

**Community Erosion Assessment
Kongiganak, Alaska
26 January 2009**

1. Community: Kongiganak, Alaska



Figure 1: Kongiganak Location & Vicinity Map

2. Community Profile Summary

Kongiganak is an unincorporated village of 411 located 3 miles north of the Bering Sea located on the western shore of Kuskokwim Bay west of the mouth of the Kuskokwim River. Kongiganak is located in the Bethel Recording District within the Unorganized Borough. It lies 70 miles southwest of Bethel and 451 miles west of Anchorage. Kongiganak is located in a marine climate. Precipitation averages 22 inches, with 43 inches of snowfall annually. Summer temperatures range from 41 to 57 degrees Fahrenheit; winter temperatures are 6 to 24 degrees Fahrenheit. Kongiganak is a traditional Yup'ik Eskimo village with a fishing and subsistence lifestyle and culture. The sale, importation or possession of alcohol is banned in the village. The tribe administers programs and operates the electrical services, washeteria, water treatment plant, flush tank haul system, landfill/lagoon site, and garbage collection services.

3. Concise Description of Erosion Problem:

Erosion at Kongiganak is episodic, occurring primarily during fall storms. Due to the nature of the soils, the failure mode of the banks of the Kongnignanohk River is mainly caused by pore pressure failure. Erosion at Kongiganak is also caused by prop wash from docking barges. Residents of the community report increased erosion near the barge landing when it is in use. Impact of the barge on the bank during offloading operations causes some direct erosion of the bank. Usually, as cargo is offloaded, the barge must keep its props turning to counter the effects of the river current while it is moored. The props cause local turbulence which disturbs the saturated soils at the bottom of the channel and near the toe of the bank. Once disturbed, these fine particles are likely to remain in suspension until they reach the Bering Sea. While survey data was not available, it is likely that there is a deep spot in the channel at the barge landing as a result of this activity.

For this study the area was divided into three reaches. Reach 1 is a 1,220-foot portion of riverbank that fronts the community and is eroding at a rate of 1.5 feet per year. Reach 2 is a 1,390-foot portion of riverbank directly upstream (and north) of Reach 2 and is eroding at a rate of 3.8 feet per year. Reach 3 is a 1,280-foot portion of riverbank west of town and is eroding at a rate of 1.8 feet per year.

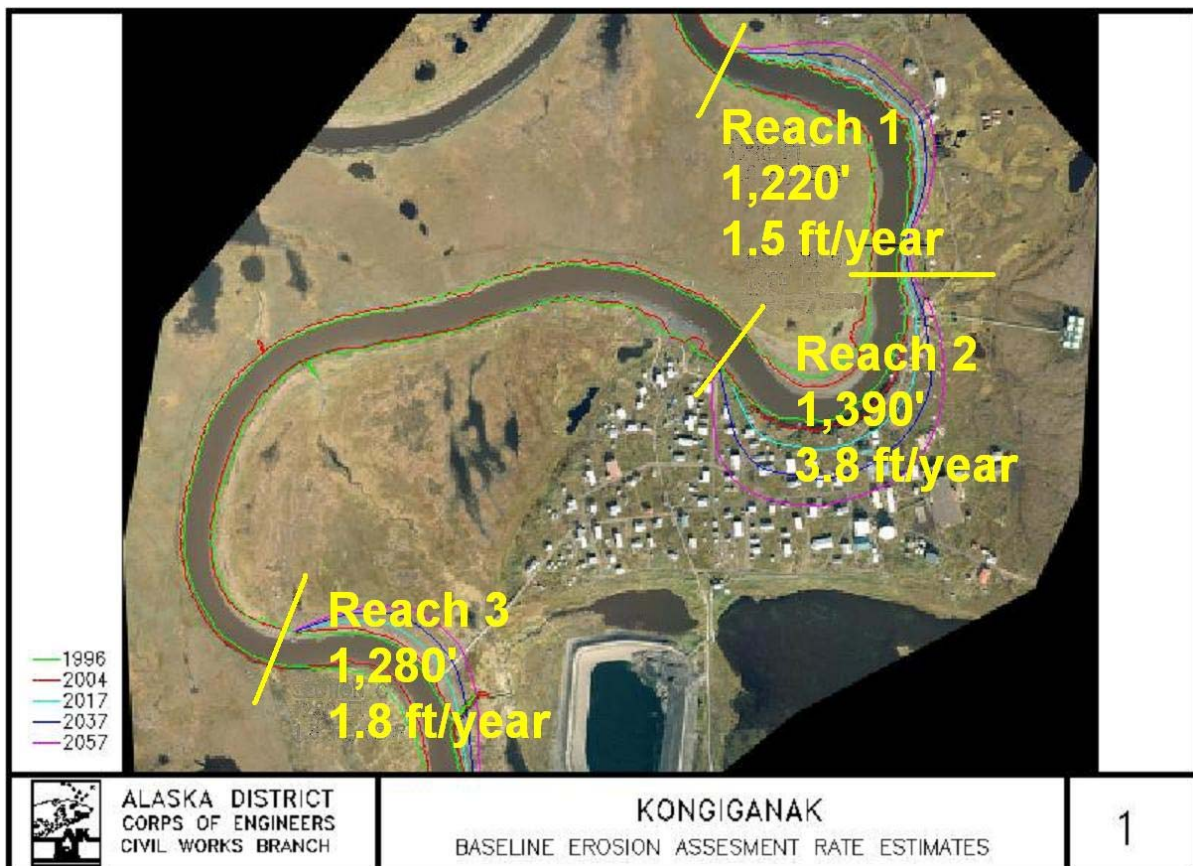


Figure 2. Kongiganak Erosion Map

4. Potential Erosion Damages:

Using the projected erosion interval lines on the aerial photograph, the economic damages were developed for the 50-year period of analysis and broken down into the sub-intervals of 0-10 years, 11-30 years and 31-50 years. Breaking down the economic damages into these sub-intervals allows us to determine when the greatest economic impact is expected to occur. Determining when the greatest economic impact could occur is important so that timely decisions can be made when an erosion retarding measure needs to be taken. For the purposes of this report, damages were assessed by time interval rather than attempting to estimate the exact year that the damage occurs. The analysis was completed in this manner to try and account for two types of uncertainty:

1. That which is associated with predicting erosion which is progressing at varying rates over time (including episodic events); and
2. That which exists when performing a surface analysis as opposed to doing an in depth investigation such as soils exploration and expensive modeling efforts.

Damage Categories:

The approach used to determine potential erosion damages is based on several assumptions as they pertain to the damage categories of residential, commercial, public infrastructure, and land values. This evaluation relies on previous reports and information gathered during site visits to determine appropriate values where data was unavailable. Assumptions used for the various damage categories are described more fully in the following discussion of future damages.

Damages caused by erosion in Kongiganak fall into seven damage categories: land, residential structures, commercial structures, public structures, infrastructure, cemeteries, and environmental hazards. Structures were considered a loss once the shoreline encroached within ten feet of the structure's foundation. Approximately 15 percent of erosion damages in Kongiganak are expected to occur within the first 10 years of the examined time period.

Expected Damages

The period of analysis for this evaluation is 50 years and all damage categories have net present values calculated based on the federal fiscal year 2009 discount rate of 4 5/8 percent. The sections below detail expected losses with a summary provided in Table 1.

Kongiganak is losing approximately 12,800 square feet of land per year (0.29 acres). Estimated land losses for Reach 1 are 2.05 acres with land losses for Reach 2 expected to be 7.08 acres and losses for Reach 3 of 5.85. It is expected that 11 acres will be lost over the 50-year period of analysis with a corresponding value of \$110,000 and a net present value of \$44,000.

Expected residential damages consist of 15 outbuildings and 14 residences. Each of the outbuildings is valued at \$1,000 and residences are valued at \$205,000.

Five commercial buildings are at risk including: the Variety Store, Marina Store, and Marine Fueling Station.

Thirteen public buildings are at risk including: teacher housing, a warehouse, the community center, and the Russian Orthodox Church.

Structural damages in Kongiganak have a total value of \$6.2 million with a net present value of \$1.7 million.

Damages to Kongiganak’s infrastructure consist of the following items: 6,880 feet of boardwalks, 15 utility poles and related phone and electrical wiring. Infrastructure damages are valued at \$7.4 million with a net present value of \$2.3 million.

Environmental concerns in Kongiganak are: seven fuel tanks and erosion of grave sites. Decommission and closure of the fuel tanks will be essential to avoid harmful environmental effects. Based on our above assumptions, closure of five tanks will be necessary within the 0 to 10 year time frame and closure of two tanks will be necessary within the 31 to 50 year time frame. This process has a cost of \$824,000 with a net present value of \$420,000.

Another environmental concern is the risk associated with eroding graves. Estimates anticipate that 2 graves will need to be relocated over the 50-year period of analysis with a total value of \$15,000, a net present value of \$1,000, and an average annual value of \$100.

Environmental damages, environmental remediation, and grave relocation costs are estimated to be in excess of \$839,000 with a net present value in excess of \$421,000 and an average annual cost in excess of \$21,800.

Summary

Total erosion damages in Kongiganak over the 50-year period of analysis are \$14.6 million with a net present value of \$4.5 million and an average annual value of \$232,300. Table 1 summarizes expected damages by category in the aforementioned time intervals.

Table 1: Summary of Expected Damages by Damage Category.

Damage category	Quantity	Time Span (Years)			Total Damages	Net Present Value	Annual Average Value
		0-10	11-30	31-50			
Land	11.02	\$ 24,000	\$ 43,000	\$ 43,000	\$ 110,000	\$ 44,000	\$ 2,300
Residential	14	211,000	1,241,000	1,444,000	2,897,000	810,000	41,800
Commercial	5	--	438,000	276,000	714,000	201,000	10,400
Public buildings	13	228,000	845,000	1,548,000	2,621,000	724,000	37,400
Infrastructure	--	1,289,000	1,822,000	4,246,000	7,358,000	2,296,000	118,600
Cemetery Relocation	2	--	--	15,000	15,000	1,000	100
Environmental Hazards	--	431,000	--	393,000	824,000	420,000	21,700
Total damages	--	\$2,183,000	\$4,389,000	\$7,965,000	\$14,539,000	\$4,496,000	\$232,300

5. Potential Solutions:

Encourage Willow Growth

While willows are sparse in the area, some stands have started to grow, notably along the side slopes of the airport embankment. Willows are not likely to grow along the low land banks upstream of Kongiganak, but having them on the slopes of the high grounds will reduce erosion caused during high water events.

Gravel Pad for Barge Landing

The gravel pad would be 12” thick laid over compacted subgrade. The site had been used for this purpose for several years so site grading should be minimal. Before placing the gravel, the site should be compacted by heavy equipment. A geotextile would be laid over the compacted subgrade to prevent material migration through the section. The gravel would be placed in two six-inch lifts with 95% compaction to be achieved on the lower lift and 100% compaction to be achieved on the surface lift. This pad would be located upstream of a new rock revetment scheduled to be constructed in the summer of 2008. Approximate cost is \$2.2 million or \$122 per square foot of pad.

6. Conclusion:

Kongiganak has a definite erosion problem that is affecting the community over the next 50 years. The community has the potential to have approximately \$14.5 million in damages. Much of this damage will be stemmed by the construction of the NRCS revetment.

Kongiganak will require some sort of assistance to stop the erosion from causing significant damages as they are unable to solve their own erosion problems due to limited financial resources.

7. Community Photos:



Kongiganak
Photo 1: Looking upstream from bank in Reach 3.

RIMG0243



N 59° 57.654' W 162° 53.515' Kongiganak
Photo 2: Looking upstream from bank fronting main town site. Bank is 30+ feet high here.

RIMG0259



N 59° 57.793' W 162° 53.276'

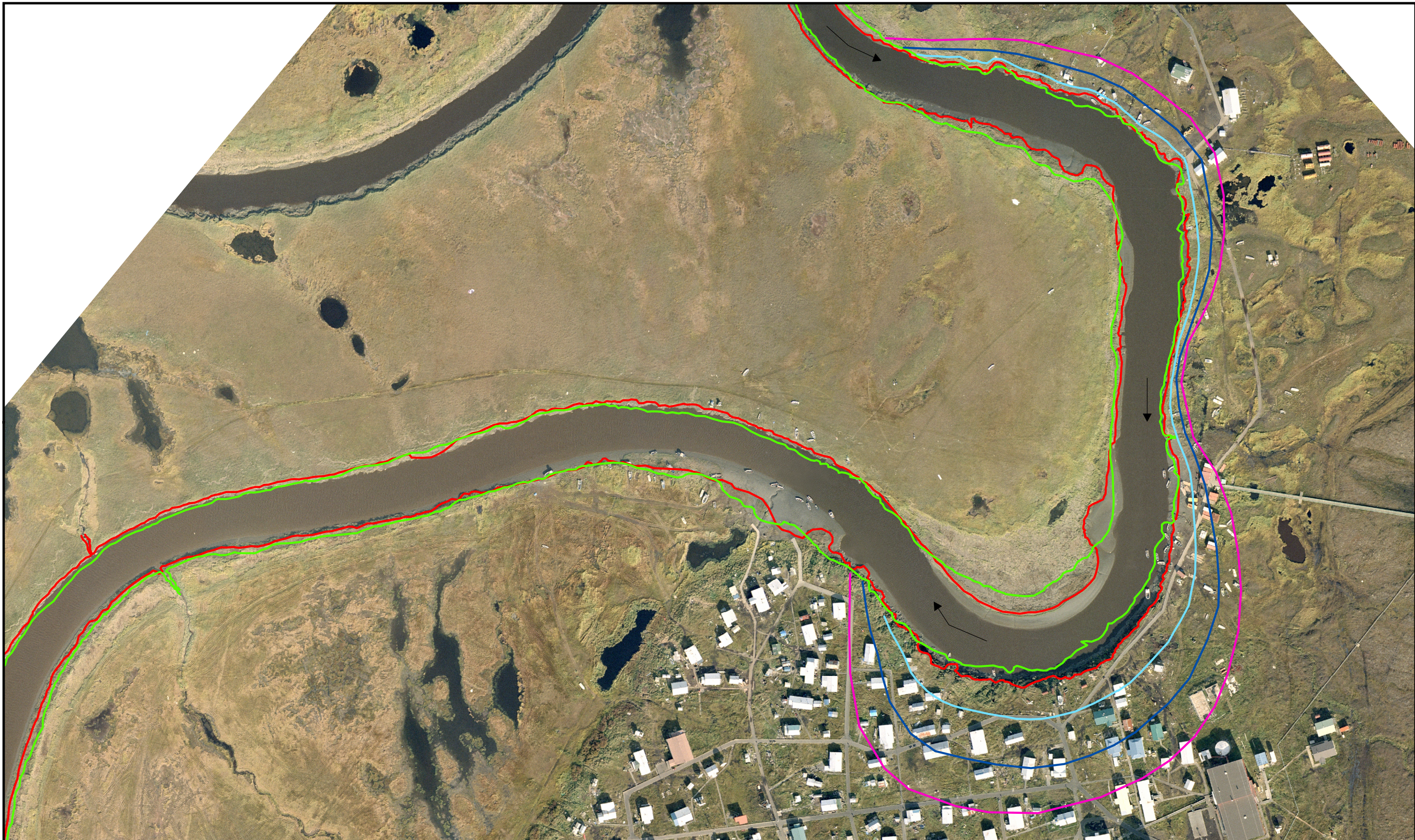
Kongiganak

RIMG0286

Photo 3: Looking downstream from north end of town.

8. Additional Information:

This assessment, as well as those for other communities, can be accessed on the internet at www.AlaskaErosion.com. The web site also contains additional information on addressing erosion issues, educational materials, and contact information.



	<p>Alaska District Corps of Engineers Civil Works Branch</p>	<p>Predicted and Historical Shorelines</p> <p>Legend</p> <table> <tr> <td>— 1996</td> <td>— 2017</td> <td>— 2057</td> </tr> <tr> <td>— 2004</td> <td>— 2037</td> <td></td> </tr> </table>	— 1996	— 2017	— 2057	— 2004	— 2037			<p>0 125 250 500 Feet</p> <p>0 25 50 100 Meters</p> <p>1 inch equals 200 feet Image dated 2004</p>	<p>Alaska Baseline Erosion</p> <p>Kongiganak, Alaska</p>	
— 1996	— 2017	— 2057										
— 2004	— 2037											