



10th Year Anniversary 2015



Promoting Justice
Empowering Survivors, &
Protecting the Human
Rights of all Alaskans

Offices in Anchorage & Juneau • 431 West 7th Avenue, Suite 208, Anchorage, Alaska 99501 • Phone: 907-279-2457 • Fax: 907-279-2450
Juneau Office Phone: 907-789-1326 • Fax: (907) 789-1324 • www.akijp.org

Kotlik: Background Report

Alaska Institute for Justice

Robin Bronen, JD, PhD
Executive Director
Robin.bronen@akijp.org
(907) 279-2457

Denise Pollock
Research Director
denise.pollock@akijp.org
(907) 279-2769

Kate Glover, JD
Government Relations Specialist
kate.glover@akijp.org
(907) 789-1340

KOTLIK

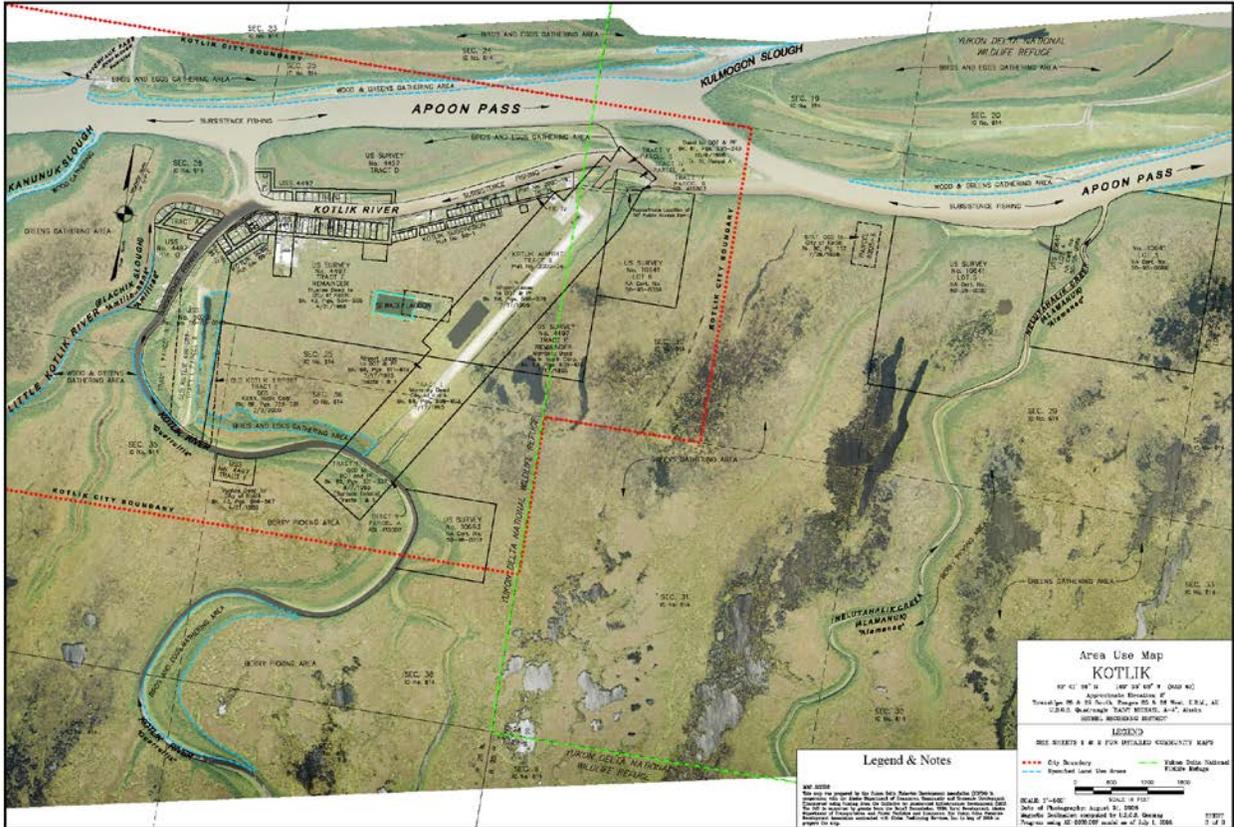


Figure 1: Kotlik Community Layout showing subsistence gathering areas, sewage lagoon, airport and homes (Map produced by Yukon Delta Fisheries Development Association and Alaska Department of Commerce, Community & Economic Development (2006). Retrieved from Division of Community and Regional Affairs Community Profile Maps, <http://dced.maps.arcgis.com/apps/webappviewer/index.html?id=18fdb060875740fdad22099ca779d637>).

I. Report Objectives

This report provides documentation about the need to relocate homes in Kotlik and includes the following information:

- Summary of previous studies regarding the causes, rate, and severity of erosion, and alternatives available to mitigate the effects of the erosion;
- Documentation of the impacts of erosion in the community, past mitigation efforts, and community perspectives;
- Documentation of the steps the community has taken to relocate homes; and
- Identification of short and long-term timeframes for the relocation of homes.

The Village of Kotlik seeks dialogue with agencies about technical assistance and available funding to relocate homes.

II. Introduction

The Native Village of Kotlik, Alaska is imminently threatened by erosion, flooding and thawing permafrost. Erosion has been occurring on the banks of Kotlik River, Little Kotlik River, and Apoon Pass since at least the 1980's. In the past 10 years, approximately 20 feet of river bank have been lost. The Army Corps of Engineers completed a bank stabilization project for Kotlik in 1986. By the mid-2000s, however, the articulated concrete mat system had eroded and no longer provided sufficient protection for the community. Although the community has made efforts to provide additional protection, erosion continues to threaten the community. In 2017, Kotlik partnered with the Alaska Institute for Justice (AIJ) and the Division of Geological & Geophysical Surveys (DGGS) to do community-based erosion monitoring. Measurements from the community-based monitoring sites show that an average of two feet of erosion occurred between June 2017 and September 2018.

Kotlik also experiences flooding and permafrost thaw, which intensifies the erosion. The most recent extreme weather storm event that caused moderate-major flooding occurred in February 2019 and damaged six homes (AIJ, 2019). In the winter of 2017-2018, Kotlik experienced five flooding events. In 2012, the Yukon River Inter-tribal Watershed Council determined that the active layer of permafrost increased while the layer of permafrost decreased in Kotlik. As the depth of the active layer continues to increase, it could impact the stability of infrastructure in Kotlik.

Approximately 120 structures (47 homes, seven commercial buildings, seven community buildings, and 59 outlying buildings) are at risk. In 2018, the Alaska Native Tribal Health Consortium identified 21 high-risk homes because they are within 10 feet of the riverbank. Of these 21 homes, four are imminently threatened. If no action is taken by state or federal agencies to relocate homes, injuries, loss of life, loss of property, environmental contamination, and displacement of residents could occur (ANTHC, 2018).

III. Village Characteristics

Location – The Village of Kotlik is located 165 miles northwest of Bethel, 460 miles from Anchorage and approximately 5 miles inland from the southern coast of Norton Sound, where the Kotlik and Little Kotlik Rivers come together. The majority of the village is located on the south of the Kotlik River, but homes are also located on the north bank of Kotlik River (USACE, 2008).

Population – In 2017, the Alaska Department of Commerce, Community, and Economic Development (DCCED) estimated that 640 people resided in Kotlik (DCCED, 2019). The population is comprised of 128 households with an average of five residents in each home (LHMP, 2013). Ninety-eight percent of Kotlik residents identify as Yup'ik. A list of these homes and residents is provided in Appendix A, Table 1-2.

Subsistence & Economy – Kotlik residents practice a subsistence lifestyle. They harvest beluga whale, seals, walrus, caribou, moose, birds, berries, and various fish (City of Kotlik, 2010). Employment opportunities include government, seasonal construction, education, and

commercial fishing. Salmon runs at the fishery have been low in recent years, which have limited income for commercial fishing. Kotlik is also a member of the Yukon Delta Fisheries Development Association, which is a Community Development Corporation (LHMP, 2013). According to the 2010 census, individual income in Kotlik was estimated to be \$9,755 while the median household income was estimated to be \$33,750 (NOAA, 2013).

Climate – Kotlik, which is south of the Arctic Circle, has a subarctic climate with a large temperature range fluctuating from -50 to 87°F. The area has a short summer and a freeze free period of about 3 months. The surrounding bodies of water—Norton Sound and the Yukon River—are generally ice-free from mid-June through October. Annual precipitation is approximately 16 inches, with 60 inches of annual snowfall (LHMP, 2013).

Infrastructure –Kotlik has an elementary and high school, a power plant, a health clinic, and other basic infrastructure. The City of Kotlik operates a drinking water treatment plant, which had 13 monitoring and reporting violations in 2018 (ADEC, 2019a). The City also operates a landfill that is subject to flooding and erosion. Although there is a water treatment plant and a sewage lagoon, there are 29 homes in Kotlik that are not served by water and sewer. A more complete discussion of the landfill and sewage lagoon, and their vulnerability to environmental hazards, is provided later in this report. Appendix A, Table 1-1, lists all of the critical infrastructure and residential facilities in Kotlik.

Transportation – Kotlik is accessible by air and boat. Pedestrians and small vehicles use boardwalks (NOAA, 2013).

Governance –Three tribal councils govern the community of Kotlik: the Kotlik Tribal Council, Bill Moore’s Slough Elders Council, and Hamilton Tribal Council. The three tribal governments formalized an Inter-tribal Court upon adoption of the Kotlik Tribal Court ordinances in 2003. The Kotlik Tribal Council is governed by a five-member council and is the most active of the three tribal governments (NOAA, 2013). The City of Kotlik was incorporated as a second-class city in 1970. The Kotlik Yupik Corporation was incorporated in 1972 and the Qerrulligmiut Foundation, the community nonprofit entity, formed in 2000 (City of Kotlik, 2010).

Contact information:

Village of Kotlik
PO Box 20210, Kotlik, AK 99620
Pauline Okitkun, Tribal Admin:
907-899-4836
kotliktc4836@yahoo.com

Benjamin Kamkoff,
Kotlik Tribal Vice-President

Lorrena Prince,
Kotlik Tribal Transportation Planner:
907-899-4327
kotliktp4327@yahoo.com

Victor Tonuchuk, Jr., Kotlik Tribal IGAP
Coordinator: 907-899-4650
kotlik_epa@yahoo.com

**Native Village of Bill Moore's Slough
(BMS)**

PO Box 20288, Kotlik, Alaska 99620
Rose Cheemuk
BMS Tribal Admin: 907-899-4232
bms99620@gmail.com

Karen Okitkun
BMS Tribal Vice-President

Harold Okitkun
BMS IGAP Director: 907-899-4206
harold_okitkun@yahoo.com

Native Village of Hamilton

PO Box 20248, Kotlik, AK 99620
Della Hunt
Hamilton Tribal Admin: 907-899-2160
dhunt@avcp.org

Richard Kamkoff, Hamilton Vice-President
hamilton_tribalcouncil@yahoo.com

City of Kotlik

PO Box 20268
Kotlik, AK 99620-0268

Thomas Sinka,
Mayor: 907-899-4313

Cyril Okitkun
City Manager: 907-899-4313
cityofkotlik@yahoo.com

Kotlik Yupik Corporation

PO Box 20207, Kotlik, AK 99620
Benjamin Kamkoff,
Kotlik Yupik Corporation
General Manager: 907-899-4014
kycyupik@yahoo.com

Lorrena Prince
Kotlik Yupik Corporation Land Planner:
907-899-4014
lprince82@hotmail.com

Paul Mike
Kotlik Yupik Corporation
President: 907-899-4014
kycyupik@yahoo.com

IV. Environmental Hazards

The Village of Kotlik is imminently threatened by severe flooding and erosion (GAO, 2009). At least seven reports have been written since 1983 documenting the erosion in the community:

- 2003 Kotlik Bank Protection Feasibility Study by Rodney P. Kinney Associates, Inc.;
- 1983 Erosion Control Task Force Report by the Alaska Department of Transportation & Public Facilities;
- 2008 Erosion Information Paper by the U.S. Army Corps of Engineers (USACE);
- 2011 Floodplain Manager's Report by the U.S. Army Corps of Engineers Floodplain Management Services Section;
- 2009 Baseline Erosion Assessment (BEA) by the U.S. Army Corps of Engineers;
- 2013 Kotlik Local Hazard Mitigation Plan (LHMP), written by the Department of Military and Veterans' Affairs, Division of Homeland Security & Emergency Management and adopted by the Kotlik City Council; and
- 2018 *Options for Near-Term Infrastructure Protection in Kotlik, Alaska*, by the Alaska Native Tribal Health Consortium (ANTHC).

The 2018 ANTHC report provides the following recommendations to address priorities identified by the community: 1) relocate 47 homes to the Old Airport site; 2) build an erosion mitigation structure to protect the landfill; and 3) identify a long-term relocation site.

Flooding and Storm Events: Kotlik primarily experiences ice jam and snow melt flooding in early summer. Rainfall flooding occurs in late summer and early fall. Most annual precipitation occurs between April and October, with August being the wettest month (LHMP, 2013, p. 5-14). All of Kotlik’s infrastructure is vulnerable to flooding because it is located along the Kotlik River, Little Kotlik River, Apoon Pass, and Yukon River (LHMP, 2013, p. 6-2). The 2013 City of Kotlik Local Hazard Mitigation Plan (LHMP) characterizes flooding impacts to the community of Kotlik as “critical”, meaning that flooding events could cause injuries resulting in permanent disability, complete shutdown of critical facilities for at least 2 weeks, and severe damage to more than 25% of property (LHMP, 2013). A flood event is “highly likely” to effect Kotlik, which means that a flooding event will likely happen within one year (LHMP, 2013).

Kotlik also experiences severe weather events such as heavy rain, heavy snow, drifting snow, winter storms, freezing rain and ice storms, extreme cold, high winds, hail, thunderstorms, and lightning (LHMP, 2013).

Flooding and severe weather events cause significant damage to infrastructure in Kotlik. Damage from two presidentially-declared disasters, one in November 2011 and another in November 2013, resulted in a total of over ten million dollars in damages in Kotlik (A.Y. Gravier, personal communication, Oct. 31, 2014). The flooding in 2011 damaged the pedestrian boardwalk, city hall building, teen center foundation, and city shop, totaling \$224,420 in damages (A.Y. Gravier, personal communication, October 31, 2014). The 2013 disaster damaged Kotlik’s barge loading dock, utilidor, water and sewer system, dump burners, tents and fences, and a honey pot basin, totaling \$9,818,459.44 in damages (A.Y. Gravier, personal communication, Oct. 31, 2014).

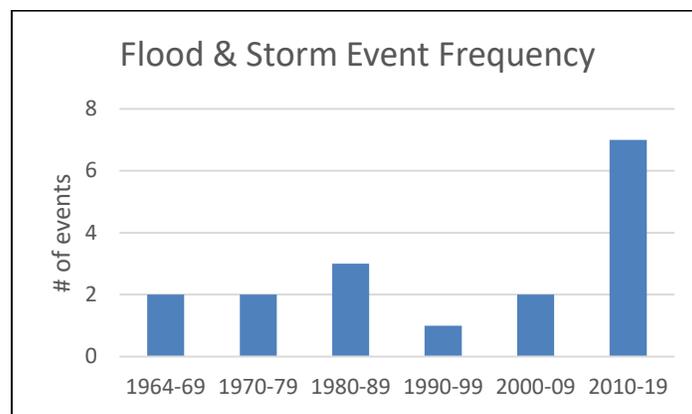


Figure 2: Recorded number of flooding and storm events between 1964 and March of 2019 (LHMP, 2013 p. 5-14 to 5-17; FEMA, 2013a; FEMA, 2013b; Mike, P., 1982; Tonuchuk, V., 1987; AIJ 2017a; AIJ 2017b; AIJ, 2017c; AIJ 2019). The graph includes storm, flooding, and severe cold events that were federally-declared disasters; records of historical flooding events reported by community members and agencies; and storm and flooding events documented by AIJ and community members through community monitoring reports. Other flooding and storm events have occurred since 1964, but the majority have not been documented.

In addition to the monetary cost of the damage, flooding and storm events affect the health and safety of Kotlik residents. The community experienced its most severe flood in 1974, when a record rainfall flooded the community to a depth of four feet (LHMP, 2013, p. 5-14). In 1975, flooding destroyed fish camps, which affected access to nutritional foods (USACE, 1982). In October 1989, almost 60 residents had to evacuate their homes because of flooding (LHMP, 2013). In 1992, over 100 people were evacuated and 23 homes damaged as a result of another flooding event. (LHMP, 2013). The damages from the 2013 disaster included significant damage to critical infrastructure, such as the utilidor and waste and sewer system, which affected health and sanitation services for the community. In February 2019, at least six local homes were affected by flooding, with damage to foundations and home insulation (AIJ, February 2019).

Flood Monitoring: The Alaska Institute for Justice (AIJ) and Kotlik residents began documenting storm impacts in Kotlik in 2017 and recorded three flooding events between October 2017 and January 2018 and one moderate-major flood event in February 2019.

As a part of this documentation, in June 2017, AIJ and Kotlik community members collaborated with DGGs to install a tide staff on a telephone pole in a low-lying area that is frequently subject to flooding. The community uses the tide staff to monitor water levels and AIJ assists with documenting the information.



Figure 3: Emmett Matthias installing tide staff (Pollock 2017).

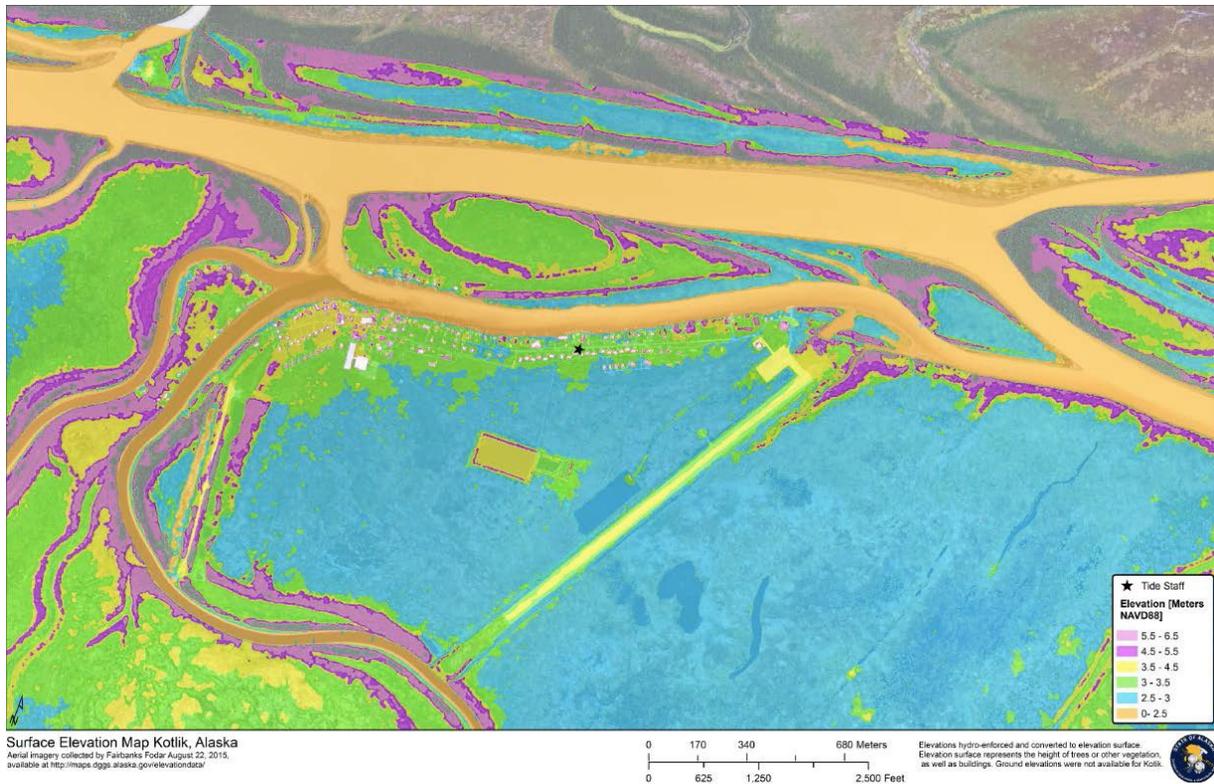


Figure 4: Preliminary map of digital surface elevation model of the Kotlik area, created by the Alaska Division of Geological & Geophysical Surveys (DGGS), Jacquelyn Overbeck, Jacquelyn.overbeck@alaska.gov in 2017. Elevation data are available at elevation.alaska.gov, are shown relative to the North American Vertical Datum of 1988 (NAVD88), and represent the tops of vegetation and buildings. In the Kotlik area, many vegetation types, including willows can be as much as a few meters in height above the ground surface.

Erosion: Flooding, ice jams, spring break up, wind, boat wakes, foot traffic, and the annual freeze-thaw cycle cause bank erosion along the Kotlik River waterfront (USACE, 2008; LHMP, 2013). The majority of the community’s infrastructure is located on the south bank of the Kotlik River. Homes are also located on the north bank of the river on East Island and on a peninsula called West Island, which is between the Kotlik and Little Kotlik rivers. All development near the riverbank is threatened by erosion (LHMP, 2013).

The banks of the Kotlik River have been actively eroding since at least the 1980s. (LHMP, 2013). The 2009 U.S. Army Corps Baseline Erosion Assessment (BEA) evaluated erosion impacts in the community and categorized Kotlik as a “Priority Action” because erosion threatens the viability of the community (USACE, 2009). The 2013 LHMP found that erosion is “highly likely” to occur and presents a “critical” risk to the City of Kotlik, which means that erosion could cause injury, permanent disability, complete shutdown of critical facilities for at least 2 weeks, and more than 25% of property could be severely damaged (LHMP, 2013, p. 5-5, 5-12). Erosion also adversely affects river navigation and aquatic habitat, increases maintenance costs, and damages public utilities (LHMP, 2013).

The 2009 BEA estimated an erosion rate of about three feet per year in Kotlik, noting that “[a]n

estimated 60 percent of village structures are at risk. Protection measures have failed and erosion continues to worsen.” (BEA, 2009, p. 4-6). The 2013 LHMP projected, based on BEA erosion estimates, that within 50 years, any infrastructure within 300 feet of the riverbank would be threatened by erosion (LHMP, 2013).

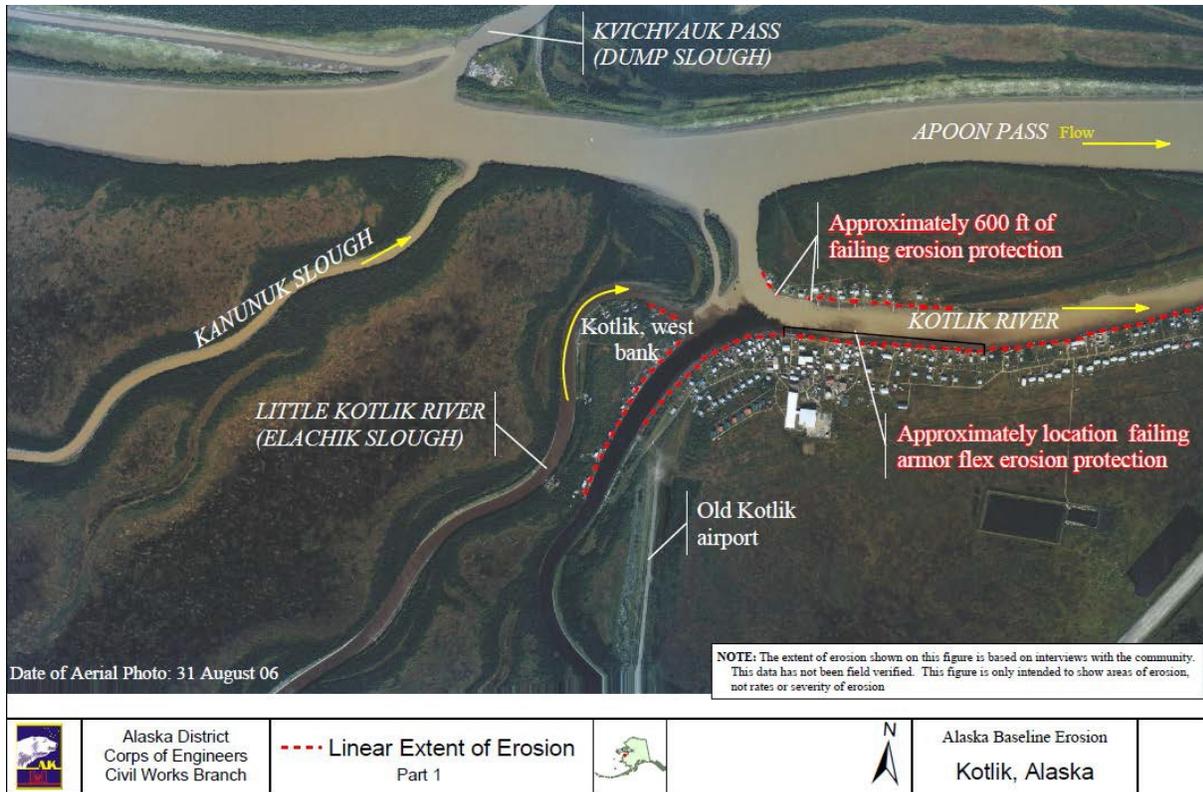


Figure 5: Linear Extent of Erosion in Kotlik (USACE, 2008, p. 4).

Erosion Impacts: The majority of the infrastructure in Kotlik, including homes, boardwalks, sheds, food storage areas, drying racks, smokehouses, the AC retail store, utility poles, and public buildings are threatened by erosion. The homes of 60 percent of the community’s population are directly at risk from erosion and nearly 20 percent of the community’s critical facilities are at risk (LHMP, 2013, p. 5-11, 6-12). Approximately 120 structures (47 homes, seven commercial buildings, seven community buildings, and 59 outlying buildings) are at risk today (ANTHC, 2018). In its 2018 report, ANTHC identified 21 homes as high risk homes because they are located within 10 feet of the shoreline and, of those 21 homes, identified four as imminently threatened by erosion (ANTHC, 2018, p. 3-4).

To address these threats, the community has relocated the riverside boardwalk inland at least three times since the early 2000’s (BEA, 2009, p. 4-6). In addition, the community has relocated two buildings that the 2008 and 2009 USACE reports identified as at risk because of their proximity to the riverbank: A church was relocated to a site approximately 80 feet from the riverbank, and a retail store was demolished and a new one built approximately 80 feet from the riverbank and south of the original location (Emmett Matthias, personal communication, Jan. 9, 2019).



Figures 6-8: Three elders' homes immediately threatened by erosion that need to be relocated (Tanya Hunt, AIJ Personal Communications, August 2018).



Erosion monitoring: In June 2017, in collaboration with DGGs, AIJ and Kotlik community members, installed erosion monitoring stakes in three locations and a time-lapse camera in one location near the Kotlik shoreline (Figure 9) to provide documentation of erosion. Local staff take measurements of the distance between the eroding riverbank and stakes at regular intervals.



Figure 9: Time-lapse camera of Kotlik shoreline, provided by the Native Village of Bill Moore’s Slough and DGGs.



Figure 10: Preliminary riverbank shoreline change map of Kotlik showing the net shoreline (riverbank) movement from 1951 to either 2015 or 2017 (where data is available). Hot colors show areas of erosion and blue shows accretion. Created by DGGs, Jacquelyn Overbeck, Jacquelyn.overbecak@alaska.gov in 2017.

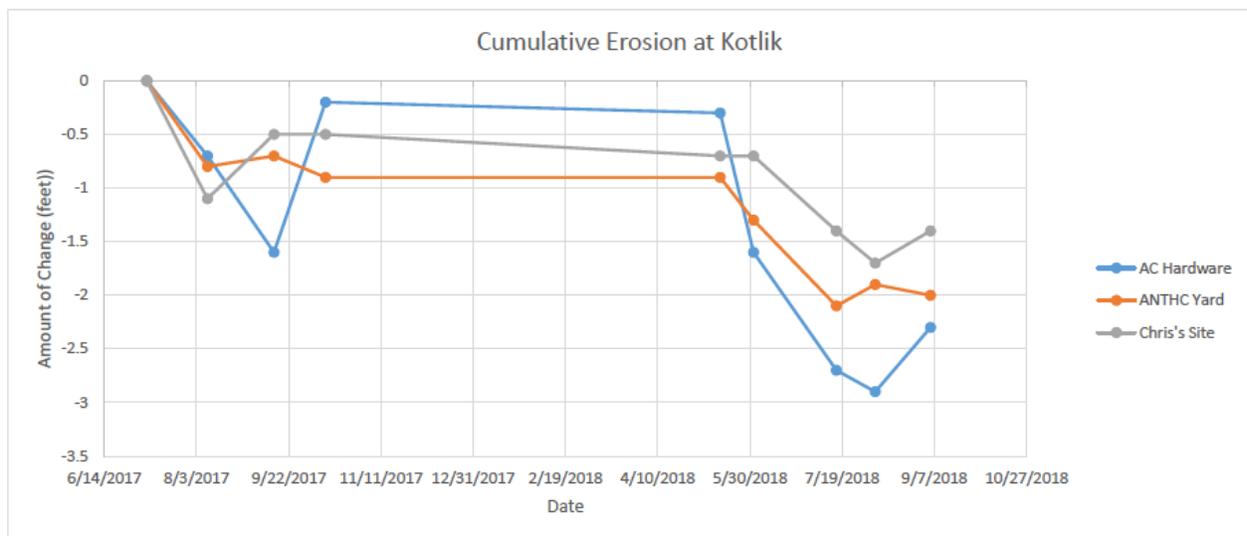


Figure 11: Cumulative erosion measurements in Kotlik at the AC Hardware Store, ANTHC storage yard, and a privately owned site between June 2017 and September 2018, showing 1.5 – 2.3 feet of erosion, provided by DGGS in 2018.

Ground Failure: Kotlik is a participant of the Active Layer Network (ALN), which is a partnership among the United States Geological Survey (USGS), the Yukon River Inter-Tribal Watershed Council (YRITWC) and the Yukon River Basin communities. This project helps the community of Kotlik monitor the changes between the active layer and near surface permafrost over the course of decades. The active layer is “the layer of soil above the permafrost that freezes and thaws with the seasons” (USGS, 2015, p. 2). In Kotlik, 50 meter by 50 meter grids and 1.1 meter steel metal rods were installed in areas of continuous permafrost to measure the soil temperature, soil moisture, and air temperature. Between 2009 and 2014, the average depth of the active layer ranged from a minimum of 47.3cm in 2010 to a maximum of 56.4cm in 2012 (USGS, 2015). The increasing average depth of the active layer increases and changes in temperature of the permafrost lead to destabilization of infrastructure and exacerbate erosion significantly in Kotlik (ANTHC, 2018, p. 3).

Environmental Contamination and community health: Erosion threatens the Kotlik Landfill, which puts the community’s drinking water and subsistence resources at risk. In addition, there are several contaminated sites in the community that have not been cleaned up, and many homes in the community lack basic water and sewer services. Each of these issues present risks to community health and subsistence resources.

Kotlik landfill: The Kotlik landfill was inspected for the Waste Erosion Assessment and Review (WEAR) project in 2015. According to the WEAR report, the landfill is located at a site about 3,200 feet upriver and across the river from the village, within the drinking water protection zone for the community. It is operated by the City of Kotlik, but is a self-haul site accessible only by boat in the summer and snow machine in the winter. Community members deliver their own solid waste to the dump site when the site is accessible. There are periods of inaccessibility during spring break-up and fall freeze-up. The landfill is approximately 4.5 acres (medium sized) and surrounded by water on all four sides. The landfill floods regularly and is actively eroding on the western edge. Runoff and waste that washes into the river from the landfill affect the

community’s drinking water supply as well as the fish and bird populations the community depends on for subsistence (ANTHC, 2018, p.12). Local landfill and Indian General Assistance Program workers push waste away from the area of erosion as a temporary measure to protect the drinking water supply (ADEC, 2015; IHS, 2017b).

Contaminated sites: The Alaska Department of Environmental Conservation maintains a list of contaminated sites in the state. The list includes seven sites in Kotlik. Clean up has only been completed for one of the sites (ADEC, 2019b). Table 1, below, describes the six contaminated sites in Kotlik with ongoing remediation activities (ADEC, 2019b). Some of the sites are subject to flooding and at least one of the sites, the Alaska Commercial Co. Former AC Value Center site, is located in an area subject to erosion. Flooding and erosion of contaminated sites can lead to further contamination of the river and threaten subsistence resources and community health.

Table 1: Contaminated sites in Kotlik. The information below was compiled from the ADEC Spill Prevention and Response Contaminated Sites database.

Contaminated Site	Information	Remediation Complete?
Kotlik Electric Former Tank Farm	Locally known as the Old Power Plant Tank Farm. In April 1993, approximately 7,000 gallons of diesel fuel spilled when a snow machine ran over a valve and broke the valve. Residents retrieved 6,000 gallons of the diesel and used it as fuel for their furnaces. The area still had a petroleum odor, but because there was also a fecal odor and fecal material in the tundra root system, it was determined that the health risks of additional petroleum removal were too great. A Village Safe Water project engineer said that the fecal odor and material came from yearly flooding at the landfill and sewage lagoon and poor handling of honey buckets. In 2012, ADEC did a site visit and noted that no petroleum odors or sheen were observed, but contamination was evident in an area adjacent to the site where there was dead vegetation, petroleum odor, and sheen. The source was a 2012 diesel spill at the AVEC power plant and a spill at the former Health Clinic building. As of September 2018, ADEC was working with the manager of the power plant to get a work plan for further cleanup efforts.	No
AKARNG Kotlik FSA	Near the Kotlik Post Office. The site was added to ADEC’s contaminated site list for petroleum contamination in 1997. The site is subject to flooding. As of Dec. 2016, all contaminated soil was cleaned up. Surface water meets Division of Water Regulation requirements, but groundwater is still contaminated. A five-year monitoring study is in progress.	No

Lower Yukon School District Former Tank Farm	In 1997, the Lower Yukon School District maintained six 8,000 gallon Above Ground Storage Tanks (ASTs) on one site and that a strong smell of diesel was present. The site is 0.25 miles from the river and public water supply. Sometime between 2001 and 2006, the fuel tanks, and possibly some of the contaminated soil, had been removed. There was still a liner present on the site in 2007. Releases from the tank farm may have contaminated an adjacent site. In 2017, ADEC sent a letter to the school district with a list and priority ranking of schools considered contaminated sites that the school district needs to clean up.	No
Kotlik Yup'ik Corporation Former Bulk Fuel Tank Farm	In 2001, soil at this site was found to be contaminated. Tanks were removed later that year and a leaking fuel pipe was noted. Soil samples were collected and contained gasoline and diesel range organics. After a site visit in 2012, ADEC noted that there were no obvious signs of the former tank farm other than a tripod and surveyors' tape. Potentially responsible party letters have been sent to the Kotlik Yupik Corporation and the City of Kotlik.	No
ADOT&PF Snow Removal Equipment Building	At the current Kotlik airport, diesel was detected and above ADEC maximum allowable cleanup levels. On Aug. 28, 2018, ADEC approved a 0.5 cubic yard clean-up to be moved to Cadman Soil Remediation in Everett, Washington. As of April 2019, ADEC was working with ADOT and a contractor to develop a work plan to clean up the site, but had not yet approved a plan.	No
Alaska Commercial Co. Former AC Value Center—Kotlik	In January 2013, approximately 5-30 gallons of diesel fuel spilled from the above ground heating oil tank at the site when the tank was dragged to the adjacent property. An area of dead vegetation, odor, and sheen was observed the following summer. Initially, the area was surrounded with absorbent booms and an orange snow fence barrier. The area of the spill is about 60 feet from the Kotlik River and is subject to erosion. Soil samples taken in 2017 showed diesel range organics in excess of ADEC maximum allowable cleanup levels. The highest concentrations are within 40 – 50 feet of a previous 2,000 gallon diesel spill from 1994. In April 2019, ADEC sent a letter to the Alaska Commercial Company requesting a work plan by June 1, 2019.	No

Sewer and wastewater: Twenty-nine homes in Kotlik are without water or sewer services. Residents of these homes use honey buckets for wastewater collection (IHSa, 2017). The honey buckets are poured into waste containers and hauled across the river to the sewage lagoon in the winter. The containers cannot be transported across the river by boat, so residents store waste containers during the summer months and haul them to the sewage lagoon by snow machine and sled after the river freezes in the winter. Residents do not dispose of waste in the river. (Emmett Matthias, personal communication, Jan. 9, 2019). A proposal to provide water and sewer service to these homes is included in the Indian Health Service's Sanitation Deficiencies

System list for Alaska as priority 262 (of 341 in 2017) for an estimated cost of \$4,720,628.00 (IHSa, 2017, IHSb, 2017).

V. Organizations Involved

- **Alaska Institute for Justice (AIJ):** Non-profit organization dedicated to protecting the human rights of Alaskans, which has been involved in community-based erosion and flood monitoring since 2017, and hosts bi-monthly community teleconferences and an annual community-based adaptation workshop. AIJ works with all local governing bodies in Kotlik to facilitate a decision-making process about long-term climate adaptation.
- **Alaska Native Tribal Health Consortium (ANTHC):** Non-profit Tribal health organization offering technical and financial assistance for movement of infrastructure.
- **Alaska Division of Geological & Geophysical Surveys (DGGS):** state government agency doing erosion monitoring and studies.
- **Yukon River Inter-tribal Watershed Council (YRITWC):** An Indigenous grassroots non-profit organization dedicated to cleaning-up and preserving the Yukon River Watershed. The agency offers technical assistance for water quality monitoring and development, research and education and training to promote health of the watershed and its Indigenous people.

VI. Community Responses to Hazards

Erosion and flooding response: Kotlik residents have advocated for erosion protection measures since erosion began significantly affecting the community in the 1980s. In 1983-84, Kotlik received an Alaska State legislative grant to install armorflex concrete matting to protect the community from erosion. Since its installation in 1986, the matting has become less effective. The City has cut brush and trees, gathered logs, filled sand bags with silt, and restacked concrete blocks in a continuing attempt to protect the community (USACE, 2008; Kinney, 2003). Community members have also placed 55-gallon drums, abandoned snow machines, outboard motors, and scrap metal pieces on the banks (USACE, 2008). Despite these strong community efforts over the last few decades, erosion continues to threaten community safety.

The 2003 Kotlik Bank Protection Feasibility Study recommended that the community reduce the causes of erosion and protect against the erosion. The study recommended riprap for bank stabilization because it is more cost effective than an articulated concrete block mat (Kinney, 2003). The feasibility study also recommended improving surface drainage, reducing bank foot traffic, and enforcing no wake boat zones along the shoreline (Kinney, 2003). Kotlik has been unable to obtain sufficient funding to install riprap facing. The 2009 BEA study states that the Department of Commerce, Community and Economic Development (DCCED) funded three completed erosion control projects under capital matching grants totaling \$83,000 (USACE, 2009, p. 2-2). Due to severe flooding, the Yukon River Towing company raised several homes to reduce the impacts of flooding in residential homes in the early 2000s.

Although the 2003 report recommended reducing foot traffic on the river banks, in a 2016 trip report to Kotlik, the Natural Resources Conservation Service indicated that reducing foot traffic

did not appear to be feasible:

If not for the proximity to the homes, and the regularity with which residents access the river during both the summer and the winter, it might be possible to reduce the erosion rates through re-vegetation of the river banks. But it seems unlikely that significantly restricting access to the river along the entire length of the village is a viable option. Virtually every home has a path to the river bank, with snow machine tracks leading to the ice, or a place to pull a boat out or tie a boat up. It is essentially a heavy use area. But it should be noted that the erosion rates are low enough that vegetation could make a considerable difference at this location (NRCS, 2016, p. 2).

Emergency planning response: In the past decade, Kotlik has taken multiple actions to prepare for and document the increasingly severe flooding and storm events that affect the community. In spring 2014, the Kotlik Tribal Council Indian General Assistance Program (IGAP) developed a Small Community Emergency Response Plan (SCERP) toolkit to help respond to flooding emergencies.

Local Hazard Mitigation Plan: The City of Kotlik's 2013 Local Hazard Mitigation plan expired December 4, 2018. The City of Kotlik and the Village of Kotlik are working to jointly complete an updated, multi-jurisdictional LHMP with the assistance of the Alaska Division of Homeland Security and Emergency Management. The updated plan is likely to be completed by the fall of 2019 (ANTHC, AIJ personal communication, January 2019).

Home relocation: In October 2018, the Alaska Native Tribal Health Consortium (ANTHC) completed a report entitled *Options for Near-Term Infrastructure Protection*. The report addresses the community of Kotlik's four highest priorities relating to environmental threats: 1) relocation of threatened homes, 2) erosion mitigation infrastructure, 3) identification of a long-term relocation site, and 4) protecting the landfill from erosion. After analyzing options, the report recommends relocating threatened homes to the old airport site and constructing an erosion mitigation structure to protect the landfill.

According to the ANTHC report,

120 structures (47 homes, seven commercial buildings, seven community buildings, and 59 outlying buildings) . . . are expected to be catastrophically impacted by harmful environmental trends in the near future.

Of the 120 structures at risk, 21 homes are considered to be at a high level of risk—they lie ten feet or less from the shoreline. Four of those homes lie four feet or less from the shoreline and are considered to be imminently threatened. The imminently threatened homes are in danger of catastrophic foundation failure due to the bank erosion within zero to two years. One home is in immediate jeopardy, as the bank has already eroded approximately three feet back from the northwest corner of the foundation. This corner of the home is cantilevered over the river, and there is a high likelihood the home's foundation could become compromised

to the point of failure during the next significant storm event. (ANTHC, 2018, p. 3-4).

Homes expected to be catastrophically damaged in 0-2 years are prioritized as Group A for relocation purposes, 17 homes that are likely to be catastrophically damaged in 2-5 years are assessed as Group B, and an additional 26 homes at risk to catastrophic damage within five to ten years are classified as Group C (ANTHC, 2018, p.4).

Due to the high cost of building a mitigation structure to protect homes, the report recommends managed retreat as the most cost-effective option for Kotlik's priorities one and two (relocating homes and erosion mitigation infrastructure). Relocating threatened homes would provide long-term protection for the community. By contrast, if no home relocations occur, loss of life and property may impact many Kotlik residents. Once homes, sheds, and other property end up in the river, fuel, hazardous material, and human waste could be released into the river. This could contaminate drinking water as well as habitat for fish and birds. Costs from environmental cleanup, medical costs related to injuries or deaths, and costs of residents' relocation could result in much higher costs than avoiding the relocation of homes at all (ANTHC, 2018, p.4).

The report finds that installing erosion mitigation infrastructure is not a cost-effective alternative. Construction of a seawall in Kotlik could cost \$59,042,614 (ANTHC, 2018, p.10) and would take 3-5 years. Construction of sheet-pile and vertically drilled thermosyphon bank stabilization would cost \$20,353,000 and would take 18 months (ANTHC, 2018, p.11). The report finds that both of these construction options would be cost prohibitive compared to phased home relocation and would only temporarily address accelerated erosion impacts.

With respect to the third priority—identification of a long-term relocation site for the entire community, the report acknowledges that identification of a long-term site is necessary, but states that identifying a site is beyond the scope of the report (ANTHC, 2018, p. 12).

Relocation Site for threatened homes: The old airport south of the community is an ideal site for relocating threatened homes because it is at a higher elevation than the surrounding area. The Kotlik Yupik Corporation owns the old airport site, which is subdivided into 21 plots with additional room for expansion. The Corporation is in the process of conveying the land to the Tribe (AIJ personal communication, February 2019). According to the ANTHC report, the steps involved in the relocation of homes include:

1. Construction of a boardwalk from the west end of town to the north end of the old airport runway with a distance of 1,500 feet. **Construction will last 4 months and the cost is \$672,750** (ANTHC, 2018 p.5).
2. Power must be distributed from the power plant to the old airport site then extended to the homes in the area. Design and construction work would likely be contracted to the Alaska Village Electric Cooperative (AVEC). The north end of the old runway is approximately 1,200 feet from the closest (west) end of town and nearly 1,800 feet from the power plant. This power distribution system must provide power to 47 homes:

Construction will last 3 months. Main power extension costs \$120,000 and connection to each home costs \$15,000.

Phase 1: Group A – 4 Homes: \$180,000

Phase 2: Group B – 17 Homes: \$255,000

Phase 3: Group C – 26 Homes: \$390,000 (ANTHC, 2018, p.5-6)

3. The old runway site requires a geotechnical analysis and final grading to ensure that the area is stable for a new subdivision. The area must be cleared, grubbed, re-graded, and sloped for site drainage. A civil site design should be completed for final preparation (ANTHC, 2018, p.6). Cost for Civil Design, Geotechnical Engineering Analysis, and Site Preparation: \$614,100

4. Homes would be relocated to the new subdivision in phases based on risk.

Phase 1: prepare the 4 imminently threatened homes in Group A.

Duration 12 Months.

- Structurally analyze each home, disconnect from utilities, brace the homes, and move the homes to a new site. **Cost for Structural Analysis: \$100,000.**
- **Cost for Home Relocation: \$855,750.**
- Once moved to the new site, the homes would be set on post-and-pad foundations and the utilities reconnected. Due to the cost of piped water and sewer infrastructure, each home would be initially set up with ANTHC's Portable Alternative Sanitation System for sanitation service. Under contract, AVEC would provide power for each home.
- **Cost for PASS Installation: \$100,000.**

Phase 2: Group B – 17 High-Risk Homes; Duration: 23 Months
Cost: \$1,875,500 (Relocation) and \$850,000 (PASS Installation)

Phase 3: Group C – 26 At-Risk Homes; Duration: 36 Months

Cost: \$2,909,000 (Relocation) and \$1,300,000 (PASS Installation) (ANTHC, 2018, p. 6-7).

Under this phased relocation of homes, piped water and sewer is likely to cost over \$2 million, which the report considers cost prohibitive. Some residents who would move to this area are currently on pipes and some currently haul water and use honey buckets. The report states that once population density supports a piped system, it can be pursued (ANTHC, 2018, p. 6-7).

As of April 2019, the Denali Commission was in the process of finalizing a \$197,000 award to help Kotlik move forward with its efforts to relocate homes (Don Antrobus, Village Infrastructure Protection Program Manager, Denali Commission, personal communication, April 24, 2019). The award is expected to fund the completion of a civil site design for a boardwalk to access the old airport site (step 1 listed above), a civil site design for a subdivision at the old airport site (step 3 listed above), and the design of a skid system and home relocation methodology that can be used locally for moving threatened structures (Don Antrobus, Village

Infrastructure Protection Program Manager, Denali Commission, personal communication, April 24, 2019).

Landfill Erosion Mitigation Structure: The ANTHC report also analyzed options for mitigating erosion at the Kotlik landfill. If nothing is done to mitigate erosion of the landfill, the release of debris into surface water will continue to contaminate soil. This would impact drinking water intake, fish, and other marine life. “The landfill currently sits on Kotlik Native Corporation land and is operated by the City of Kotlik. Site control belongs solely to the corporation. Expenditure of public funds for seawall construction on land owned by a for-profit corporation could create complications.” (ANTHC, 2018, p.12). The cost for the sheet-pile and thermosiphon bank stabilization option recommended in the ANTHC report is estimated at \$1,605,400 and would take about twelve months for design and four months for construction (ANTHC, 2018, p. 14-15).

VII. Community Relocation Responses

In August 2018, the Kotlik Indian General Assistance Program distributed a survey to 35 community members with six questions addressing the severity of erosion in the community of Kotlik and potential relocation sites. The survey results showed that 82% of the participants were willing to move to higher grounds and 61% of the participants were willing to move without utilities. Below are two figures representing the information in the survey.



Figure 13. Kotlik relocation sites map. The four red dots on the map indicate relocation sites identified by the community (Map produced by AIJ in collaboration with Victor Tonuchuk and Emmett Matthias (2019), base map generated using Alaska Department of Natural Resources Alaska Mapper, <http://dnr.alaska.gov/mapper/>).

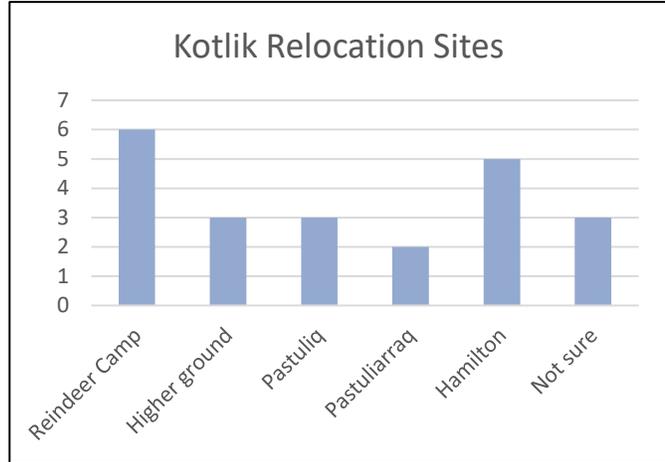
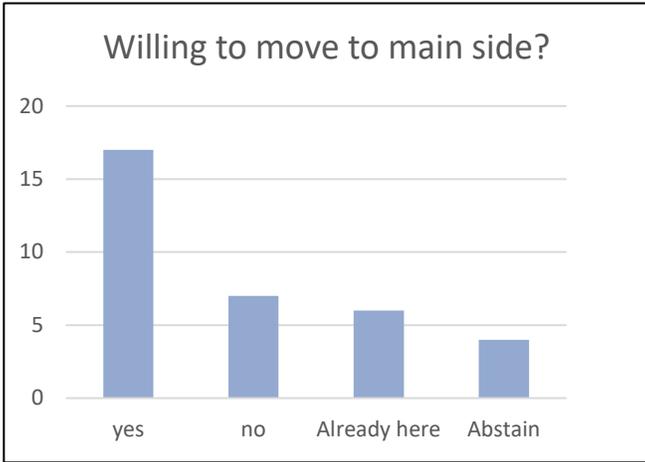


Figure 12. Relocation sites suggested by the community. Reindeer camp, located northeast of Kotlik near Coffee Point, received 6/22 votes (27%). Hamilton, which is located upriver from Kotlik, received 5/22 votes (22%). Pastuliq, which is east of Kotlik, and higher ground, each received 3/22 votes (14%). Pastuliarraq, which is also east of Kotlik, received 2/22 votes (9%). Finally, 3/22 participants were unsure of a relocation site (14%).

References

- Alaska Department of Commerce, Community, and Economic Development (2019). *2017 DCCED Certified Population*. Alaska Community Database Online. Retrieved May 1, 2019, from <https://dcra-cdo-dcced.opendata.arcgis.com/>.
- Alaska Department of Environmental Conservation, Division of Water. (2019a). Best Practices Score: Kotlik. Retrieved May 1, 2019 from <https://dec.alaska.gov/water/technical-assistance-and-financing/best-practices/#tab-5>
- Alaska Department of Environmental Conservation (2019b). Spill Prevention and Response. Contaminated Sites Database. Retrieved April 30, 2019 from <https://dec.alaska.gov/Applications/SPAR/PublicMVC/CSP/Search/>.
- Alaska Department of Environmental Conservation (2015). *Detailed Action Plan: Kotlik Landfill Waste Erosion Assessment & Review (WEAR)*.
- Alaska Department of Transportation & Public Facilities (1983). *Memorandum for Record, NPAEN-PL-FP: Erosion Control Task Force – Trip Report for Kotlik, Emmonak, Sheldons Point, and Bethel*.
- Alaska Institute for Justice (2017c). *December 2017 Storm and Weather Narratives*. (Copy on file with author).
- Alaska Institute for Justice (2017a). *Early October 2017 Coastal Communities Storm Summary*. (Copy on file with author).
- Alaska Institute for Justice (2019). *February 2019 Storm & Weather Narratives*. (Copy on file with author).
- Alaska Institute for Justice (2017b). *November 2017 Storm and Weather Narratives*. (Copy on file with author).
- Alaska Native Tribal Health Consortium. (2015). *Alaska Rural Utility Collaborative Report on Activities*.
- Alaska Native Tribal Health Consortium (2015b). *Comprehensive Energy Audit for Kotlik Water Treatment Plant*.
- Alaska Native Tribal Health Consortium (2018). *Options for Near-Term Infrastructure Protection Kotlik, Alaska*.
- City of Kotlik (2010). *Kotlik community development plan*. Retrieved from Division of Community and Regional Affairs Community Plans Library, <https://www.commerce.alaska.gov/dcra/dcrepoext/Pages/CommunityPlansLibrary.aspx>.
- Department of Military and Veterans' Affairs, Division of Homeland Security & Emergency

- Management (2013). *City of Kotlik, Local Hazard Mitigation Plan*.
- Department of Military and Veterans' Affairs, Division of Homeland Security & Emergency Management (2015). *State of Alaska Hazard Mitigation Plan: Disaster Cost Index*.
- Federal Emergency Management Agency (FEMA) (2013a). *Alaska Flooding (DR-4122)*. Retrieved May 2, 2019 from <https://www.fema.gov/disaster/4122>.
- Federal Emergency Management Agency (FEMA) (2013b). *Alaska Severe Storms, Straight-line Winds, and Flooding (DR-4162)*. Retrieved May 2, 2019 from <https://www.fema.gov/disaster/4162>.
- Government Accountability Office (2003). *Alaska Native Villages, Most Are Affected by Flooding and Erosion, but Few Qualify for Federal Assistance*.
- Government Accountability Office (2009). *Alaska Native Villages, Limited Progress Has Been Made on Relocating Villages Threatened by Flooding and Erosion*.
- Indian Health Service (2017a). Sanitation Tracking and Reporting System (STARS): Proposed Sanitation Projects for Kotlik, Water & Sewer to Inland Sections. Retrieved Sept. 26, 2018 from <https://wstars.ihs.gov/>.
- Indian Health Service (2017b). Public SDS One-Line Report-Fiscal Year 2018. Retrieved Sept. 26, 2018 from <https://wstars.ihs.gov/>.
- Mike, Joseph (1982). [Description of November 1975 Kotlik flood for Alaska District Engineer, Corps of Engineers, Flood Plain Management Services]. (Copy on file with author).
- National Oceanic Atmospheric Administration (2013). *Community profiles for north pacific fisheries – Alaska: Kotlik*. Retrieved January 20, 2015, from <https://www.afsc.noaa.gov/REFM/Socioeconomics/Projects/communities/profiles.php>.
- Natural Resources Conservation Service (2017). *ENG-TRIP Report: Kotlik Village Visit*.
- Rodney P. Kinney Associates, Inc. (2003). *Kotlik bank protection feasibility study*.
- State of Alaska (2017) *Community, Target Area, and Project Selection Process for the Nation Disaster Resilience Competition*. Retrieved August 29, 2018, from <https://ready.alaska.gov/Plans/Documents/PhaseII/Community%20Target%20Area%20and%20Project%20Selection%20Process%20NDRC.pdf>
- State of Alaska, Department of Environmental Conservation (2015). *Detailed Action Plan Kotlik Landfill, Waste Erosion Assessment & Review (WEAR)*.
- Tonuchuk, Victor, Sr. (1987). [Description of 1964 and 1965 Kotlik floods for Alaska District Engineer, Corps of Engineers, Flood Plain Management Services]. (Copy on file with author).

- United States Army Corps of Engineers (2008). *Alaska baseline erosion assessment: erosion information paper– Kotlik, Alaska.*
- United States Army Corps of Engineers (2009). *Alaska baseline erosion assessment: study findings and technical report.*
- United States Army Corps of Engineers (1987). *Flood data.*
- United States Army Corps of Engineers (1982). *Flood data.*
- United States Army Corps of Engineers (2011). Floodplain Management Services Section [Report].
- United States Geological Survey, Yukon River Inter-Tribal Watershed Council, and Yukon River Communities (2015). *Active layer network: five year summary report for Kotlik.*
- United States Senate, Subcommittee on Emergency Management, Intergovernmental Relations, and the District of Columbia, Majority Media (June 30, 2014), *Delegation Announces Grants and Contracts to Alaska Programs*,
<https://www.hsgac.senate.gov/subcommittees/emdc/majority-media/delegation-announces-grants-and-contracts-to-alaska-pams>.
- Yukon Delta Fisheries Development Corporation and Alaska Department of Commerce, Community and Economic Development. *Area Use Map: KOTLIK*. DCRA Community Profile Maps. Retrieved April 30, 2019 from
<http://dced.maps.arcgis.com/apps/webappviewer/index.html?id=18fdb060875740fdad22099ca779d637>.

Appendix A

Tables 1-1 and 1-2 show critical facilities, infrastructure, and residential households in Kotlik. Both tables are duplications of tables that appear in the City of Kotlik’s 2013 *Local Hazard Mitigation Plan*. The 2013 tables have been updated with information provided by residents of Kotlik through personal communications with AIJ.

A. Critical Facilities and Infrastructure.

“A critical facility provides essential products and services or fulfills important public safety, emergency response, and disaster recovery functions. Critical Facilities for the City of Kotlik are listed in [Table 1-1].” (LHMP, 2013, p 6-3 to 6-4; AIJ personal communications).

Table 1-1 Kotlik Critical Facilities

Facility Name	Facility Type	Latitude	Longitude
New Airport	Airport	63.03017	-163.53136
Cemetery (new)	Cemetery		
Cemetery (old)	Cemetery2		
Assembly of God	Church	63.03408	-163.55146
Catholic Church	Church	63.03407	-163.54897
Community Center	Community Hall	63.03368	-163.551
Fire Station	Fire Station	63.03329	-163.54942
Fuel Storage SE of Power Plant	Fuel Storage Tanks (>500gal)	63.03296	-163.54993
Kotlik Yupik Corp Fuel Farm	Fuel Storage Tanks (>500gal)	63.03727	-163.52921
Kotlik Yupik Corp Fuel Farm (2)	Fuel Storage Tanks (>500gal)		
Kotlik Yupik Corp Fuel Farm (3)	Fuel Storage Tanks (>500gal)		
Kotlik Yupik Corp Fuel Farm (4)	Fuel Storage Tanks (>500gal)		
Utility Fuel Tank (1)	Fuel Storage Tanks (>500gal)		
Utility Fuel Tank (2)	Fuel Storage Tanks (>500gal)		
Utility Fuel Tank (3)	Fuel Storage Tanks (>500gal)		
Utility Fuel Tank (5)	Fuel Storage Tanks (>500gal)		
Utility Fuel Tank (4)	Fuel Storage Tanks (>500gal)		
Electric Plant/generator (New)	Generator		

School generator	Generator	63.03353	-163.55272
Health Clinic	Hospital/Clinic/ER	63.0333	-163.54879
Municipal Landfill	Landfill/Incinerator	63.03978	-163.56027
Armory	National Guard	63.03357	-163.55403
City Office	Offices	63.03384	-163.55414
Police Department	Police Station		
Post Office	Post Office	63.03384	-163.55414
Power Plant	Power Generation Facility	63.03322	-163.55092
Washeteria	Reservoir/Water Supply	63.03423	-163.56599
Water Plant	Reservoir/Water Supply	63.03365	-163.55232
Water Tank	Reservoir/Water Supply		
Cable Building	Satellite		
Head Start Pre-school	School	63.03268	-163.55823
LYSD School (Elementary & High)	School	63.03408	-163.55238
City Sewage Lagoon	Sewage Lagoon	63.03225	-163.55172
Sanitation Garage	Sewage Lagoon		
A.C. Store Complex	Store	63.03511	-163.53982
City Lodge/Hotel	Store	63.03392	-163.551
Laufkak	Store	63.03345	-163.55456
Duplex (1)	Teachers Quarters		
Duplex (2)	Teachers Quarters		
Duplex (3)	Teachers Quarters		
Principal's House	Teachers Quarters		
Teacher Housing (1)	Teachers Quarters	63.0332	-163.55343
Teachers Housing (2)	Teachers Quarters		
Teachers Housing (3)	Teachers Quarters		
United Utilities Telephone	Telephone	63.03379	-163.55105

Table 1-2 identifies each residential household and the population of the household for year 2018. (LHMP, 2013, p. 6-5 to 6-7; AIJ personal communications).

Table 1-2 Kotlik Residential Facilities

Head of Household	# of members	Head of Household	# of members
Ms. Emma Matthias	3	Unoccupied	0
Mr. Emmett Matthias	3	Ms. Tanya Hunt	3
Mr. Wilbur Tonuchuk	12	Mr. George Williams	1
Mr. Walter Tonuchuk	6	Mr. Rudy Williams Jr.	8
Mr. Joe Uisok	13	Unoccupied	0
Mrs. Stella Fancyboy	9	Mr. Peter Yunak	4
Mr. William Unok	4	Ms. Louise Yunak	6
Mr. John Unok	9	Triplex Unit 2	0
Mr. Ralph Waska	5	Lilly Odinzoff	3
Unoccupied	0	Lavina Tony	5
Mr. Thomas Wasuli	1	Phillip Andrews	6
Ms. Liz Wasuli	1	Anna Mike	1
Mr. George Waska, Jr.	4	Mr. Andres Sinka	6
Mr. Darry Tonuchuk	4	Mr. Chris Wasuli	5
Mrs. Elsie Kamkoff	4	Mrs. Ester Andrews	2
Mr. Ralph Martin	4	Mr. Victor Tonuchuk	7
Mr. Roger Aketachunak	4	Mr. Chris Aketachunak	1
Mr. Leonard Elachik	1	Mr. Martin Okitkun Sr.	3
Mr. Peter Elachik	10	Mr. Emery Matthias	6
Mr. James Fancyboy	4	Unoccupied	0
Ms. Martha Hootch	7	Unoccupied	0
Mr. Bernard Hunt	6	Unoccupied	0
Mr. Cyril Hunt	5	Unoccupied	0
Mr. Hermus Hunt	1	Mrs. Theresa Prince	3
Mr. Isadore Hunt	3	Mr. Thomas Prince	5

Mr. Martin Hunt	7	Ms. Angela Prince	8
Ms. Darlene Hunt	5	Mr. Francis Prince	7
Ms. Francis Hunt	3	Ms. Laurie Prince	5
Mr. Paul Hunt	2	Ms. Lorrena Prince	3
Unoccupied	0	Mrs. Anna Prince	5
Mr. Bernand Hunt	8	Ms. Elaine Savetilik	7
Mr. Andy Hunt Jr.	6	Mr. Ike Seton Sr.	3
Mr. Michael Hunt Sr.	5	Mr. Thomas Sinka	4
Ms. Martina Jack	8	Ms. Laurentia Sinka	2
Mr. Joe Johnson	3	Mr. Abraham Teeluk	7
Mr. Alvina Murphy	2	Mr. Alfred Teeluk	2
Mr. Benny Kamkoff	9	Mr. Billy Teeluk	1
Mr. Clifford Kamkoff	7	Mr. Raymond Teeluk	16
Mr. Richard Kamkoff	4	Mr. Robert Teeluk	4
Mrs. Mary Keys	2	Mr. Ralph Teeluk	5
Ms. Philomena Keyes	3	Mrs. Nita Aketachunak	2
Mr. Helen Kitsick	6	Unoccupied	0
Mr. Harold Kitsick Sr.	3	Mr. John A Tonuchuk	4
Mrs. Lucy Akaran	5	Mr. David Mike	2
Mr. Ignatius Akaran	6	Mrs. Justina Unok	3
Mrs. Theresa Akaran	6	Mrs. Cecelia Mike	3
Mr. Irene Akaran	2	Unoccupied	0
Mr. Sean Kameroff	5	Ms. Mary Ann Mike	13
Mr. Theodore Akaran	8	Unoccupied	0
Mr. Anthony Huny	1	Mr. Nolan Murphy	3
Mr. Anthony Aketachunak	5	Mr. William Murphy Sr.	7
Mr. Felix Aketachunak	5	Unoccupied	0
Mrs. Martha Aketachunak	9	Mr. Joseph Odinzoff	6
Unoccupied	0	Unoccupied	0

Ms. Mollie Aketachunak	3	Mr. Benedict Okitkun	4
Mr. Alfred Andrews	2	Mr. Darryl Okitkun	6
Mr. Brian Andrews	6	Mr. Harold Okitkun	8
Mrs. MaryAnn Andrews	3	Mr. John Okitkun	10
Unoccupied	0	Mr. Marvin Okitkun	3
Mr. Ronald Andrews	12	Mr. Peter Okitkun	12
Mr. Lance Andrews	2	Mr. Reynold Okitkun	5
Mr. Gabriel Andrews	1	Mr. Robert Okitkun	3
Mr. Hermes Aparezuk	5	Mr. Wayne Okitkun	4
Mr. Benedict Aparezuk	2	Ms. Phyllis Okitkun	19
Unoccupied	0	Ms. Patricia Okitkun	5
Ms. Rose Cheemuk	4	Ms. Maggie Okitkun	3
Ms. Felicity Demers	1	Mrs. Michaela Okitkun	6