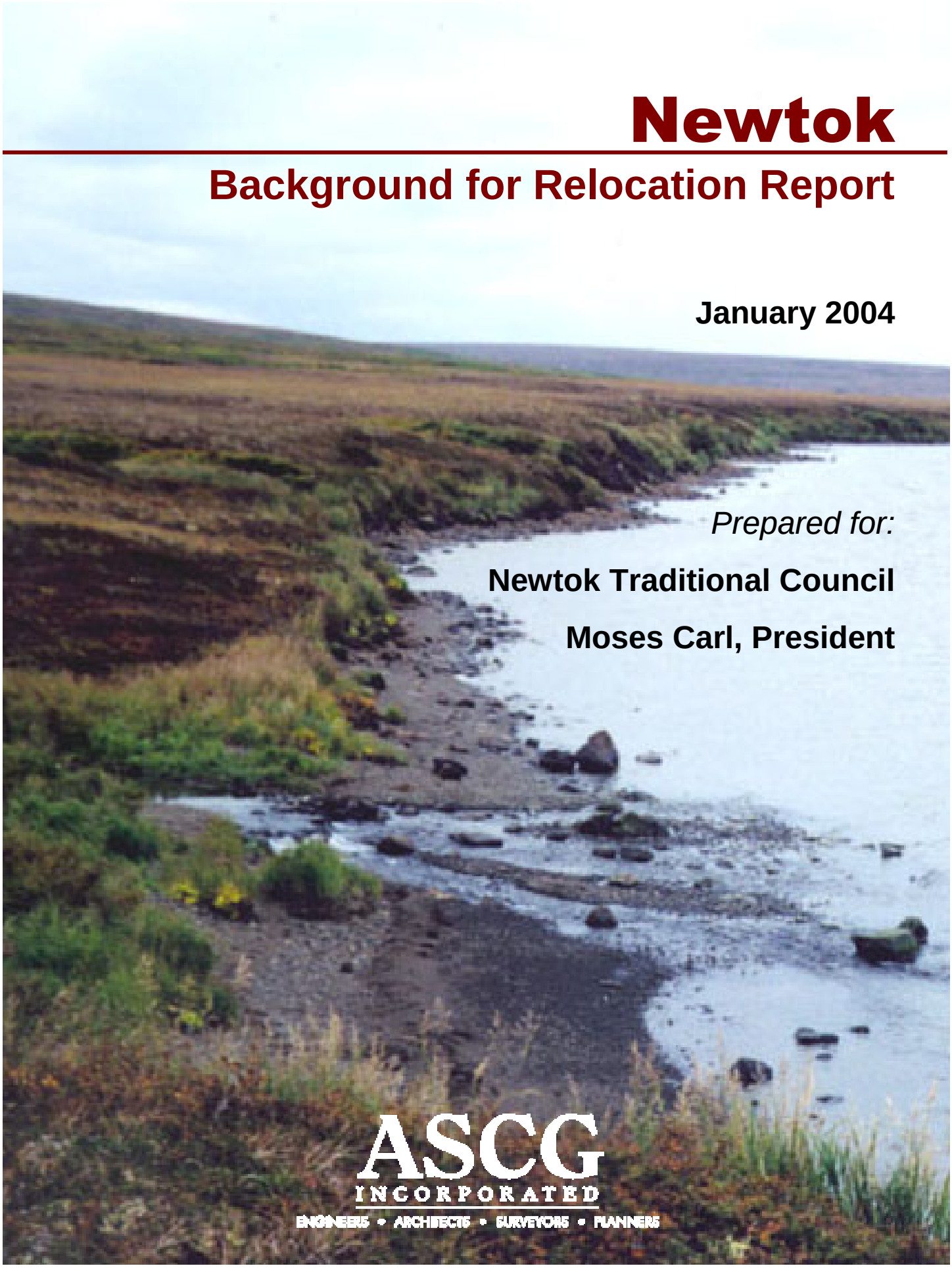
Newtok

Background for Relocation Report

January 2004



Prepared for:

Newtok Traditional Council

Moses Carl, President

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List of Abbreviations

ADOT&PF	Alaska Department of Transportation and Public Facilities
ANCSA	Alaska Native Claims Settlement Act
ASCG	ASCG Incorporated
ATV	All-terrain Vehicle
BIA	Bureau of Indian Affairs
GIS	Geographic Information System
GPS	Global Positioning System
LKSD	Lower Kuskokwim School District
NTC	Newtok Traditional Council
USGS	United States Geological Survey
YKHC	Yukon-Kuskokwim Health Corporation

1.0 INTRODUCTION

1.1 Overview

The Village of Newtok, Alaska is being threatened by the advance of the Ninglick River due to high rates of erosion of the river bank adjacent to the village. This erosion has been occurring for years and is recognized as a serious long-term threat to the existence of the village. The Ninglick River eroded away approximately 3,320 linear feet of land in front of the village between 1954 and 2003. The average annual erosion rate for this period was 68 feet per year. In 2003 however, 110 linear feet of land between the river and the village washed away.

As of July 2003, approximately 735 linear feet of land separated the river and residential storage areas and steam houses, with 830 linear feet left between the river and the closest four residences at the south end of the village. The Newtok Shoreline Erosion Map in Appendix A of this report shows projections indicating storage areas and steam houses physically impacted by erosion in approximately 12 years (2015) and the closest residences impacted in 2016. This may be a conservative estimate considering the 110 linear feet lost to the river in 2003. See Chapter 3 for more details.

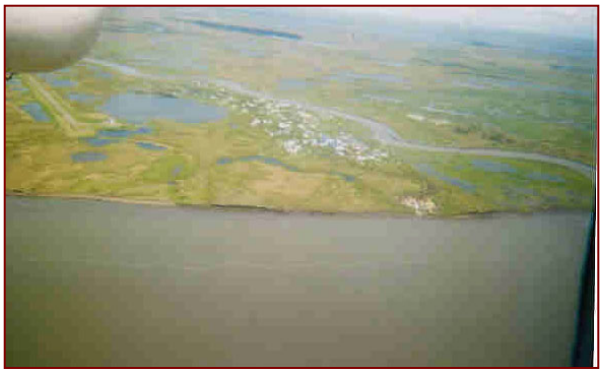


Photo 1 This photo shows the small stretch of land remaining between the advancing Ninglick River and the Village of Newtok.

The Newtok Tribe has inhabited this area for hundreds of years, and has taken a proactive approach to this serious threat to Newtok's homes and facilities. Since the 1970s, the Newtok Traditional Council (NTC) has continuously monitored the encroaching erosion by measuring with stakes. Since the early 1980s, they worked with Woodward-Clyde Consultants and the U.S. Army Corps of Engineers studying the problem and searching for means of mitigation. The conclusion of these efforts is that the village must relocate, as there is no permanent and cost effective alternative available for remaining at the current site. This conclusion is discussed in greater detail in Chapter 3 of this report.

1.2 Relocation Planning Process

In 1994, the NTC started a relocation planning process as a response to the erosion problem. The Council analyzed six potential village relocation sites. The selected relocation site, located on the north end of Nelson Island, approximately nine miles southeast of Newtok (see Appendix D), is referred to as Takikchak. The site is currently contained in the Yukon-Delta National Wildlife Refuge. Congress approved a land exchange between the Newtok Village Corporation and the U.S. Fish and Wildlife Service in 2003.

In 2000, the NTC hired ASCG Incorporated to assist in the development of relocation plans. The U.S. Army Corps of Engineers and the Bureau of Indian Affairs (BIA) were enlisted as funding partners. It is crucial that the relocation plans are acceptable to the residents of Newtok and are attractive to potential funding agencies.

ASCG completed a site layout and transportation plan for the selected relocation site at Takikchak in 2001 (see Appendix E). The U.S. Army Corps of Engineers performed a preliminary geo-technical overview of the site in 2002 (see Appendix J). Based on the results of the overview, the Corps considers this site to be feasible for community development.

1.3 Report Objective

The objective of this report is to provide background documentation to government agencies and officials in order to justify the efforts of the village to relocate to Nelson Island, and to support requests for government assistance in this process. The NTC realizes that state and federal agencies may have heard about the erosion problem in Newtok, but may have very little documentation concerning its magnitude and severity. The NTC therefore hired ASCG, Inc. to perform the following tasks:

- Summarize previous studies regarding the causes, magnitude, and severity of the erosion problem, mitigation alternatives, and recommended courses of action
- Map advancing Ninglick River bank shorelines using topographic maps and aerial photos available from 1954, 1983, 1996, and 2002 to show the scope of erosion
- Document the impacts of erosion on the village, village perspectives, and past mitigation efforts
- Document the proactive approach the village has taken in response to the problem such as the relocation site selection process, new site studies and layout, and the resident relocation survey process

Because of the apparent short timeframe for impact, the NTC also asked ASCG to develop a projection for the year of impact as well as a tentative timeline to be used as a guide for both short and long term relocation of residences. Based on this information, the NTC will continue to closely monitor the advancing erosion and will modify the timelines as conditions dictate.

With submittal of this report, the NTC would like to start ongoing dialogue with agencies in terms of advice and assistance they may have to offer. Initially, the Council would like to know how their village relocation needs can fit into existing government programs.

Information for this report was researched and compiled from previous studies of the Newtok erosion problem, from interviews with NTC members and staff, and from input from residents during public meetings. Mapping was developed from a 1954 USGS topographic map, and from 1983, 1996, and 2002 aerial photos.

2.0 VILLAGE CHARACTERISTICS

2.1 Location

The Village of Newtok is a coastal community situated on the west bank of the Newtok River, just north of the Ninglick River and approximately nine miles northwest of Nelson Island. The Ninglick River connects the Bering Sea with Baird Inlet, located upstream from Newtok. The village is located 94 miles northwest of Bethel, in the Yukon-Kuskokwim Delta Region. The north, east, and south boundaries of the community are contiguous with the Yukon Delta National Wildlife Refuge. The geographical coordinates for the community are approximately 60 degrees, 56 minutes North and 164 degrees 38 minutes West (Sec. 24, T010N, R087W, Seward Meridian). The area encompasses 7.3 square miles of land and 1 square mile of water.

2.2 Climate

Newtok is located within an area classified as the Transitional Climatic Zone of Alaska. This zone is typified by pronounced temperature variations throughout the day and year, and less cloudiness, lower precipitation and humidity than are found in a Maritime climate. Average precipitation is 17 inches, with annual snowfall of 22 inches. Summer temperatures range from 42 to 59 degrees Fahrenheit; winter temperatures range from 2 to 19 degrees Fahrenheit.

2.3 Culture and History

Newtok is a traditional Yupik Eskimo village, with an active subsistence lifestyle. The people of Newtok share a strong cultural heritage with the Nelson Island communities; their ancestors have lived on the Bering Sea coast for at least 2,000 years. The people from the five villages in the area are known as Qaluyaarmiut, or “dip net people.”

Relative isolation from outside influences has enabled the area to retain its traditions and customs; more so than more accessible parts of Alaska. The area had only brief and intermittent contact with Russians and Americans until the 1920s.

Around 1949 the village was relocated from Old Kealavik three miles away, to its present location along the Newtok River and a school was built in 1958. The existing village site was the farthest point up river the BIA barge could access to off-load the school building materials.

The residents of Newtok continued a migratory pattern through the 1960s, summering in fish camps on Nelson Island and wintering at the current village site. After the fishing season, Newtok’s men often traveled to Bristol Bay to work in the canneries. Thus Newtok remained primarily a winter residence for its people. By the 1970s, however, the snow machine and modern housing projects had replaced dog teams and sod houses in Newtok; residents began to assimilate elements of American culture and to remain more stationary.

2.4 Government

Newtok was incorporated as a second class city within an unorganized borough in 1976. In 1997, the city government was dissolved. The BIA-recognized Newtok Traditional

Council conducts local government affairs. The Newtok Native Corporation also serves the village. Contact information follows.

Newtok Traditional Council
P.O. Box 5545, Newtok, Alaska 99559
Moses Carl, President. Phone: 907-237-2314 Fax: 907-237-2428
Email: ntcamii@yahoo.com

Newtok Native Corporation
General Delivery, Newtok, Alaska 99559
Larry Charles, CEO. Phone: 907-237-2413

2.5 Population

The 2000 U.S. Census recorded a population of 321 (54% male and 46% female). Alaska Natives represented 96.9% of the population. The majority of the population is Yupik Eskimo. There were 63 households with an average household size of 5.1.

Table 1 shows the percentage of population in Newtok by age group.

Table 1 Newtok Population by Age Group

AGE GROUP	NUMBER OF PERSONS	PERCENT
Age 4 and under	49	15.3%
Age 5 to 19	105	32.7%
Age 20 to 24	23	7.2%
Age 25 to 34	47	14.6%
Age 35 to 54	63	19.6%
Age 55 and above	34	10.6%

According to the Alaska State Department of Community and Economic Development (DCED), the population increased from 114 in 1970 to 321 in 2000. ASCG developed a population projection using this increase in growth from 1970 to 2000. The average annual growth rate for this period was 3.51%. If this rate of increase continues, Newtok can expect a population of 640 by 2020.

2.6 Housing

According to the 2000 census, there were a total of 67 housing units, with 63 units (94%) occupied. Owners occupied 41 (65%) of the 63 occupied units, which had a median value of $23,100. The median rent paid for 22 rental units was $325 per month.

2.7 Economy

The school, health clinic, Traditional Council, Native Corporation, and commercial fishing provide most employment. Subsistence activities and trapping supplement income. Twenty-two residents hold commercial fishing permits.

According to the 2000 census, the median household income was $32,188 with 31% of residents living below the poverty line. There were 101 people employed with 33 people looking for work, or 24.6% unemployed. This unemployment rate, when combined with able-bodied adult workers not in the labor force, equals a total unemployment rate of 52.1%.

2.8 Public Facilities and Services

ASCG developed a land use map in 2003 using a 2002 aerial photo of Newtok. See the map in Appendix C for referencing the location of the following facilities:

2.8.1 Health Clinic

The Newtok Health Clinic provides local health care. The Yukon-Kuskokwim Health Corporation (YKHC) operates the clinic, which is overcrowded. For several years, the YKHC deferred the construction of a new and bigger health clinic due the threat of erosion to the village. Because of the ever-increasing need, new clinic was finally deemed necessary regardless of the erosion threat and construction began in the summer of 2003.

2.8.2 School

A new modular school was constructed in 2001. The school serves approximately 100 students, and is staffed by six certified teachers. The school has its own sewage lagoon.

2.8.3 Electricity

Electricity is provided by the Ungusraq Power Company. Fuel oil is barged to Newtok during the summer months and stored at fuel tank farms. The Newtok Native Corporation tank farm has a fuel storage capacity of 94,000 gallons, and the Lower Kuskokwim School District (LKSD) has a fuel storage capacity of 121,255 gallons. Tom's Store has a fuel storage capacity of 24,000 gallons for heating fuel and gasoline.

2.8.4 Water

Drinking water is pumped from a nearby lake into a water treatment plant and transferred to the village water tank. Newtok residents haul water from watering points located in the village. Residents supplement their water supply by collecting rainwater in the summer and by melting ice in the winter.

2.8.5 Washeteria

The washers and dryers at the washeteria were closed down in 2000 because of obsolete power lines to the washeteria. Additionally, the washeteria power was turned off because the village power generators are inadequate to accommodate all village electrical needs. Laundry is now done by hand at home using hauled water and clotheslines. Private saunas are used for bathing.

2.8.6 Wastewater

Wastewater from Newtok's homes is collected in honeybuckets and dumped along the Newtok River bank. There is no plumbing.

2.8.7 Landfill

Erosion washed the previous village landfill, located on the south end of the village, into the Ninglick River in 1996. A temporary dumpsite was then established on the other side of the Newtok River adjacent to the village. This has created problems because trash gets dropped off and piles up on the riverbank while waiting for transport across the river. Transport across the river is only possible at high tide.

2.8.8 Airport

A State-owned 2,180-foot gravel airstrip provides air access year-round; major improvements have been delayed due to the threat of erosion to the village. A seaplane facility is also available, but not widely used.

2.8.9 Transportation

Newtok is accessible by air and water; there are no roads connecting the community with any other in the area. Boats, skiffs, and ATVs are used in the summer and snow machines are used in the winter for local transportation and subsistence activities.

Barges deliver cargo twice per month during the summer. This is becoming more difficult as the Newtok River entrance to the boat landing becomes shallower.

There are no gravel roads in the village. There are approximately 1½ miles of boardwalks within the community that provide the means for foot and ATV transportation. The 800-foot boardwalk connecting the airport to the system of boardwalks in the village is eight feet wide, and in good condition. All other village boardwalks vary between four and eight feet in width and are in poor condition. These boardwalks were built of wood, with most construction occurring in 1976 and 1981. The system is approaching the end of its useful service life.

Photo 2 Boardwalks comprise Newtok's primary transportation system within the village.

2.9 Right-of-Way

Despite its lack of road development, Newtok has five segments of dedicated right-of-way, including a 110-foot-wide tract containing the boardwalk to the airport. Other corridors, all of which are 40 feet wide, include undeveloped access for a housing area near the school site (in the southeast corner of town), and for a subdivision near the armory at the north edge of town.

Very little subdivision of the Village Corporation property has occurred and consequently, Newtok's boardwalks are nearly wholly contained on private (Village Corporation) property and are probably owned by the Newtok Corporation. The Newtok

Native Corporation has an Alaska Native Claims Settlement Act (ANCSA) 12(a) entitlement to 92,160 acres but has not acted related to 14(c)(3) status.

2.10 Wildlife.

Fish and wildlife are abundant in the vicinity of Newtok. The area is a prime habitat of mink, land otter, and beaver. There are occasional brown bear, moose, and caribou. Salmon found in local waters include Coho, Pink, Chum, Sockeye and Chinook. In addition, area waters host black fish, needle fish, white fish, smelt, pike, lush fish, and seal. Birds include swans, cranes, swallows, sandpipers, raven, crow, seagulls, and a variety of geese.

2.11 Soils and Topography

Newtok is a coastal community situated on the west bank of the Newtok River, a slow-moving river draining the flat Yukon-Kuskokwim delta. Approximately 735 feet to the south is the encroaching Ninglick River, eroding towards the village at an average rate of 64 feet per year. The surrounding land is flat, low-lying, marshy tundra dotted with thousands of thaw-lakes and sloughs. Vegetation in this low area is primarily the mosses, lichens, hair grass, sedges, and berries typical of tundra.

The bedrock in the area is comprised of non-marine sandstone and siltstone overlaid by volcanic flows and capped with wind-deposited silt. A typical soil profile has a deep frozen silt layered with peat at the surface. Permafrost continuously underlies a two-foot active layer (sometimes thicker when a greater layer of peat is present).

The shallow active layer combines with the continuous presence of permafrost and nearly flat surface slopes to yield extremely poor drainage conditions around Newtok. The permafrost is ice rich and, in thaw periods, the active layer is almost completely saturated and has virtually no bearing capacity.

Flooding and erosion raise additional concerns for Newtok. The shoreline is highly vulnerable to flooding, especially during spring ice jams in the river or in severe westerly windstorms on the Bering Sea. Thermal degradation of the riverbanks is causing shoreline sloughing.

3.0 SUMMARY OF EROSION PROBLEM

3.1 Erosion Problem

In 1983-84, Woodward-Clyde Consultants (now URS Corporation) conducted an assessment of Ninglick River erosion in proximity to the village of Newtok. The purpose of the assessment was to evaluate the causes and rates of the erosion, as well as to examine potential mitigation of the impact of river advancement on the village. This study is the only in-depth evaluation of this problem.

According to Woodward-Clyde, the main variables affecting erosion of the bank of the Ninglick River in the area around Newtok include a combination of temperature changes, wave action, and river current. Since the soils in the area have a high ice content, the summer heating of the river edge and associated substrate results in the loss of soil structure caused by interstitial ice degradation. This enhances erosion capability along the river and is coincident with periods of high potential scouring inputs from the unfrozen Ninglick River. Furthermore, Newtok is geographically situated in an area that is affected by both tidal activity and strong winds. This combination increases the likelihood of shoreline erosion by the impact of twice-daily tides as well as periods of intensified wave action from storm surges and winds.

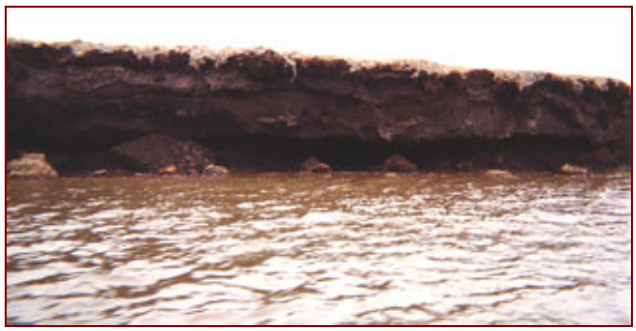


Photo 3 Erosion undercuts Ninglick River bank in front of Newtok.

According to village residents, the recurring summer storms associated with winds from the south and southeast, result in the biggest wave action and tremendously accelerate the rate of riverbank erosion. NTC staff members have measured as much as 25 linear feet lost to erosion after a big storm with winds coming from the south and southeast.

Photo 4 At low tide the undercutting effect of the Ninglick River on the riverbank is apparent

The Ninglick River exhibits a sinuous, meandering pattern typical of rivers in areas of gentle topography. River morphology in general is defined by alternating stretches of erosion and deposition, while meandering rivers are typified by high erosion rates on the outside of bends with deposition on the inside and downstream of bends. Newtok is located on the outside, and slightly downstream, of a significant bend in the Ninglick River. Because of this, higher rates of erosion are caused by the river current in this region. See the topographic map in Appendix D for a view of the topography described.

3.2 Statistical Analysis of the Erosion Rate

Woodward-Clyde performed field measurements over the course of their study from upstream and downstream locations, as well as collecting information from historic data. They concluded an average rate of 79 feet per year could be attributed for advancement of the Ninglick River on the village of Newtok. This average was based on values ranging from 42 to 113 feet per year (excluding noted maximum values of 130 feet per year) along the extent of their study area.

During the summer of 2003, the NTC staff and ASCG worked together to update and build on Woodward-Clyde's work in evaluating the impact of erosion of the Ninglick River on the village of Newtok. An in-depth analysis of river channel dynamics and morphology was not possible due to the lack of needed data such as river discharge, sediment load, channel cross-sections, et cetera. However, by building on information compiled from the original Woodward-Clyde assessment, the observations of Council staff and village residents, and the use of available mapping and air photos, ASCG utilized modern Geographical Information Systems (GIS) tools to perform statistical analysis and reexamine historic rates of erosion in order to show the magnitude of erosion and model the potential future impact of erosion on the village. The process is described below and the results are shown on the Newtok Shoreline Erosion Map in Appendix A.

3.3 Newtok Shoreline Erosion Map

USGS topographic maps and digital aerial photos were brought into the GIS and aligned to geographic coordinates. This allowed for location of surface features for reference, for measurements to be made in real-world units, and for the digitization of historic shorelines. Shorelines for 1954, 1983, 1996, and 2002 were generated. The location of a portion of the current (2003) shoreline of the Ninglick River was obtained from global positioning system (GPS) coordinates recorded on July 14, 2003. These coordinates were checked against oblique aerial photos taken at the same time and found to be accurate.

Location of these historic shorelines provided the information necessary to calculate rates of erosion over the 49-year data history. This was accomplished by measuring total linear foot retreat of the shoreline between record years and dividing the total loss by the number of intervening years. Thus, a simple statistical average was attained for the erosion rate per year. Additional analysis of area loss was performed by creating a grid pattern encompassing all digitized shorelines and then using database calculations of each individual polygon created. This allowed for a "normalization" factor to be applied to the calculated linear rates to attempt to adjust for irregular shoreline patterns. The results of this process determined an apparent exponential erosion rate with significant increases in the eroding capability of the river experienced upstream. This pattern complied with typical river channel morphology that indicates higher rates of erosion nearer to the outside apex of a meander bend. It was found that average rates varied from 36 feet per year on the downstream reach to over 83 feet per year upstream. It was also observed that the average rate of erosion appears to be increasing in the upstream reaches. The average rate of erosion occurring directly in front of the village (at the east end of the barge landing on the Ninglick River) between 1954 and 2003 was measured to be 68 feet per year.

3.4 Impact of Erosion on Newtok

As can be seen on the Newtok Shoreline Erosion Map in Appendix A, the loss to erosion has been continuous from the base year of 1954. Residents concur that the erosion has been non stop, year after year. Erosion has and continues to negatively impact the village in the following areas:

- Loss of facilities
- Diminished river access to the village
- Increased workload in providing services
- Nuisance Problems
- Deferred community development
- Interrupted subsistence activities
- Social impacts

Below are details of these problems. See the Shoreline Erosion Map in Appendix A for reference.

3.4.1 Loss of Facilities

3.4.1.1 Village Dump Site

The previous village dumpsite and the boardwalk leading to it, located on the south end of the village, washed into the Ninglick River in 1996 due to erosion. A temporary dumpsite was then established on the east side of the Newtok River, across from the village.

Photo 5 Containers endangered by Ninglick River erosion in 2001

3.4.1.2 Barge Landing and Container Storage Area

The existing barge landing and container storage area located south of the village on the Ninglick River is being washed away. The advancing river continuously threatens containers and material at the site. There is no other location for the landing. According to Newtok Traditional Council staff, the site has and will continue to be moved back towards the village as the advancement of the river dictates.

Photo 6 Erosion threatened building materials stored along the Ninglick River bank (2003)

3.4.2 Diminished River Access to the Village

The Newtok River forms the eastern boundary of the village. The river was once busy with daily boat traffic in summer and provided easy access to residences and barge off-loading facilities. The Newtok River has become progressively shallower

due to the encroachment of the Ninglick River in 1996 (see photos in Appendix B for a view of the encroachment, as well as comparisons of the advancement of erosion in 1983 and 1986). The encroachment of the Ninglick River has stopped the flow of the Newtok River, creating a build up of silt. During low tide, the river becomes similar to a mud flat. It is now difficult for boat access to and from the two village boat landings (see land use map in Appendix C for location.) Barge access in the Newtok River is now limited. Some barges can make it into the river; others can offload freight only at the barge landing 830 feet south of the village on the banks of the Ninglick River. Smaller boats must then haul the freight up the Newtok River at high tide.

3.4.3 Increased Workload in Providing Services

After the village dump located on the Ninglick River was washed away in 1996, a temporary dumpsite was established on the east side of the Newtok River, across from the village. The workload for hauling trash to the new dump has now tripled:

1. The trash is first hauled to the drop off point on the village side of the river.
2. The trash is then ferried by boat across the river (only at high tide).
3. The trash must then be hauled again, to the dumpsite approximately 950 feet away.

3.4.4 Nuisance Problems

Trash that has been hauled to the drop off point at the Newtok River piles up on the village side of the river because transport across the river is only possible at high tide. The close proximity of the drop off point to the village has created a nuisance to nearby residents because of the odor and scattered debris.

3.4.5 Deferred Community Development

The advancing erosion and the current and future loss and damage to facilities have caused agencies in the past to delay expending capital funds at Newtok. The concern among agencies and the NTC is the substantial investment required to provide much needed new capital facilities, versus the risk involved considering the Ninglick River advancing upon the village.

Airport improvements and a solid waste master plan have been deferred. The Yukon-Kuskokwim Health Corporation deferred the construction of a new health clinic for several years. Currently there is concern by the Alaska Energy Authority regarding the advancement of erosion on the village and their plans for construction of a new power plant.

The concern among agencies regarding the investment required to construct and maintain capital facilities in Newtok is valid. On the other hand, the deferment of maintenance and new construction has created and will continue to create hardships on village residents, as well as negatively impacting their quality of life. The village considers itself in a state of limbo as far as development is concerned.

3.4.6 Interrupted Subsistence Activities

Travel by boat is the only mode of transportation to and from Newtok in the summer time. Access to the village is provided by the Newtok River at high tide only, because of the build-up of silt. This has interrupted village subsistence activities because departing from and arriving back to the village must be timed to high tides. Hardships are exacerbated when boats loaded with subsistence food have to wait for offloading.

3.4.7 Social Impacts

The encroaching erosion on the village has created serious social impacts as well. Year by year, residents have watched the Ninglick River get closer to their homes. Residents have seen facilities disappear into the river. This has created much anxiety and concern among village residents. Individual and household decisions concerning plans for the future have been put on hold due to the uncertainty of where they will be living in the next decade. As the tribe has lived in the Newtok area for hundreds of years, it is very difficult for residents to know that their homes and way of life are being threatened.

3.5 Erosion Mitigation Alternatives and Efforts

Woodward-Clyde investigated possible mitigation of the erosion problem and offered several alternatives. These alternatives included the use of soil/cement filled geo-fabric bags for soil improvement, rip-rapping for bank stabilization; the construction of spur dikes to impede the effects of channel flow; and the dredging of a cutoff channel. The main concerns with potential mitigation centered around the location and use of available resources, cost of construction, and the ongoing cost/benefit of any solution due to maintenance concerns well into the future. The poor quality and availability of local materials (specifically soils and rock) and the inordinate expense of construction mobilization/demobilization to this remote part of the state were two major precluding factors for each alternative.

One mitigation project took place in 1987, when the village with the help of the U.S, Army Corps of Engineers attempted to slow the process of erosion with an experimental seawall project. Canvas bags filled with cement and styrofoam were placed along the riverbank, but the material eventually washed away.

3.6 Erosion Problem Conclusion

Ultimately, question of whether any of the mitigation alternatives would reduce the erosion problem enough to secure village habitation for a sustained period could not reasonably be answered due to the assortment of environmental and other variables. A final alternative was presented by Woodward-Clyde; that of village relocation to a site on Nelson Island, southeast of the current village location. Relocation was considered to be more economical in the long-run (although with more initial cost) than the process of bank erosion stabilization over the required large area. The incalculable cost of the personal impact to local residents necessitated deferment of this decision to the residents of Newtok.

ASCG staff met on August 19, 2003 with URS staff (formerly Woodward-Clyde) who had participated in the 1983-84 study to discuss the conclusions of their report (refer to

Appendix H for Woodward-Clyde November 29, 1984 assessment letter). URS staff emphasized again that mitigation efforts such as a seawall and other alternatives are no permanent solution and are not going to solve the erosion problem in Newtok. The alternatives may slow down the erosion process, but would be extremely expensive over the years to maintain. They concluded that erosion in Newtok is a problem that will never be controlled.

3.7 Erosion Rate Projections

Projected shorelines at five-year intervals were determined using the average erosion rates along each of the examined stretches of river. The projected annual erosion rate from 2002 is 64 feet per year. The results of this analysis can be seen in the attached Newtok Shoreline Erosion Map located in Appendix A. As shown, the map projections indicate the following threatened facilities:

Table 2 Projected Year of Erosion Impact on Newtok Facilities

THREATENED FACILITY	YEARS UNTIL IMPACT	IMPACT YEAR
Existing barge landing area on the Ninglick River	2	2005
Steam houses and storage structures at south end of village	12	2015
Four houses at the south end of the village	13	2016
Water supply in a small lake just south of the airport	15	2018
High school and elementary school	17	2020
Airport	19	2022

It should be noted that since the five-year intervals are statistically derived averages and have not been calculated based on actual Ninglick River morphologic data, the most conservative erosion rate values were used in these projections. Actual observations by residents and raw, non-averaged data indicate periods of higher erosion rates. The data from 2003 (not included in this analysis) shows a loss of 110 feet prior to the middle of July. Basic river dynamics would indicate that advance of the Ninglick River on Newtok will be greatest from the upstream side with the rate increasing on average each year.

Of great concern to residents is the low-lying, marshy, pond area, southeast of the village where the Ninglick River meets the Newtok River. Residents state that pond areas have eroded much more quickly than other areas in the past. They fear that these pond areas will be overtaken by the Ninglick River faster than the stated erosion projection, and thus village facilities would face erosion from the southeast as well as from the south.

Photo 7 Low lying marshy, pond area southeast of the village (right side of photo)

3.8 Timeline for Moving

Based on the compilation and analysis of data above, the following information provides a recommended timeline for responses coordinated by the village. The NTC will continue to monitor the advancement of the Ninglick River very closely to make any required adjustments to the timeline.

Based on the projected erosion rate of 64 feet per year, the erosion would physically impact the south end of the village and the residential properties in approximately 12 years, or 2015. However, based on the actual loss to erosion of 110 linear feet in 2003, the impact to the first residential properties would occur in seven years, or 2010.

Table 3 Comparison of Projected Impact Years

(Average Annual Erosion Rate versus 2003 Erosion Rate)

THREATENED STRUCTURES	IMPACT YEAR (at average annual rate of 64 feet/year)	IMPACT YEAR (at 2003 rate of 110 feet/year)
Storage sheds and saunas at south end, 735 feet away	2015	2010
Four residences at south end, 830 feet away	2016	2011

Because the projection of 64 feet per year is based on an average, the NTC wants to be prepared for the worst case scenario of erosion impact in 2010 (if the 2003 erosion loss of 110 feet or similar losses continues annually). The NTC will continue to monitor the advancement of the Ninglick River very closely.

Although the long term plan is to relocate all residents from the village, the Council considers it wise to have a short term response or contingency plan ready. The short term plan would involve having a process in place to temporarily move residents at the south end of the village away from erosion. According to ASCG Construction Management staff, this process should begin no later than three years before possible impact, or 2007. When considering the long term and the relocation of the entire village, residential and infrastructure master planning, design, and construction should begin immediately (estimate of three years planning and four years of construction).

Table 4 Action Timeline for Village Response to Erosion Impact

ACTION	YEAR TO BEGIN
Facility master planning for new site	2003
Short-term process of moving residents away from erosion	2007
Relocation of all residents	2009

4.0 VILLAGE RELOCATION

4.1 Village Discussion of Relocation Options

After Woodward-Clyde recommended village relocation in 1984, the NTC and residents have engaged in many discussions regarding relocation options. These options can be classified into three main categories:

1. Relocation to surrounding villages
2. Relocation to Bethel
3. Relocation to a new development site in the region

Below are discussions on each of the options. The information was compiled from interviews with village residents, during public meetings, and from NTC members and staff.

4.1.1 Relocation to Surrounding Villages

The three other villages in the region are all located on Nelson Island:

Table 5 Year 2000 Population of Surrounding Villages

VILLAGE	2000 POPULATION
Nightmute	208
Tununak	325
Toksook Bay	532

The disbursement of the Newtok community (321 residents) to surrounding villages would significantly increase their village populations. The disbursement would also have the potential for the newcomers to encounter and intensify problems already similar to those of Newtok, as well as creating additional problems:

- Housing shortages and problems of deferred maintenance
- Lack of facilities, services, and school capacity
- Problems of high unemployment
- Funding shortages for community development
- Strain on local subsistence

The people of these three Yupik villages have customs and lifestyles similar to those of Newtok. However, Newtok residents share a strong bond with each other and feel that the disbursement of their community would result in the end of their identity as a unique culture and tribe of people whose current close ties with each other and with their traditions and values would be broken.

It is also questionable whether any of the three other villages would even consider having their community increase this significantly. Because of this, Newtok residents do not feel that relocation/disbursement to another village is viable. This sentiment is reflected in the August 2003 relocation survey poll (no votes) discussed later in this chapter.

4.1.2 Relocation to Bethel

Newtok residents consider relocation to Bethel as incomprehensible. Discussions concerning this option bring looks of astonishment during public meetings. Bethel is thought of as the big city with big city problems. Consumption of alcohol is legal in Bethel, and this is a big concern to Newtok residents. There is different and less abundant subsistence. Residents feel that it would be very difficult to assimilate into this very different lifestyle. They feel that the assimilation of their population into this much bigger community would also result in the end of their identity as a unique culture and tribe of people whose current close ties with each other and with their traditions and values would be broken. This sentiment was also reflected in the August 2003 relocation survey poll (one vote).

The two options above are only a general discussion regarding the relocation of Newtok residents to other villages or cities in the region. Should a group of people in the Newtok community ever consider these options as viable, then a more detailed analysis concerning the current physical and socioeconomic thresholds and the optimum size of these villages, as well as the amount of the investment to accommodate the newcomers should be performed.

4.1.3 Relocation to a New Development Site in the Region

Relocation to a new development site in the region is the option most favored by Newtok residents. Residents feel that their unique culture, close community ties, and traditional way of life will stay intact. Between September 2 and November 9, 1994, the NTC identified and analyzed six potential village relocation sites in the region:

Site #1 Tunuirun
Site #2 Kaikilirmiut
Site #3 Narukachuk
Site #4 Puklanarivik
Site #5 Takikchak on the north end of Nelson Island
Site #6 Tagkanirluta

4.2 Selection Criteria for Relocation to a New Development Site

Criteria used by the NTC to select the relocation site included:

- Good soil foundation for village development
- No erosion
- Land suitable for an airport
- Good barge access
- Access to subsistence

4.3 Relocation Site Selection and Alternatives

4.3.1 Takikchak (North End of Nelson Island)

The Takikchak site is located approximately nine miles southeast of Newtok on the north end of Nelson Island, adjacent to the Baird Inlet (see Appendix D for location). The site satisfied all relocation site criteria and was selected by the NTC and the community in 1994 as the prime site for village relocation. This site has been approved by Newtok residents in several survey polls, with the most recent held on August 27, 2003 (see Chapter 5 for details on the latest survey).

In addition to meeting the criteria listed above, the NTC staff was concerned that all current travel destinations from Newtok could easily be accessed from the Takikchak site. In 2003, ASCG developed a map for the NTC that shows current regional winter trails and planned trail linkages for relocation. Additional subsistence trails from the new site were also identified (see Appendix G for more details).

The Army Corps of Engineers performed a preliminary geotechnical overview of the site on Nelson Island in the summer of 2002. They did a site reconnaissance to visually evaluate the surface and subsurface conditions at Takikchak. The Corps investigated a potential materials source for development of the proposed village infrastructure, the suitability of the barge landing area, water infiltration gallery area, proposed airport location, the area for the proposed infrastructure and roads, and archeological assets. In conclusion, the Corps of Engineers reported that the visual reconnaissance of the site did not identify any geotechnical site conditions that would preclude the site from use for village relocation. Geotechnical investigations will be required before development. For specific details see the Preliminary Geotechnical Overview in Appendix J.

4.3.2 Other Alternative Relocation Sites

The other alternative sites considered are described below, as well as reasons why each site was not selected. Refer to Appendix F for the location map of site alternatives and for the entire list of pros and cons for each site.

Tunuirun

The Tunuirun site is located on an island in the Ninglick River approximately 2.5 miles southeast of Newtok. The island, a key breeding ground for Brandt Geese, is situated between the existing village of Newtok and the chosen village relocation site of Takikchak, on the north end of Nelson Island. There is high ground and good barge access. There would be no change in subsistence activities as the island is only 2.5 miles from Newtok. This short distance would also mean the shortest relocation move of all the potential relocation sites. However, Tunuirun was not selected because the island is eroding in a similar manner to the current Newtok site.

Kaikilirmiut

The Kaikilirmiut site is located in an area of low-hills on the Manokingk River, approximately 25 miles northeast of Newtok. Rock and gravel are available, as well as barge access, a good airport site, and good subsistence. Kaikilirmiut was not selected

because it is too far from the prime subsistence areas on and around Nelson Island. This inaccessibility would cause difficulties for some residents; long distance and increased fuel expense were factors. Kaikilirmiut is also located on an extensive archeological site hosting many graves. Some elders of the village were against a move to Kaikilirmiut out of respect for the dead.

Narukachuk

The Narukachuk site is located on the Narukachuk River, a tributary of the much larger Azun River, approximately 15 miles northwest of Newtok There is good subsistence in the area. However, the site was not selected because of the sinking, swampy land (the same as Newtok), no high ground available in case of flooding, and the land is not suitable for airport or school development.

Puklanarivik

Puklanarivik is located on the Puklanarivik River, a tributary of the Azun River, approximately 20 miles northwest of Newtok. There is land suitable for an airport and there subsistence is plentiful in the area. The site was not selected because the river is too shallow for barge access.

Tagkanirluta

The Tagkanirluta alternative is at the existing site of Newtok, but further inland away from the erosion. Moving the village further inland would be the easiest relocation effort because of the short distance. The existing airport could still be used by extending it inland as well. The current subsistence routine of the village would not be interrupted. This alternative was not selected because the Ninglick Riverbank will continue to erode, with the result of providing only a temporary solution to the problem. There would be a continuous search by the NTC for funds to move and or build new structures further inland. Continuous moving would not be good for future generations.

5.0 RESIDENT SURVEY REGARDING RELOCATION

Takikchak (on the north end of Nelson Island) has been approved by Newtok residents as the best site for relocation in several survey polls conducted since 1996:

- September 25, 1996
- May 22, 2001
- August 27, 2003

5.1 August 27, 2003 Resident Survey

The Newtok Traditional Council held a public meeting on Wednesday August 27, 2003 to discuss the erosion problem and to begin administration of a survey poll regarding what action residents desire the NTC to take in responding to the erosion threat. Although there have been several resident surveys taken in past years, this survey of the community was performed in order to reconfirm and officially document resident views on village relocation.

The Traditional Council not only documented the vote tally and resident views contained in the survey responses, but documented the survey process as well. The Council felt this process should be thoroughly documented in order to show that a clear, fair, and official step-by-step survey was administered to all eligible voters. Through this Public Involvement Process the Council wants to make it clear that the Newtok Village community is unified in its goal of relocating the entire village to Nelson Island. See Appendix I for the process the Traditional Council developed to administer an official survey, document the process, and tally resident responses.

5.2 Voter Eligibility Criteria

The Traditional Council determined that eligible voters must meet all of the following criteria to participate in this survey:

- Tribally enrolled
- Age 18 and over
- Current Newtok resident
- Must be physically present to vote during the hours set by the NTC

Council staff used the Tribal Enrollment list and the Alaska State list of registered voters for Newtok as a basis for developing the list of eligible voters. Staff then performed follow-up research to make sure the qualified voter list was complete with the names of all Tribally enrolled people over the age of 18 who reside in Newtok.

5.3 Survey Results

There was a 94% voter turnout. A total of 148 people voted out of a 158 eligible voters. Of the 10 eligible voters who did not vote, four people refused to vote, and the other six were away from the village during the entire six week voting period. Below is the relocation survey question followed by the breakdown of how people voted.

QUESTION: The Newtok Traditional Council is making preparations now, for the future impact of erosion on the village. Do you want the Traditional Council to use their resources and seek government assistance to help make plans and preparations to:

Table 6 August 27, 2003 Resident Relocation Options Survey Results

# OF VOTES	PERCENT	RELOCATION CHOICE
136	**92.0%**	Relocate the village to the proposed village relocation site on the north end of Nelson Island.
4	**2.7%**	Relocate the village to another site in the region, instead of Nelson Island.
4	**2.7%**	Other solution.
3	**2.0%**	Remain at the existing village site when erosion physically impacts the village and move threatened village structures inland away from the encroaching Ninglick River as necessary.
1	**0.6%**	Relocate village residents to Bethel.
0	**0%**	Relocate village residents to one of the surrounding villages.

Of the 148 votes cast, 136 votes (92%) overwhelmingly favored relocating the village to Takikchak on the north end of Nelson Island. See the Appendix I spreadsheet for details concerning the 148 votes (voter selection, explanation, gender, age, length of residency). Explanations by the 12 voters (8%) who do not want to move to Nelson Island are given below because it is important to have a clear picture of all dissenting views.

The next highest vote count came from four voters (2.7%) who want to move to a new development site other than Takikchak on Nelson Island. Of these four votes, two voters explained they want to move to the alternative site of Narukachuk for better subsistence, and two want to just move up river.

Four voters (2.7%) selected “other solution”. According to their explanations, two voters haven’t decided what to do yet, one voter had no comment, and one voter thinks Takikchak will disappear.

Three people (2%) want to stay at the existing village site and move residences and facilities away from the advancing erosion as necessary. Two explained they were raised in Newtok and it will be too hard to leave, and one wants to stay and build a seawall. The fact that only three people voted to remain at the existing site should help alleviate valid concerns by government agencies about the possibility of having two separate villages after relocation has occurred.

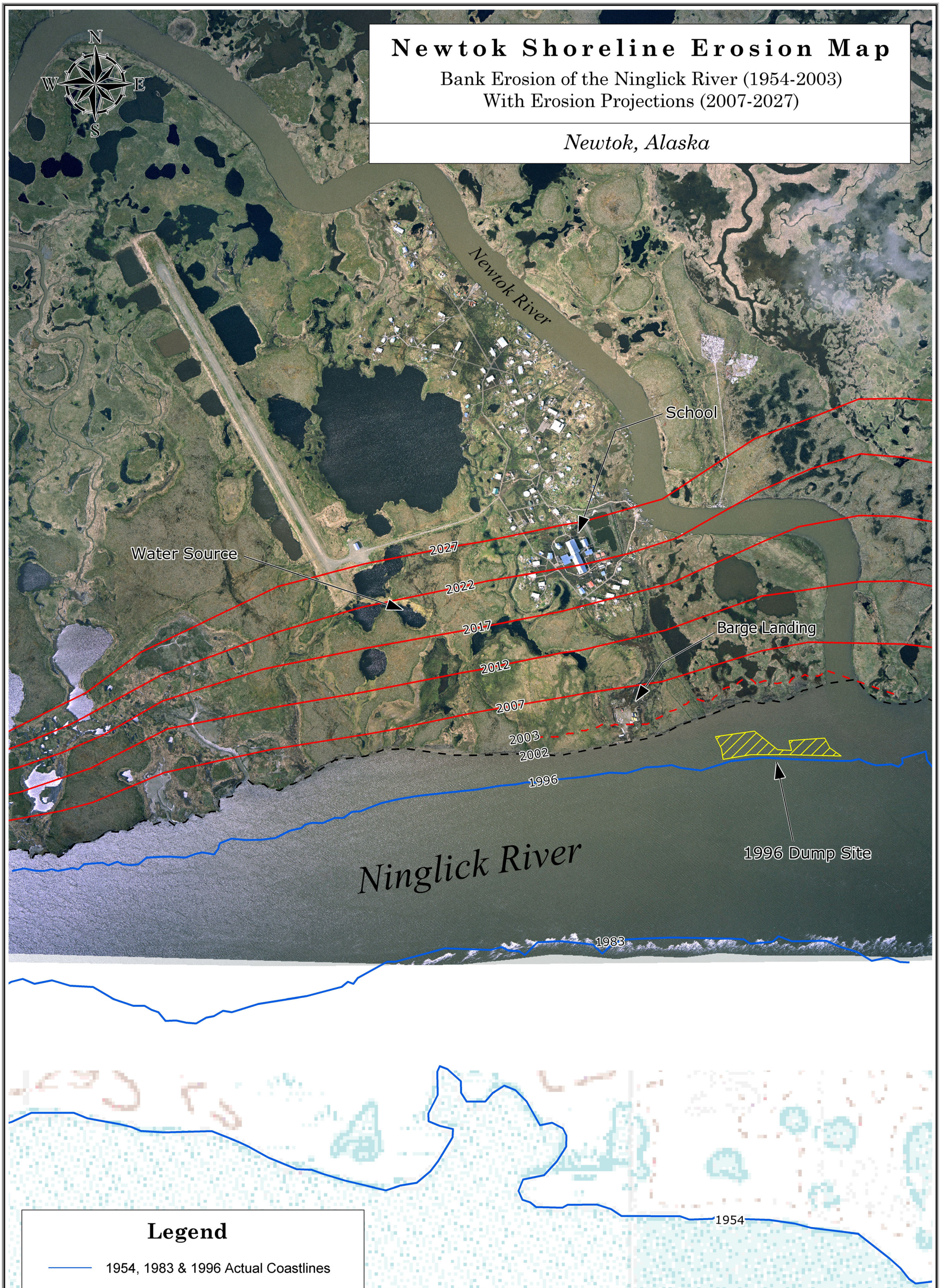
And lastly, only one person (0.6%) wanted to relocate to Bethel (more job opportunities). There were no votes for relocating to any of the surrounding villages.

APPENDIX A. Newtok Shoreline Erosion Map
(2002 aerial photo)

Newtok Shoreline Erosion Map

Bank Erosion of the Ninglick River (1954-2003)
With Erosion Projections (2007-2027)

Newtok, Alaska



Legend

- 1954, 1983 & 1996 Actual Coastlines
- 2002 Coastline
- 2003 Coastline (measured July 14, 2003)
- 2007-2027 Projected Coastlines (Five year intervals as noted)

0 200 400 800 1,200 1,600 2,000 Feet

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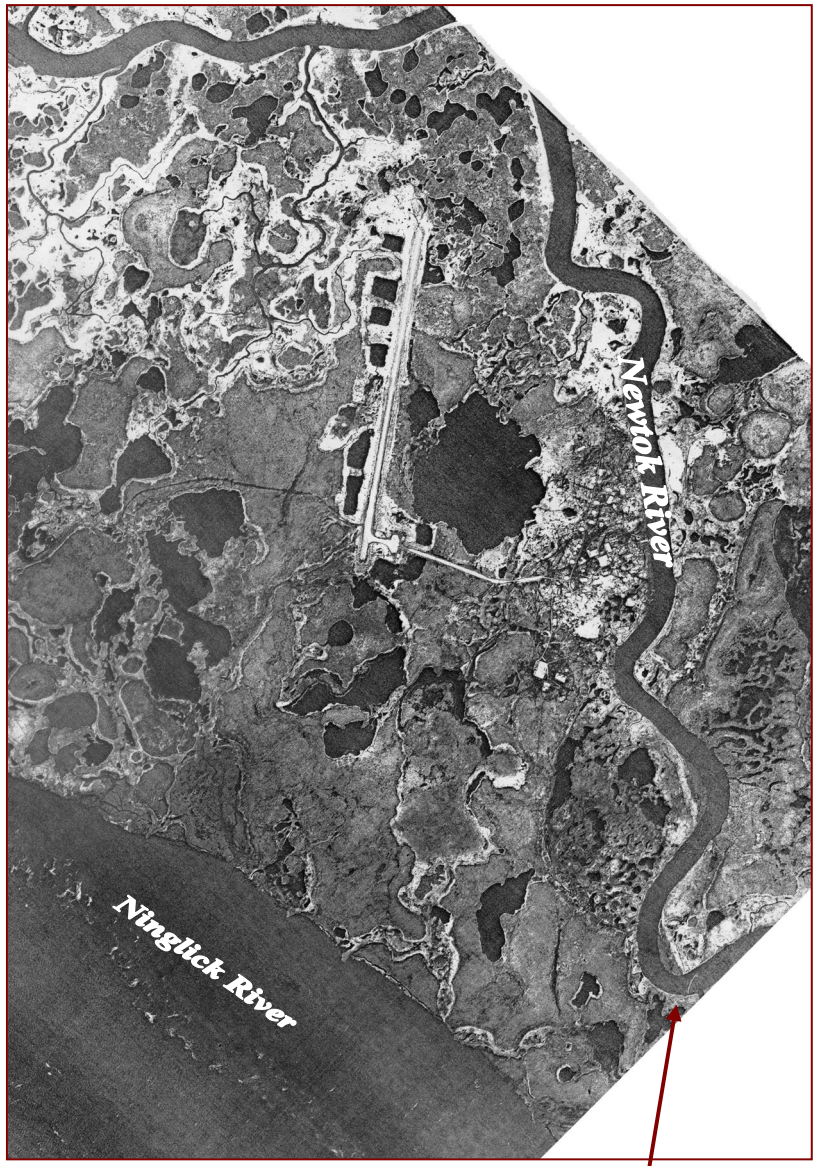
Historic shorelines digitized from USGS topographic maps and digital aerial photos. Projected shorelines are from statistically derived averages and have not been calculated based on actual Ninglick River data. Therefore, conservative erosion rate values were used for these projections, ranging from 36 ft/yr (west/downstream) to 83 ft/yr (east/upstream). Actual observations by residents and raw, non-averaged data indicate periods of much higher erosion rates. July 2003 shoreline represents a rate of 110 ft/yr.

Aerial photo date: June 15, 2002

APPENDIX B. 1983 and 1996 Aerial Photo Comparison of Ninglick Riverbank Erosion



June 10, 1983

July 4, 1996

These photos show the extent of erosion over a thirteen-year period.

APPENDIX C. Newtok Land Use Map
(2003 update of existing village site on 2002 aerial photo)

Land Use Map

Newtok, Alaska

Existing Land Use (2003)

1. Barge Landing
2. Water Source
3. Airport Garage
4. Teachers' Quarters
5. School Generators
6. School Tank Farm
7. Head Start
8. Sewage Lagoon
9. School Warehouse
10. Elementary/High School (LKSD)
11. Teachers' Quarters
12. Boat Landing #2
13. Traditional Council Office
14. Health Clinic
15. Generator (Ungusraq Power Co.)
16. Community Water Tank
17. Washeteria
18. Phone Company (United Utilities)
19. Post Office
20. Rental Housing (Traditional Council)
21. Old BIA School
22. Playground Deck
23. Generator (Old BIA School)
24. Ungusraq Power Company Office
25. Old BIA Harbor
26. Old BIA School Tank Farm
27. Church Rectory
28. Community Hall (Public Meeting, Bingo, Recreation)
29. Catholic Church
30. Tom's Store
31. Tank Farm (Tom's Store)
32. Newtok Corporation Store & Offices
33. Warehouse (Newtok Corporation)
34. Rental Housing (Newtok Corporation)
35. Ice Skating Rink
36. Armory
37. Tank Farm (Newtok Corporation)
38. Boat Landing #1
39. Tank Farm (Ungusraq Power Company)
40. Graveyard
41. New Dump Site
42. Old Dump Site
43. Dump Unloading Site

Aerial Photo Date: June 15, 2002

Newtok River

Under Construction

New Health Clinic Site Under Construction Fall 2003

State Airport Boardwalk

Existing Waterline

Old Barge Landing Boardwalk (unusable)

Ninglick River

0 200 400 800 1,200 Feet

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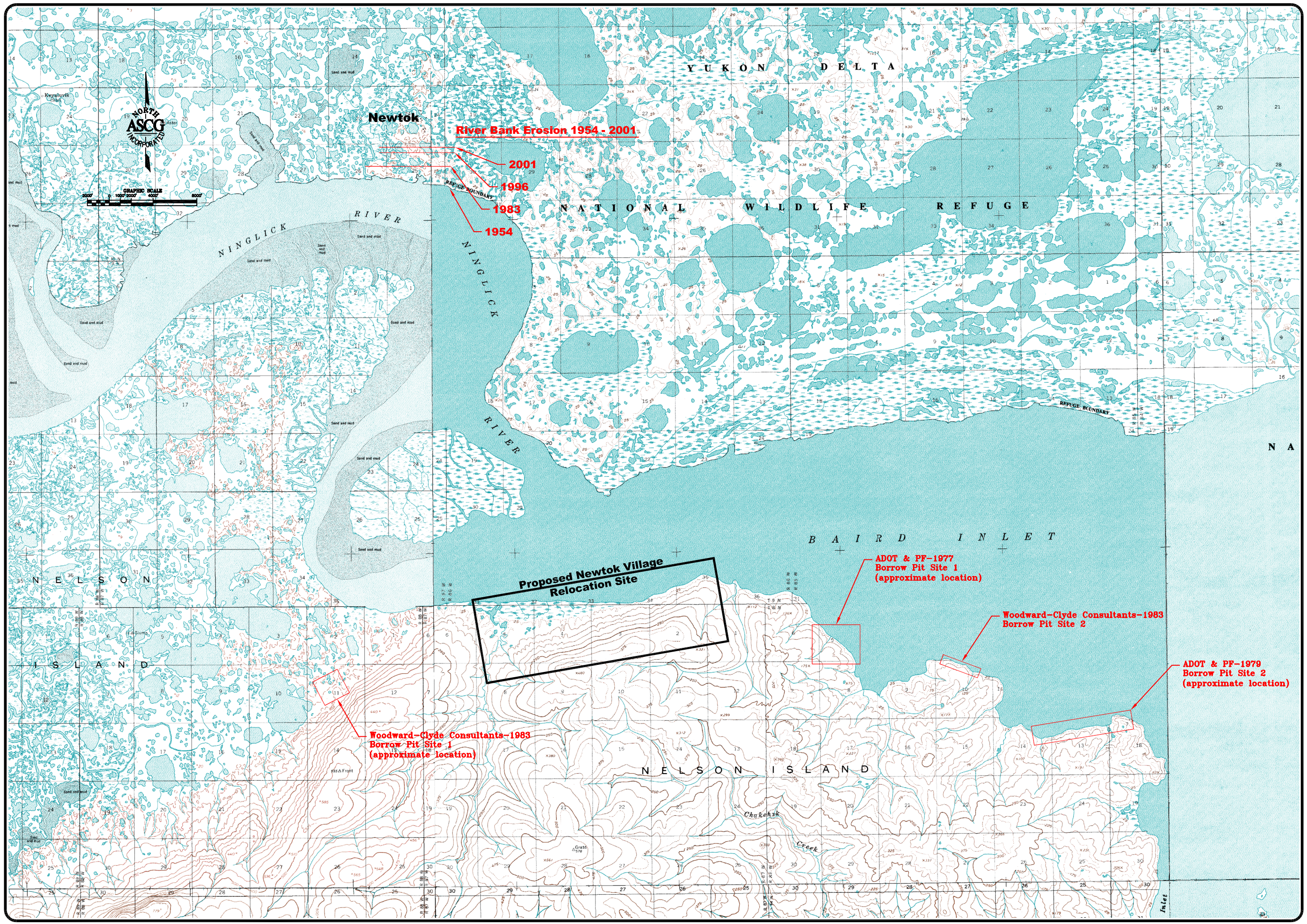
APPENDIX D. Proposed Relocation Site Map
(1954 USGS topographic map of Takikchak on Nelson Island)



DWG FILE: J:\1110\4209 Newtok\acad 14\Figure 2.dwg

PLOT DATE: 11/19/01

U.S. DEPARTMENT OF THE INTERIOR
March 1, 1849

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PHONE (907) 344-6145 FAX (907) 344-6215

FIGURE 2
PROPOSED RELOCATION SITE

NEWTOK, ALASKA

BUREAU OF INDIAN AFFAIRS

JOB NO:	4209
DATE:	10/25/01
DRAWN BY:	DRM
CHECKED BY:	TM

APPENDIX E. Proposed Relocation Site Plan of Takikchak on Nelson Island
(1995 Infrared photo Takikchak on Nelson Island)

Priority 1	BARGE LANDING ROAD Access to barge landing, barge unloadng and storage area, marine fuel header, and fuel tanks.	Route 0010	.23 miles
	AIRPORT ROAD Access to airport	Route 0020	.68 miles
		Sub Total	.91 miles
Priority 2	MAIN STREET Access to landfill, sauna, teacher's housing, school, washeteria, church, residences, water treatment and tank, sewage lagoon, water filtration gallery & pump house.	Route 0030	3.63 miles
	QUGAGLIG ROAD Access to power plant, two stores, multipurpose building, health clinic, post office, residences, and shoreline	Route 0040	.88 miles
	PIUNRITARKAQ ROAD Access to residences and shoreline	Route 0050	.20 miles
		Sub Total	4.71 miles
Priority 3	MIKCYAQ ROAD Access to school, multipurpose building, residences and shoreline	Route 0060	.25 miles
	QASSAIULI ROAD Access to health clinic, washeteria, residences and shoreline	Route 0070	.29 miles
	QEATUAK ROAD Access to church, store, residences and shoreline	Route 0080	.26 miles
	ARNAPAGAQ ROAD Access to residences and shoreline	Route 0090	.29 miles
		Sub Total	1.09 miles
	TOTAL VILLAGE ROAD DISTANCE		6.71 miles

LAND USE PLAN

1. Consolidated Fuel Tanks
2. Barge Unloadng and Storage Area
3. Barge Landing and Marine Fuel Header
4. Multipurpose Building
5. Store
6. Power Plant
7. Community Sauna Building
8. Teacher's House
9. Airstrip
10. Health Clinic
11. Washeteria
12. Water Treatment Building & Tank
13. Church
14. Post Office
15. Store
16. School
17. Landfill
18. Sewage Lagoon
19. Water Filtration Gallery & Pump House

NORTH

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GRAPHIC SCALE

500' 0 500' 1000' 2000'

PHOTO DATE: 6/12/95

BAIRD INLET

QUGAGLIG ROAD ROUTE 0040

MIKCYAQ ROAD ROUTE 0060

QASSAIULI ROAD ROUTE 0070

QEATUAK ROAD ROUTE 0080

ARNAPAGAQ ROAD ROUTE 0090

PIUNRITARKAQ ROAD ROUTE 0050

BARGE LANDING ROAD ROUTE 0030

MAIN STREET ROUTE 0030

AIRPORT ROAD ROUTE 0020

AIRSTRIP 4200' X 200'

MAIN STREET ROUTE 0030

FIGURE 1

PROPOSED RELOCATION SITE PLAN

NEWTOK, ALASKA

BUREAU OF INDIAN AFFAIRS

ASCG INCORPORATED
ENGINEERS · ARCHITECTS · SURVEYORS · INSPECTION SERVICES
301 ARCTIC SLOPE AVENUE · ANCHORAGE, AK 99518
PHONE (907) 349-5146 FAX (907) 349-4215

JOB NO:	4209
DATE:	8/19/03
DRAWN BY:	KML
CHECKED BY:	TM

DWG FILE: J4110/4209 Newtokxcad 14/Figure 1.dwg
PLOT DATE: 11/26/01

APPENDIX F. New Development Site Alternatives for Relocation

1. Location Map of Site Alternatives
   (1954 USGS topographic map)
3. 1994 Alternative Site Selection Lists of Pros and Cons

Village of Newtok

Location of Site Alternatives for Village Relocation

Kaikilirmiut

Kaikilirmiut is located on the Manokingk River approximately 25 miles northeast of Newtok

Puklanarivik

Puklanarivik is located on a tributary of the Azun River approximately 20 miles northwest of Newtok

Narukachuk

Narukachuk is located on the Narukachuk River approximately 15 miles northwest of Newtok

Tagkanirluta

Tagkanirluta is located further inland from the existing village site of Newtok

Current Village Site

Tunuirun

Tunuirun is the island in the Ninglick River, 2.5 miles southeast of Newtok

Takikchak

Takikchak is the preferred relocation site chosen by the Newtok Community. The site is located on the north end of Nelson Island, approximately 9 miles from Newtok

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0 1 2 4 6 8 Miles

APPENDIX F.

Original 1994 Alternative Site Selection List of Pros and Cons

Site Alternative #1 Tunuirun

The Tunuirun site is located on the island in the Ninglick River approximately 2.5-miles south of the existing Newtok Village site.

PROS	CONS
1. High ground	1. The island is eroding also
2. Good barge access	2. The possibility of the village moving again
3. Won't move too far from existing Newtok site	3. Further away from Chevak
4. No difficulty in re-fueling village fuel tanks	
5. We can still access the existing airport, although it will be further away	
6. The ocean won't be too much farther away	
7. Pike fishing close by	
8. Good boat landing	
9. Mudflats are developing and growing, possible they might stop erosion	
10. Not moving further away from subsistence and wild animals	
11. Women and children can still go hunting	

Site Alternative #2 Kaikilirmiut

The Kaikilirmiut site is approximately 25 miles north of Newtok.

PROS	CONS
1. High ground	Further than Puklanarivik
2. Presence of rock and gravel	A spooky place
3. Good airport site	Some elders said not to move here because of lots of death and graves. We should respect the dead.
4. Has barge access	Gas price will increase
5. Ground good for possible sewer line???	Further from herring and halibut fishing
6. Good water	Plane routing will change
7. Road access	Possibly more teen pregnancies
8. No strong currents	May have to charter a plane or through Bethel to visit relatives
9. Plenty of seal	Some people may have to charter a plane to go to Nelson Island for subsistence
10. Close to the ocean	With more activities available for young people closer by, there may be more accidents during travel
11. Good subsistence	
12. Good place for emergency airport	
13. Good place to build a high school	
14. Closer to wild animals	
15. Won't stop eating blackfish and needle fish	
16. Can store boats on ground in winter time	
17. The river goes in and out like the Niugtaq River	
18. Not swampy	

Site Alternative #3 Narukachuk
Narukachuk site is approximately 15 miles northwest of Newtok.

PROS	CONS
1. Plenty of subsistence, good for future generations	No high ground
Will continue to get blackfish	1.Sinking, swampy land; the same as the existing Newtok site
Lots of needle fish in area	Difficult for people to walk around, the same as in Newtok
Can fish for pike	The site is not suitable for airport or high school construction
Historically, the Azun River has provided good subsistence food to regional inhabitants	The site is a too great a distance from Newtok regarding relocation
Strong river current	No fresh water
Plenty of wild animals	Our children may want to move again
The ocean is not far away	If flooding occurs, there is no high ground to evacuate to
Good place to park boats in winter time	No mail all summer
	2. No fishing close by due to strong, muddy current

Site Alternative #4 Puklanarivik

The Puklanarivik site is approximately 20 miles northwest of Newtok.

PROS	CONS
Plenty of river access	Seven hour trip from existing site
Plenty of subsistence	The river gets shallow in Springtime
Solid ground	Gas prices will increase
Possible to have sewer line	In spring, won't get herring on time due to shallow water
Good water	Plane routing will change
The tide doesn't go low	Possible more teenagers
Road access	Possible more pregnancies due to more teenagers in area
Good airport site	More teenagers will be invited to villages now closer in the north
Good for making emergency airport	To visit relatives, we will now have to charter a plane and go through Bethel; more expensive
Good place for making high school	Subsistence people will have to charter a plane to Nelson Island for subsistence
Good for our future kids	Possibly more winter time accidents by teenagers due to closer proximity of northern villages; increased search and rescue activities
Plenty of fishing	Difficult barge access because of sand bars and shallow water in spring time
Can go anywhere for subsistence	Food problems related to the dumping of honey buckets in the river
Land bottom is sand and rocks	Halibut grounds are far away in summer
High ground	Too far a distance for relocation
Won't have to stop eating blackfish	
Can park boats on grounds in winter time	
Lots of pike and whitefish year round	

Site Alternative #5 Takikchak

The Takikchak site is approximately nine miles southwest of Newtok on the north end of Nelson Island, and is the prime site selected for relocation.

PROS	CONS
Solid ground	The river won't freeze right away because of strong currents; tough for subsistence
Possible to have sewer line	Open spots in the ice during winter
Good water	Rocky areas on the mountain (behind the village site)
Close to the ocean	Icing problem on road to airport because of steep slopes
Plenty of wood	Mountain area will thaw quicker
Plenty of fish	Possibility of less seals taken
No strong currents	Shallow river areas
Can make roads with available sand and rocks	Always foggy; the fog could hinder emergency planes
Good airport site	Difficult to go after subsistence food in fall and spring
Good place for a high school	The ice may be dangerous for kids while ice skating or sledding
Closer to pike fishing	May be dangerous for kids because of nearby streams that don't freeze
Plenty of seals	No place for kids to hunt or gather eggs nearby
Good locations along the beach to build a dock	Poor spring hunting for women
Safe from high water; no sinking, no erosion	
Good place for the future of our kids	
Commercial fishing areas are not far away	
Not far from herring fishing	
Deep water next to shore	
Can park boats in river	

Site Alternative #6 Tagkanirluta

The Tagkanirluta alternative is at the existing site of Newtok, but further inland away from the erosion.

PROS	CONS
Higher ground	The land will still erode
Don't have to move too far away	We'll use more money if we keep moving
Can always move further up if erosion gets close	We'll have to keep asking for help from governor and senators, etc.
Will be close to subsistence and wildlife	If we are going to continue moving, it is not good for future kids
Closer to blackfish	
Not far from Newtok	
We'll still be close to our loved ones that are buried	
Continue to live as we have for so many years	
We won't be far from the airport	

APPENDIX G. Existing Regional Winter Trails and Planned Trail Linkages for Newtok Village Relocation
(1954 USGS topographic map)

Existing Regional Winter Trails and Planned Trail Linkages for Village Relocation

Village of Newtok, Alaska

Legend & Trail Key

Villages & Trail End Points ●

Existing trails: ⟶

#	Name	Use	Miles*
1.	**Qassak Trail**	Seal Hunting	4.5
2.	**Miigarmiut Trail**	Seal Hunting	18
3.	**Chevak Trail** (To Village of Chevak)	Trading, hunting, ice fishing, driftwood gathering	53
4.	**Kayalivik Trail**	Hunting, ice fishing, trapping	1
5.	**Puqllaniruuq Trail** (To Inqqisak Mountains)	Hunting, ice fishing, trapping	40
6.	**Cuqfogtug Trail**	Hunting, ice fishing	36
7.	**Qiisaq Trail**	Hunting, ice fishing, trapping	9.5
8.	**Kasiluq Trail**	Trading	62
9.	**Cak'caq Trail** (To Village of Nightmute)	Village visits, community gatherings, ice fishing	42
10.	**Tununak & Toksook Bay Trail** (To Villages of Tununak & Toksook Bay)	Visiting, community gatherings	33

***Mileage from existing site**

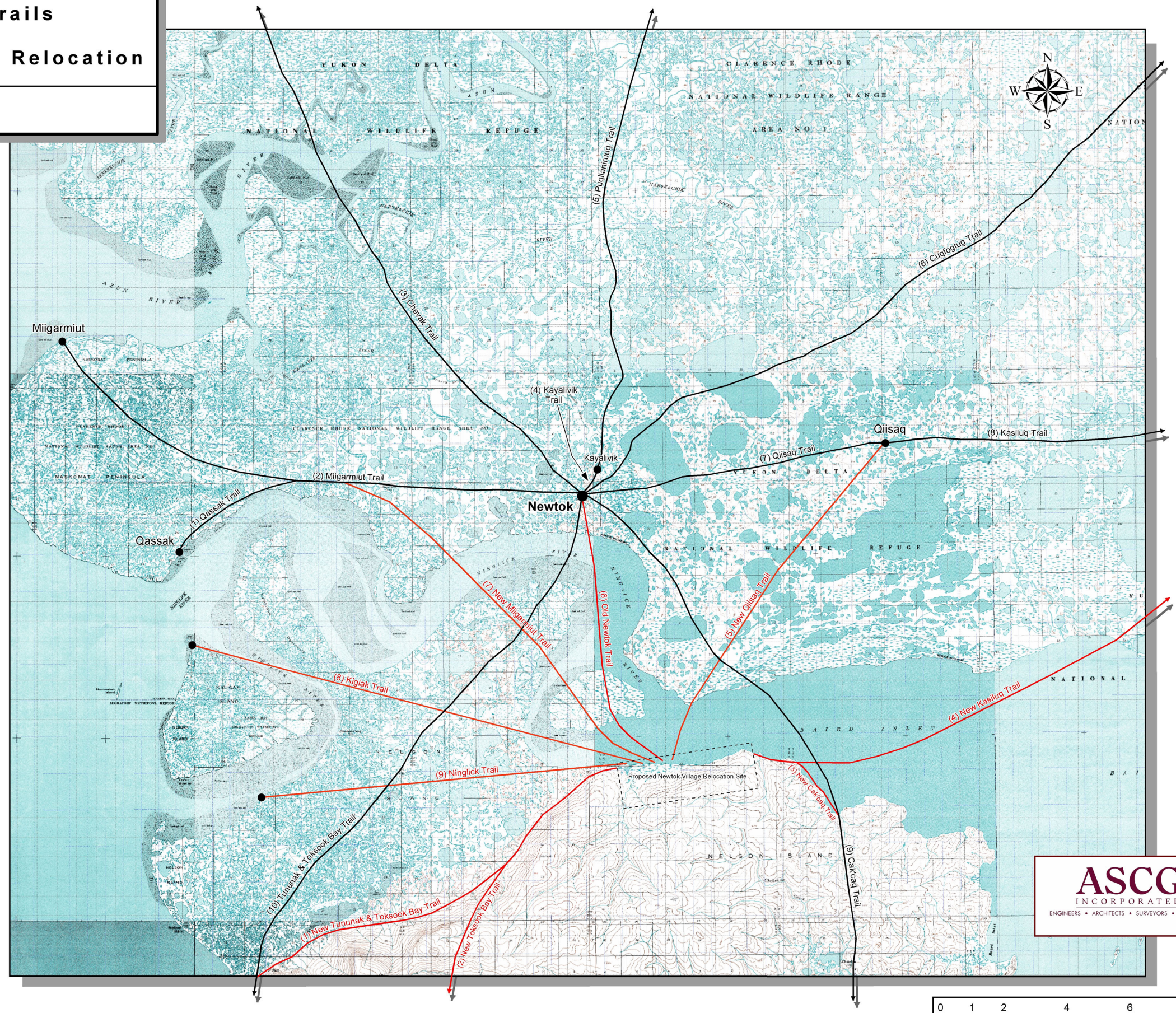
Planned trail linkages: ⟶

#	Name	Use	Miles*
1.	**New Tununak & Toksook Bay Trail** (To Villages of Tununak & Toksook Bay)	Visiting, community gatherings	28
2.	**New Toksook Bay Trail** (Shortcut trail to Village of Toksook Bay)	Village visits, community gatherings	4.5
3.	**New Cak'caq Trail** (To Village of Nightmute)	Village visits, community gatherings, ice fishing	3.5
4.	**New Kasiluq Trail**	Trading	74.5
5.	**New Qiisaq Trail**	Hunting, ice fishing, trapping	12.25
6.	**Old Newtok Trail**	Trail linking new village relocation site with trails leading north, west and east from existing site	9.25
7.	**New Miigarmiut Trail**	Seal hunting	13.5
8.	**Kigiak Trail**	Seal hunting, wood gathering	14.75
9.	**Ninglick Trail**	Seal hunting	11.5

***Mileage from proposed site**

NOTE: All summer transportation is by boat

Base map compiled from USGS 1:63360 topographic series, 1954.



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APPENDIX H. 1984 Ninglick River Erosion Assessment Letter from Woodward-Clyde Consultants

APPENDIX I. August 27, 2003 Relocation Survey Documentation

1. Information Flier for Resident Survey Questionnaire
2. Resident Survey Preparation and Process
3. Survey Questionnaire
4. Survey Analysis Spreadsheets

1. Information Flier for Resident Survey Questionnaire

NEWTOK TRADITIONAL COUNCIL
Public Involvement Process
Resident Survey on Response to Erosion Problem

Below is a brief summary of the erosion problem in Newtok. The summary is followed by a survey question regarding what Newtok residents think is the most appropriate response that should be taken by the Newtok Traditional Council to prepare for the impact of erosion on the village. This resident survey is part of the Public Involvement Process that will ensure that any Council request for agency assistance is supported by the community.

Summary of Erosion Problem
The north bank of the Ninglick River has been eroding for decades and the retreating coastline continues to advance on the village of Newtok. The coastline has eroded approximately 4,000 feet in places since 1954 (an average of around 81 ft/yr) and is now approximately 800 feet away from village residences. In a one year period between June 2002 and June 2003, 110 feet was measured to be lost.

In an effort to help determine potential impacts on the village and give a reasonable timeline for action, available historical aerial photos and topographic maps along with current observations and GPS data have been utilized to statistically analyze future erosion patterns. This analysis has presented a potential encroachment of the Ninglick River into residences in the village of Newtok around the year 2017.

A 1984 erosion assessment performed by Woodward-Clyde Consultants concluded that relocating the village would be less expensive than trying to hold back the Ninglick River. This opinion was confirmed again in an August 2003 interview with Woodward-Clyde staff who participated in the 1984 assessment. Their opinion is that there are no permanent solutions to the erosion problem. There are temporary solutions that may slow down or stop the erosion rate over a short period of time, but would have no permanent affect on the encroachment of the river on the village of Newtok. Woodward-Clyde's conclusion is that trying to hold back the Ninglick River would be a continuous effort, costing millions of dollars more than village relocation, in the long run.

There may be various views of residents concerning what course of action the village should take to plan and prepare for the impact of erosion. The predominant views of the village regarding what action to take will strongly affect what kind of government assistance may be made available to the village. The dollar amount of government assistance for any course of action to be taken by the village will be extraordinarily high. Planning and preparation will take many years.

A **well-documented** survey of resident views is necessary to help acquire adequate assistance. The Newtok Traditional Council is administering this survey poll to document what course of action residents want the Council to take. A show of strong

village unity in this survey is necessary in order to justify the Council's request to the many government agencies for assistance.

2. Resident Survey Preparation and Process

Survey Preparation
Residents were first informed of the August 27, 2003 Resident Survey and Public Meeting at the August 21, 2003 Public Meeting held by the Newtok Traditional Council with ASCG, Inc. Flyers advertising the August 27 meeting and survey were then made up and distributed around the village on August 22. VHF radio advertisements began on August 22.

Survey Process
A public meeting was held on Wednesday, August 27, 2003 at 7 pm in the Community Hall to start off the Resident Survey process. The Erosion Summary and Newtok Shoreline Erosion Map developed by ASCG were available for review and discussion. At the close of the meeting, eligible voters answered the Resident Survey Questionnaire regarding what action they think the Traditional Council should take in response to the erosion problem. During the voting process, Council Staff had the voter sign in on the Eligible Voter List before handing the voter the Erosion Problem Summary and the Survey Questionnaire. Staff made sure that there was only one answer checked off. All other qualified village residents who didn't attend the meeting had the following day, Thursday, August 28, to answer the survey question.

Note: The survey was administered in August during a period of major subsistence activity in the village. Therefore a significant number of eligible voters were not present to vote during the two allotted days. As the Traditional Council felt that it was necessary to have all eligible voters be given the chance to express their opinion, the poll remained open till October 16, 2003 to accommodate people arriving back to the village from summer and fall subsistence activities. Council Staff sent letters and made house calls near the end of the voting period to get the straggler votes in.

Survey Tally and Documentation
The Newtok Relocation Planning Coordinator and the Tribal Coordinator tallied the number of responses received for each option. A Survey Statistic spreadsheet was also filled out to record each voter's response, their explanation, and the voter's gender, age, length of residency.

3. Survey Questionnaire

For Official Use Only

count #1 _____

count #2 _____

statistic count ____

NEWTOK TRADITIONAL COUNCIL

Public Involvement Process- Survey Question

August 27-28, 2003 Resident Response to Erosion

Residents must meet all of the following qualifications to participate in this survey:

- Tribal enrolled
- Age 18 and over
- Newtok Resident
- Must be physically present to vote

****

Please provide the following information:

1) Male _____ Female _____

2) Age _____

3) How many years have you lived in the Village of Newtok? _____

****

Please make only one selection or checkmark on this page next to the statement which best matches what <u>you</u> think is the best response to the erosion problem. If your view is not represented on this page, please write it in at #6. Use the space provided to explain your answer.

QUESTION: The Newtok Traditional Council is making preparations now, for the future impact of erosion on the village. **Do you want the Traditional Council to use their resources and seek government assistance to help make plans and preparations to:**

_____ 1- Remain at the existing village site <u>when</u> erosion physically impacts the village and move <u>threatened</u> village structures inland away from the encroaching Ninglick River as necessary. Why?_____

_____

_____ 2- Relocate the village to the proposed village relocation site on the north end of Nelson Island. Why? _____

_____

_____ 3- Relocate the village to another site in the region, instead of Nelson Island. Why? _____

_____

_____ 4- Relocate village residents to Bethel. Why? _____

_____

_____ 5- Relocate village residents to one of the surrounding villages. If so, which village would be your choice? Why?_____

_____

_____ 6- Other solution. Why? _____

NEWTOK TRADITIONAL COUNCIL
8-28-03 Relocation Survey

Voter Selection #	Voter Explanation	Male or Female *(M or F)*	Age	Length of Residency	Vote Count
2	better land, good higher land.	m	67	54	1
2	because it has solate ground and it is higher from the water	m	39	39	2
2	cause we need to move before the erosion gets to our house	f	41	41	3
2		m	36	18	4
2	hard land	m	42	42	5
2	higher ground, plenty of water; promising future	m	45	45	6
2		f	23	23	7
2		f	44	since 1958	8
2	good land		62	62	9
2	proposed site	m	58	58	10
2	we want to stay high land	f	61	61	11
2	good soil if moved to another village we'll have problems they'll see us as bad neighbors	m	36	36	12
2		m	58	58	13
2	because the site is good	m	27	27	14
2	because it's good	m	48	48	15
2	better land, then any other land	m	32	32	16
2	better land	f	28	28	17
2	for better living!	m	39	39	18
2	better place to live any on befare disaster strikes	m	66	66	19
2	this was the origenal site	f	47	47	20
2	good place takikchaq and good water	f	59	52	21
2	this was the origenal site	f	50	50	22
2	this was the origenal site	f	59	since 1991	23
2		m	29	29	24
2	we need to get land for our child to live best land	m	41	41	25
2	this was chosen site let it be so.	f	77	77	26
2		f	72	72	27
2	higher land fresh water	f	44	44	28
2	I want to move to stable ground	f	36	36	29
2	better location for future development	m	65	53	30
2		m	54	54	31
2	higher ground and good water system	m	43	43	32
2	we all need land that will not be none.	f	45	45	33

NEWTOK TRADITIONAL COUNCIL
8-28-03 Relocation Survey

Voter Selection #	Voter Explanation	Male or Female (M or F)	Age	Length of Residency	Vote Count
2	better land and especially for our younger generation	m	51	51	34
2	more stable ground, hard ground and sturdy	m	46	46	35
2	little or no erosion problem solid foundation, solid ground and higher	m	30	30	36
2	solid ground/higher water stream available where I can roam around the Nelson Island.	f	47	47	37
2	better location for development	m	50	50	38
4	more job opportunities and don't have erosion problem.	f	23	23	39
2	need to move where there will be no erosion	m	42	13	40
2	proposed site	f	81	81	41
2	because its good	m	52	42	42
2	I may live longer	m	53	53	43
2		m	41	41	44
2	cause it's solid & dry, and don't have to worry about bank erosion	m	48	48	45
2		m	73	73	46
2	better place to live	m	74	53	47
2	higher ground, fresh water close by the location site	m	55	48	48
2	the land has the rock! It is hard, so we could have running water flush toilet, no more packing water & dumping honey buckets for better life having showers		m37	37	49
2	this town smells so bad from the mud. If they tro to improve this place it wont work, if we move we will have running water for the first time clean water smell of fresh air.			f26	50
2	erosion	m	47	47	51
2	the ground is more stable	m	71	71	52
2	for better land and better water treatment running water	m	27	27	53
2	because the erosion will keep coming	m	37	37	54
2	better ground have yearly water supply from taqiqcaq stream	m	31	31	55
2	we need running water	f	25	25	56
2	because the elders choice. Because they're been voting & voting for this. Possible running cool water possice more job oppuortnities.	f	31	31	57
2	safety running water, better home, higher land and etc.	f	22	5	58
2	best spot	m	40	121/2	59
2	running water, better envronment more land no erosion, more berries, better home cant wait to move	f	24	24	60
2	higher ground better water	m	50	50	61
2	would love tomove because it's better land and know the place	f	81	81	62
2	because the place is sturdy and our land Newtok is becoming the island of all the island	m	41	41	63
2	seem more stable	f	35	12	64
2	cause there will be more space	m	19	19	65
2	better land nice water	m	28	28	66

NEWTOK TRADITIONAL COUNCIL
8-28-03 Relocation Survey

Voter Selection #	Voter Explanation	Male or Female *(M or F)*	Age	Length of Residency	Vote Count
2	there will be no land in this area	m	72	72	67
2	because of the erosion. We will have running water better land and home	f	21	20	68
2	were ever my husband moves, he will need my support and for my children would have a better home and place	f	64	64	69
2	there be good running water	m	22	22	70
2	erosion, no where else to move for our family and better home for our future children	f	88	88	71
2	better ground, fresh water from mountian	m	25	14	72
2	higher land better environment w/out waste problems	f	38	27	73
2	because higher land, and for our future children	m	18	18	74
2	running water, flushing toilet, better place	f	45	45	75
2	higher land more stable land	m	38	38	76
1	I've lived here the most of my life why move fish on this side	f	54	54	77
6	don't know yet where to move	m	34	34	78
2		f	38	38	79
2	for running water purposes	f	28	20	80
2	we need running water	f	54	26	81
2	to have running water	f	24	24	82
2	need secure land	f	27	27	83
3	move up river	m	25	25	84
2	because the village might make roads village to village	m	19	17	85
2	running water	f	27	25	86
2	because better water and better fresh camp	f	51	51	87
3	move up river	m	18	18	88
2	better land	m	24	24	89
2	higher village running water	m	60	60	90
2	water swere system	m	20	20	91
2	no erosion, running water	m	22	22	92
2	need more roads new house for lots of people and running water	f	39	20	93
2	better stable land and good future for the younger generation	f	64	24	94
2	since its closer to where we are and closer to our surrounding village	f	37	37	95
2	because so there wouldn't be any erosion again & have to deal w/ this again. Nelson Island is better because there's no erosion.	f	18	18	96
2	because we need higher land and so we'll have running water and fresh water	f	21	16	97
2	we need higher land so we don't have to worry about our subblings kitiq-ing (drowning)	f	20	5	98
2	erosion keeps coming need to move the village	f	21	21	99

NEWTOK TRADITIONAL COUNCIL
8-28-03 Relocation Survey

Voter Selection #	Voter Explanation	Male or Female *(M or F)*	Age	Length of Residency	Vote Count
2	because the erosions getting closer and closer	m	24	24	100
2	higher and stable ground	m	46	46	101
2		f	40	18	102
2	because it's has good land	m	52	since birth	103
2	where erosoin is not very fst and land is more stable	f	40	40	104
2	land security	m	54	54	105
2		m	55	55	106
2	move to Taqikcaq if erosion reaches Newtok. Good to move there.	m	28	28	107
2	we will have running water, the land is hard. High. It is a good place to live.	m	37	37	108
3	Naruukacuk. Better place than the side of the mountain with stormy weather in winter. Can't do anything.	m	25	25	109
2	why not?	m	24	24	110
2	I guess there would be no more erosion.	f	19	19	111
2	too good	f	48	48	112
2		m	52	52	113
2	that is the best place possible for Newtok. Will not have erosion problem there.	f	25	10	114
2	secure land	f	20	20	115
2	high water	f	20	20	116
2	we need a higher & harder land where we can have fresher water & flushing toilets.	m	19	19	117
2	better living land & higher ground	m	45	45	118
2	we need a higher land so we would be more cleaner.	f	37	37	119
2	it's a better, stronger, solid ground	f	42	42	120
2		m	57	57	121
2	because it's okay.	f	47	47	122
2		m	18	18	123
2		m	18	18	124
2		f	30	30	125
2		m	27	27	126
2	it has solid ground with gravel, and fresh water and has high ground	m	45	45	127
2		m	19	19	128
3	Naruukacuk. More food available	m	20	20	129
2	land is better there. Less chance of erosion.	f	32	9	130
2		m	29	29	131
2		f	21	21	132

NEWTOK TRADITIONAL COUNCIL
8-28-03 Relocation Survey

Voter Selection #	Voter Explanation	Male or Female *(M or F)*	Age	Length of Residency	Vote Count
2		m	20	20	133
2	no last minute relocate due to erosion coming fast	f	31	31	134
2		f	33	33	135
2		m	21	14	136
1	too expensive to move. 50 million too much. Give me 1 million & I'll build a seawall.	m	32	30	137
2	secure land. Water & sewer	f	20	20	138
6	no comment	m	22	22	139
6	will figure out later	m	36	36	140
1	hard to leave home when raised here	f	25	25	141
2	won't flood there	f	67	67	142
2	closer relocation site for Newtok, it won't cost as much for other locations.	f	45	44	143
2		f	21	21	144
6	heard from elders taqikcaq will disappear & will lose lots of money	m	33	4	145
2	secured land	m	20	20	146
2	water & sewer	f	19	12	147
2	better land	f	30	30	148
					149
					150
					151
					152
					153
					154
					155
					156
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					159
					160

APPENDIX J. Preliminary Geotechnical Overview of the Proposed Village Relocation Site on Nelson Island (Takikchak) by the U.S. Army Corps of Engineers

APPENDIX K. References

BIA *Juneau Area Transportation Plan, Bethel Agency Report*, Juneau, Alaska. 1990 & 1993 Update

DCED Online Community Profiles

Woodward-Clyde Consultants. *Ninglick River Erosion Assessment: Addendum.* Anchorage, Alaska, November 1984