164,267
501	4	Class A Concrete	Cubic Yards	65	\$400	\$26,000
501	7	Precast Concrete Member Bulb T	Each	4	\$400,000	\$1,600,000
505	5	Furnish Structural Steel Piles	Linear Foot	400	\$250	\$100,000
505	6	Drive Structural Steel Piles	Each	4	\$10,000	\$40,000
505	10	Test Pile	Each	2	\$20,000	\$40,000
505	11	Load Test	Each	2	\$20,000	\$40,000
603	1A	24 inch CSP	Linear Foot	180	\$120	\$21,600
603	1B	48 inch CSP	Linear Foot	180	\$100	\$18,000
603	1C	60 inch CSP	Linear Foot	240	\$190	\$45,600
606	1	W-Beam Guardrail	Linear Foot	500	\$200	\$100,000
606	11	Extruded Terminal	Each	8	\$20,000	\$160,000
606	12	Guardrail/Bridge Rail Connection	Each	6	\$5,000	\$30,000
611	1	Riprap, Class 3	Cubic Yards	60	\$150	\$9,000
611	2	Riprap, Class 4	Cubic Yards	90	\$200	\$18,000
615	1	Standard Sign	Square Foot	16	\$85	\$1,360
618	1	Seeding	Acres	6	\$7,000	\$40,727
624	1	Calcium Chloride for Dust Control	Tons	25	\$1,093	\$27,650
630	1	Geotextile Separation	Square Foot	364,320	\$1	\$364,320
640	1	Mobilization & Demobilization	Lump Sum	1	\$1,500,000	\$1,500,000
641	1	Erosion and Pollution Control Administration	Lump Sum	1	\$250,000	\$250,000
641	4	Temporary Erosion and Pollution Control	Lump Sum	1	\$250,000	\$250,000
642	1	Construction Surveying	Lump Sum	1	\$350,000	\$350,000
643	2	Traffic Maintenance	Lump Sum	1	\$50,000.00	\$50,000

Shaktoolik Evacuation Road Segment A

\$7,447,275

Contingency (15%) \$1,117,091

Total \$8,564,367

Shaktoolik Project Scoping
Main Street Rehabilitation Project and Evacuation Road Project

Item		Description	Pay Unit	Quantity	Unit Price	Total
201	1B	Clearing	Acres	65	\$5,000	\$326,181
203	5	Borrow	Cubic Yards	420,992	\$40	\$16,839,680
301	4	Aggregate Surface Coarse, Grade E-1	Cubic Yards	16,016	\$80	\$1,281,280
603	1A	24 inch CSP	Linear Foot	1,800	\$120	\$216,000
603	1B	48 inch CSP	Linear Foot	1,800	\$100	\$180,000
603	1C	60 inch CSP	Linear Foot	2,400	\$190	\$456,000
611	1	Riprap, Class 3	Cubic Yards	600	\$150	\$90,000
611	2	Riprap, Class 4	Cubic Yards	900	\$200	\$180,000
615	1	Standard Sign	Square Foot	100	\$85	\$8,500
618	1	Seeding	Acres	45	\$7,000	\$317,671
624	1	Calcium Chloride for Dust Control	Tons	197	\$1,093	\$215,671
630	1	Geotextile Separation	Square Foot	2,841,696	\$1	\$2,841,696
640	1	Mobilization & Demobilization	Lump Sum	1	\$1,500,000	\$1,500,000
641	1	Erosion and Pollution Control Administration	Lump Sum	1	\$250,000	\$250,000
641	4	Temporary Erosion and Pollution Control	Lump Sum	1	\$250,000	\$250,000
642	1	Construction Surveying	Lump Sum	1	\$500,000	\$500,000
643	2	Traffic Maintenance	Lump Sum	1	\$50,000.00	\$50,000

Shaktoolik Evacuation Road Segment B.
Alternative A

\$25,502,679

Contingency (15%) \$3,825,402

Total \$29,328,081

Shaktoolik Project Scoping
Main Street Rehabilitation Project and Evacuation Road Project

Item		Description	Pay Unit	Quantity	Unit Price	Total
201	1B	Clearing	Acres	20	\$5,000	\$97,575
203	5	Borrow	Cubic Yards	125,938	\$40	\$5,037,511
301	4	Aggregate Surface Coarse, Grade E-1	Cubic Yards	4,791	\$80	\$383,289
501	4	Class A Concrete	Cubic Yards	33	\$400	\$13,200
501	7	Precast Concrete Member Bulb T	Each	2	\$400,000	\$800,000
505	5	Furnish Structural Steel Piles	Linear Foot	200	\$250	\$50,000
505	6	Drive Structural Steel Piles	Each	20	\$10,000	\$200,000
505	10	Test Pile	Each	1	\$20,000	\$20,000
505	11	Load Test	Each	1	\$20,000	\$20,000
603	1A	24 inch CSP	Linear Foot	540	\$120	\$64,800
603	1B	48 inch CSP	Linear Foot	540	\$100	\$54,000
603	1C	60 inch CSP	Linear Foot	720	\$190	\$136,800
606	11	Extruded Terminal	Each	4	\$20,000	\$80,000
606	12	Guardrail/Bridge Rail Connection	Each	2	\$5,000	\$10,000
611	1	Riprap, Class 3	Cubic Yards	180	\$150	\$27,000
611	2	Riprap, Class 4	Cubic Yards	270	\$200	\$54,000
615	1	Standard Sign	Square Foot	35	\$85	\$2,975
618	1	Seeding	Acres	14	\$7,000	\$95,030
624	1	Calcium Chloride for Dust Control	Tons	59	\$1,093	\$64,517
630	1	Geotextile Separation	Square Foot	850,080	\$1	\$850,080
640	1	Mobilization & Demobilization	Lump Sum	1	\$1,500,000	\$1,500,000
641	1	Erosion and Pollution Control Administration	Lump Sum	1	\$250,000	\$250,000
641	4	Temporary Erosion and Pollution Control	Lump Sum	1	\$250,000	\$250,000
642	1	Construction Surveying	Lump Sum	1	\$450,000	\$450,000
643	2	Traffic Maintenance	Lump Sum	1	\$50,000.00	\$50,000

**Shaktoolik Evacuation Road Segment B.
Alternative B**

\$10,560,777

Contingency (15%) \$1,584,117

Total \$12,144,894

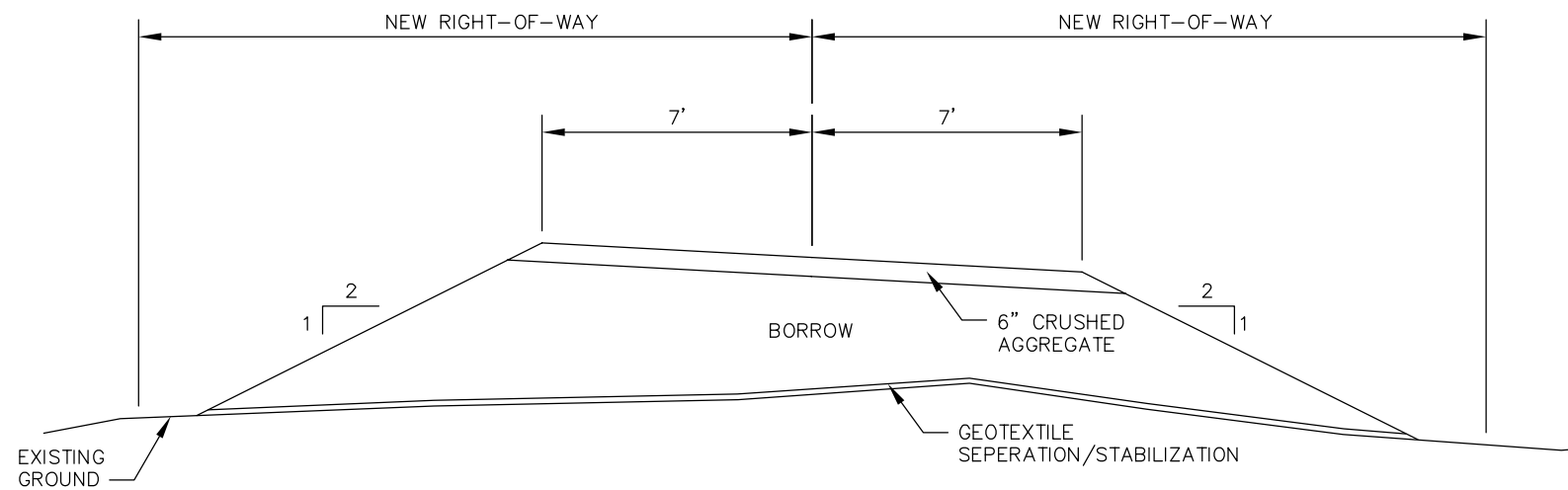
Item		Description	Pay Unit	Quantity	Unit Price	Total
301	4	Aggregate Surface Coarse, Grade E-1	Cubic Yards	2,173	\$68.00	\$147,791
603	1A	24 inch CSP	Linear Foot	750	\$120.00	\$90,000
624	1	Calcium Chloride for Dust Control	Tons	8	\$1,093.00	\$8,907
641	1	Erosion and Pollution Control Administration	Lump Sum	1	\$250,000.00	\$250,000
641	4	Temporary Erosion and Pollution Control	Lump Sum	1	\$150,000.00	\$150,000
643	2	Traffic Maintenance	Lump Sum	1	\$20,000.00	\$20,000

Main Street Upgrades

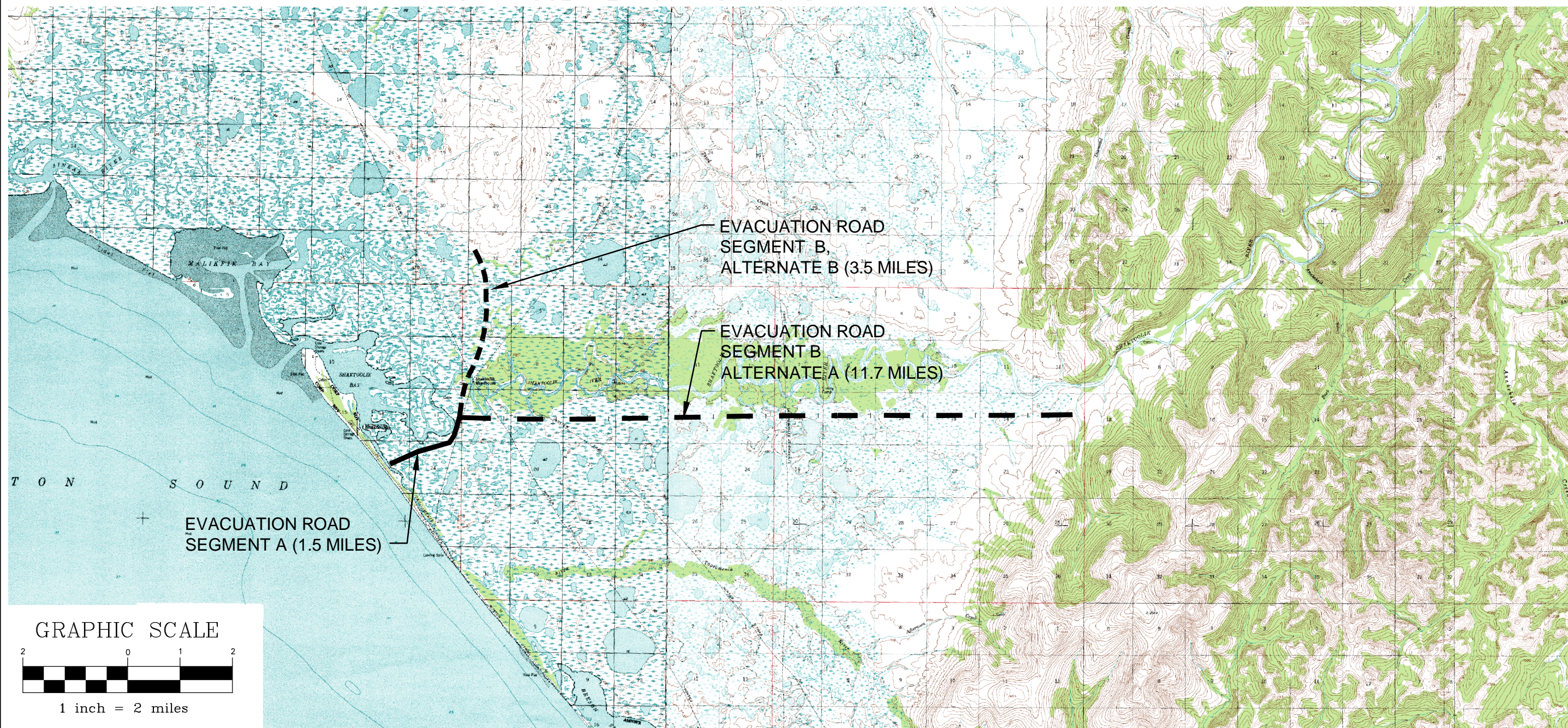
\$666,698.53

Contingency (15%) \$100,004.78

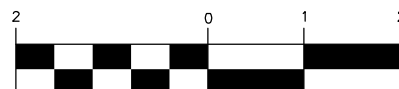
Total \$766,703.31



TYPICAL ROADWAY SECTION
SHAKTOOLIK EVACUATION ROAD -NTS-



GRAPHIC SCALE



1 inch = 2 miles

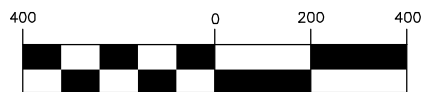
IMAGE SOURCE: TOPOZONE.COM



LEGEND

- COMMUNITY STREETS REQUIRING UPGRADES
- CONSTRUCT EVACUATION ROAD - SEGMENT A
- NEW BRIDGE CONSTRUCTION

GRAPHIC SCALE



1 inch = 400 feet

IMAGE SOURCE: AERO-METRIC, INC.