



U.S. Army Corps  
of Engineers  
Alaska District

## ***ALASKA BASELINE EROSION ASSESSMENT***

### **AVETA Report Summary – Shishmaref, Alaska**

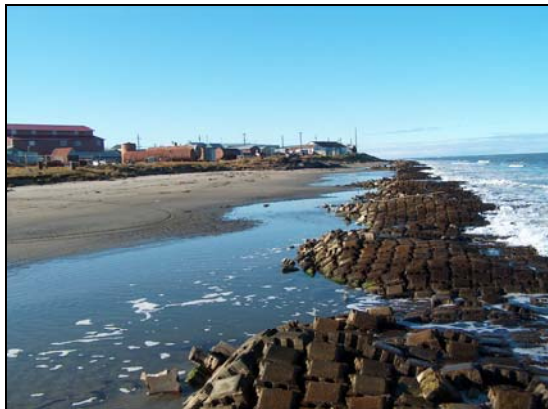
#### **Community Information**

Shishmaref is on Sarichef Island in the Chukchi Sea, just north of Bering Strait. Shishmaref is 5 miles from the mainland, 126 miles north of Nome, and 100 miles southwest of Kotzebue. The village is surrounded by the 2.6 million-acre Bering Land Bridge National Reserve. It is part of the Beringian National Heritage Park, endorsed by Presidents Bush and Gorbachev in 1990. The community is at approximately 66° North Latitude and -166° (West) Longitude, (Sec. 23, T010N, R035W, Kateel River Meridian).

Shishmaref is in the Cape Nome Recording District. The area encompasses 2.8 square miles of land and 4.5 square miles of water. The area experiences a transitional climate between the frozen arctic and the continental Interior. Summers can be foggy, with average temperatures ranging from 47 to 54 degrees Fahrenheit; winter temperatures average -12 to 2 degrees Fahrenheit. Average annual precipitation is about 8 inches, including 33 inches of snow. The Chukchi Sea is typically frozen from mid-November through mid-June, although in recent years freeze up has occurred later and thaw earlier.



The community of Shishmaref



Old articulated concrete mat project

### **What are the costs associated with continued erosion?**

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

#### **Historical Erosion Protection Costs**

The community of Shishmaref is being affected by high rates of erosion along the shoreline. Climatic conditions have led to icepack development occurring later and later each year. Without the icepack in place, the island is more susceptible to fall and early winter storms that have increased erosion and littoral drift. Erosion and littoral drift are shifting the island footprint northeastward and southwestward, subjecting the developed areas to massive wave scour and erosion of the fine materials that make up the island. Erosion is undermining buildings and infrastructure, causing several structures to collapse and fall into the sea. All efforts to arrest the erosion have been unsuccessful for other than short periods of time.



Past protection attempts in 2003.



BIA protection in foreground in 2003.

Recently the Bureau of Indian Affairs (BIA), the City of Shishmaref, and the Corps have invested in shoreline protection along the community of Shishmaref. In 2004, the BIA installed 200 feet of shoreline protection along the shoreline near the Native store. In 2005, the Corps installed 230 feet of protection, connecting to the BIA project, extending to the east to protect the Shishmaref School. Also in 2005, the community of Shishmaref installed about 250 feet of protection extending to the east from the Corps project. The Corps has continued to install segments of erosion protection as funding has become available.





Post Fall 2004 Storm



Corps Project Under Construction in 2005



Post Construction – Corps Project to Right / City Project to Left in 2005

Erosion control efforts by the state (including legislative grants and Department of Transportation funding), Corps, and BIA to date total more than \$9.5 million.

#### **Cost of New Shore Protection**

The Corps is also developing a project that will protect the remaining portions of shoreline as well as upgrade all the existing projects to the same standard of protection. The project is currently estimated to cost \$25,000,000. This project will provide for consistent protection stretching along the entire community waterfront, not including the airport. The recently installed projects will provide some protection against the ongoing erosion problem. The city project could use an additional layer of armor stone and both the BIA and city project may need to be elevated, but both should provide adequate protection until the remainder of the Corps project can be built. Protecting the airport may require additional effort.

#### **Future Damages**

The approach used to determine potential erosion damages at Shishmaref 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 two different rates of erosion. An examination of the erosion rates based on aerial photos from 1973 to 2003 show a somewhat subdued rate of erosion, while actual erosion rates from 2001 to

2003 are much more dramatic. These damages would occur if the proposed project was not installed or the community did not relocate.

### ***Residential Structure Assumptions***

Several existing residences are within a 5 to 10 year range of the erosion line. It is assumed that as erosion approaches individual homes, homeowners will take steps to salvage their personal property. However, since there is limited available land in the community, it would be difficult to relocate buildings, so they are considered a total loss. It is estimated that much of the community's residential structures would be lost in the next 10 to 15 years.

### ***Commercial and Public Buildings Assumptions***

According to the Alaska Department of Commerce, Community, and Economic Development, there are 16 active business licenses in Shishmaref. These include city offices, the washeteria, arts and crafts stores, school, community center, and a variety of other public buildings. Under both erosion scenarios, these buildings will be lost within the 50 year planning horizon, with critical infrastructure being lost within 10 to 15 years.

### ***Infrastructure Assumptions***

Infrastructure includes power, communications, bulk fuel facilities, sewage lagoon, airport, and some water supply tanks. The airport and sewage lagoon have the greatest vulnerability. The power plant and bulk fuel facilities would likely be lost after the school.

### **Summary of Future Damages**

The value of the combined land lost, residential and commercial buildings, public buildings and infrastructure lost, and the costs fuel tank decommissioning, and closure due to erosion at Shishmaref range from more than \$47 million to more than \$130 million for the 50-year project horizon.

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

Shishmaref has formed a Relocation Coalition consisting of city officials, Native village elders, and other community leaders that has identified an area on the western shores of Shishmaref Lagoon near Tin Creek where the community could relocate. Relocating Shishmaref and providing similar services currently afforded to Shishmaref residents would cost approximately \$180 million.

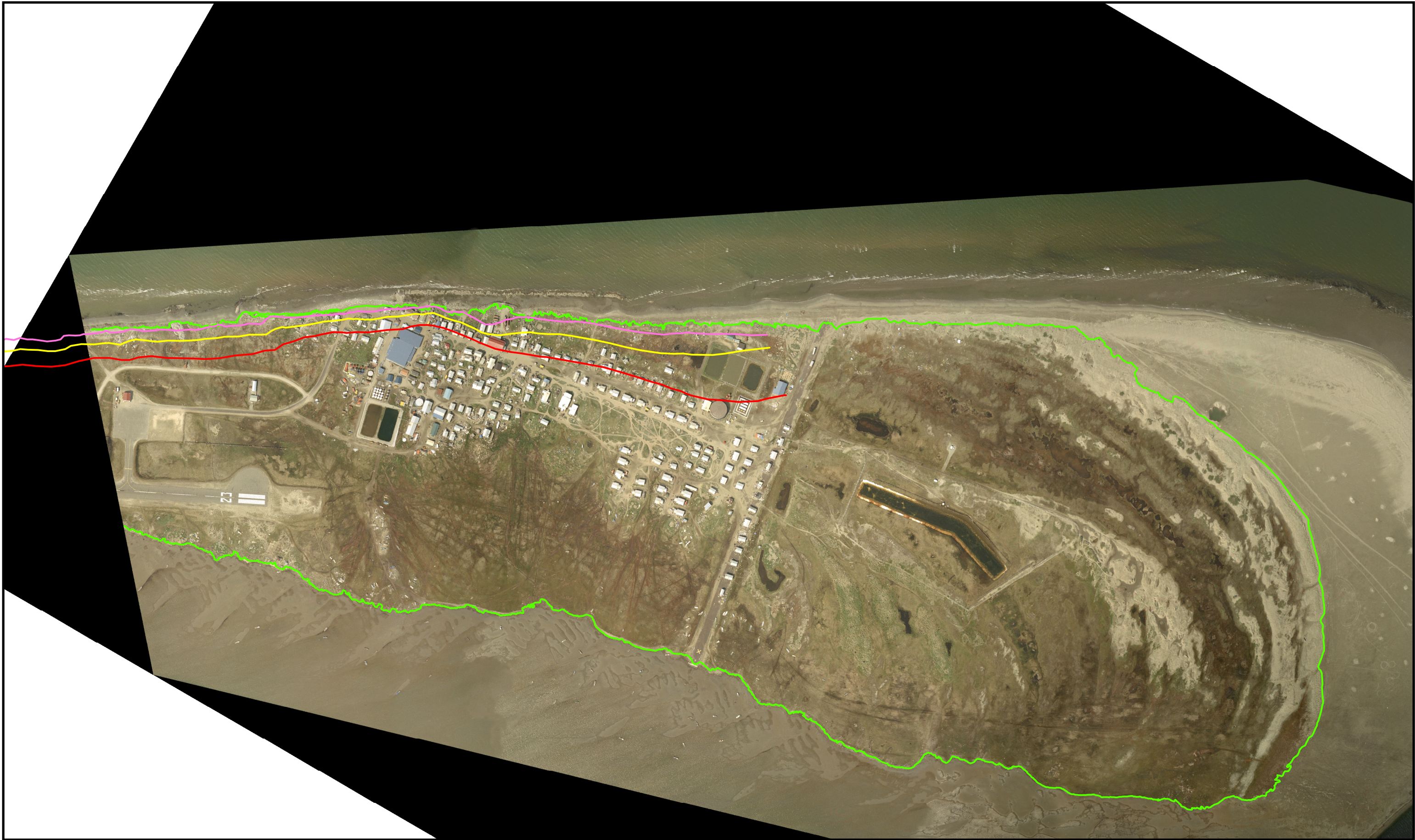
A collocation of the community would be to Nome or Kotzebue. Nome has more room for a collocation and has a lesser cost of the two at \$93 million.

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

The Shishmaref erosion rates are subject to many factors including weather, when sea ice

is formed, amount of permafrost exposed, types of bank protection, and quantities of bank protection installed. Estimating future erosion for Shishmaref was done utilizing two erosion rates. The current profile shows extreme rates of erosion that would all but eliminate the community's viability in about 10 years. The longer period record shows a slower rate of about 25 years until the community is no longer viable. Loss of viability in this example means a significant decrease in the ability of the community to provide basic services for its residents (e.g. power, water, education). These rates are highly subjective and can accelerate or decelerate based upon types of bank protection, magnitude and frequency of storms, and differences in soil conditions. Choosing a reasonable midpoint range yields a 10 to 15-year timeline before enough of the critical infrastructure is lost to force an evacuation.





Alaska District  
Corps of Engineers  
Civil Works Branch

### Predicted and Historical Shorelines

— 2053    — 2013  
— 2028    — 2004



Alaska Village Erosion  
Technical Assistance Program  
**Shishmaref, Alaska**