



U.S. Army Corps
of Engineers
Alaska District

ALASKA BASELINE EROSION ASSESSMENT

AVETA Report Summary – Kivalina, Alaska

Community Information

Kivalina is at the tip of an 8-mile barrier reef located between the Chukchi Sea and Kivalina River. It is 80 air miles northwest of Kotzebue. The community is at approximately 67° North Latitude and -164° (West) Longitude, (Sec. 21, T027N, R026W, Kateel River Meridian.). Kivalina is in the Kotzebue Recording District. The area encompasses 1.9 square miles of land and 2.0 square miles of water. The community is in the transitional climate zone, which is characterized by long, cold winters and cool summers. The average low temperature during January is -15 degrees Fahrenheit, and the average high during July is 57 degrees Fahrenheit. Temperature extremes have been measured from -54 degrees Fahrenheit to 85 degrees Fahrenheit. Snowfall averages 57 inches, with 8.6 inches of precipitation per year. The Chukchi Sea is ice-free and open to boat traffic from mid-June to the first of November.



Kivalina shoreline with skiffs



Typical structures in Kivalina



Undermined building on Kivalina



Emergency shoreline protection - 2005

What are the costs associated with continued erosion?

There are three elements related to costs associated with erosion: past protection endeavors, the cost of ongoing repair and maintenance, and future damages. These are discussed in more detail in the following paragraphs.

Erosion Protection Costs

Kivalina has not historically seen significant erosion. The Kivalina spit has seen cyclic erosion and accretion, with modest accretion on the Chukchi Sea side more prevalent during the 30-year period of 1970 to 2000. The higher energy storms that could result in significant erosion occur during the winter months when the Chukchi Sea is frozen. This has resulted in natural erosion protection in the past. However, with global climate change the period of open water is increasing and the Chukchi Sea is less likely to be frozen when damaging winter storms occur. Winter storms occurring in October and November of 2004 and 2005 have resulted in significant erosion that is now threatening both the school and the Alaska Village Electric Cooperative (AVEC) tank farm. This erosion has resulted in the loss of some teacher housing and the school and community washateria drain fields. Erosion control efforts by the state from 1985 to 2002 totaled \$477,000, and during the last two years emergency erosion control efforts have cost approximately \$850,000.

Cost of New Shoreline Protection

Due to the significant erosion of the several years, emergency erosion protection has been pursued by both the State and Federal governments. The Corps is currently implementing interim erosion protection for the community of Kivalina, recognizing that there will likely be a significant timeline associated with moving a community.

Future Damages

The approach used to determine potential erosion damages at Kivalina is based on several assumptions as they pertain to the damage categories of residential, commercial, public infrastructure, and land values. In addition, damages are based on an assumed rate of erosion. These damages are those that would occur should the erosion protection not be installed or the community not relocate.

Residential Structures Assumptions

Oceanfront properties are assumed to fail in the 10-year project horizon and the rest of the village is assumed to fail in the 20-year project horizon. It is assumed that as erosion approaches individual homes, homeowners will take steps to salvage their personal property. With nowhere to move the structures, once the erosion reaches them, they will be a complete loss.

Commercial and Public Buildings Assumptions

The Kivalina Native Store and warehouse are the primary commercial structures in the community. While the store and warehouses are moveable, the lack of available land precludes relocation.

Infrastructure Assumptions

Roads, utility lines, the sewage lagoon, and solid waste site construction are based on the recent Shishmaref study with a discount for the smaller Kivalina population.

Summary of Future Damages

If no bank protection structures were to be installed, the combined residential, commercial, and public buildings and infrastructure costs due to erosion at Kivalina total more than \$105 million for the 20-year project horizon, although the community will become uninhabited long before complete loss occurs.

What are potential costs associated with moving to a new location or an existing community?

The community has long assumed that the island would succumb to natural forces, and that they would have to move. To this end, residents have pursued relocation for the last 20 years. Their efforts have been stymied by difficulties in choosing a new village site, funding the relocation effort, and social problems within the village stemming from overcrowding, poverty, and other difficult living conditions.

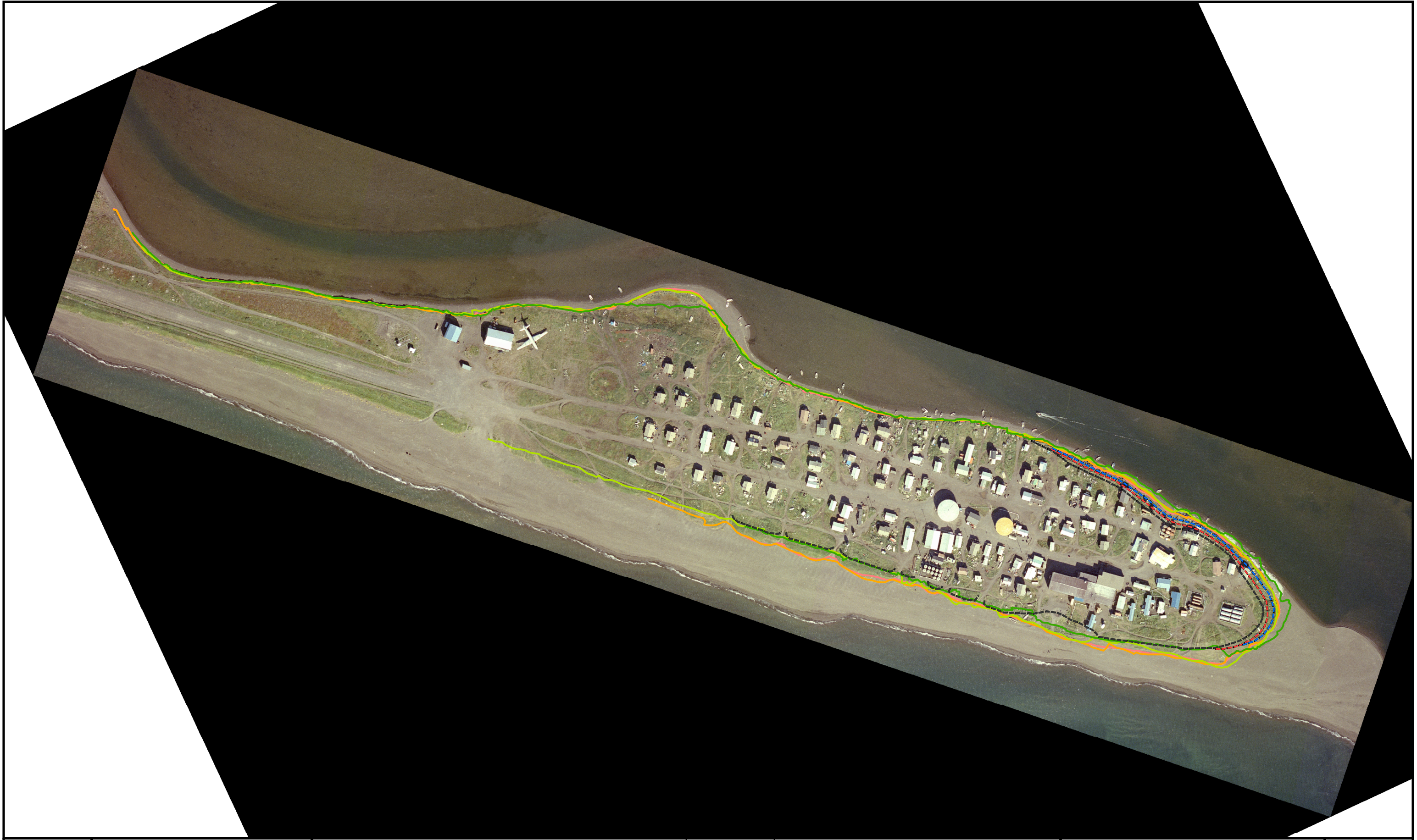
Kivalina has yet to determine if they are going to relocate and where they would relocate to, which makes it difficult to estimate what the relocation costs would be. In addition, some of the sites selected by some in the community would require a significant amount of fill to be brought in, which would cost hundreds of millions of dollars, making those sites infeasible. The following, however, are preliminary estimates based upon finding a site requiring little or no fill to raise it above flood levels.

A relocation of the community to a new location would cost an estimated \$123.4 million, which would include a minimal level of housing, water, and sanitation facilities.

A co-location to Kotzebue, the nearest hub community, would cost an estimated \$95 million. This information is based upon a 2004 preliminary cost of alternatives for co-locating Shishmaref to Kotzebue, scaled to reflect the difference in population for Shishmaref and Kivalina.

What is the expected time line for a complete failure of the usable land?

The winter storms of 2004 and 2005 eroded 70 to 80 feet of uplands behind the school. The bank line is now within 25 feet of the main school structure. Erosion in the vicinity of the AVEC tank farm is similar, with only 5 feet of uplands remaining between the nearest tanks and the bank line. Without the construction of emergency erosion control structures, the school and tank farm will begin to fail within the next year if erosion continues at the same rate as it has during recent months. Even if erosion slows, these critical structures are in imminent danger and are unlikely to survive for any extended period of time. Due to the physical lack of open land in the Kivalina community, these structures can not be relocated, and their failure would render the community uninhabitable.



	<p>Alaska District Corps of Engineers Civil Works Branch</p>	<p>Predicted and Historical Shorelines</p> <table border="0"> <tr> <td> 1975</td> <td> 2000</td> <td> 2030</td> </tr> <tr> <td> 1990</td> <td> 2010</td> <td></td> </tr> <tr> <td> 1997</td> <td> 2020</td> <td></td> </tr> </table>	1975	2000	2030	1990	2010		1997	2020				<p>Alaska Village Erosion Technical Assistance Program Kivalina, Alaska</p>	
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