City of Kotlik

LOCAL

HAZARD MITIGATION PLAN

FEMA Approved

December 5, 2013

U.S. Department of Homeland Security
Region X
130 228th Street, SW
Bothell, WA 98021-9796

FEMA

December 5, 2013

Honorable Thomas Sinka
Mayor, City of Kotlik
P.O. Box 20268
Kotlik, Alaska

Dear Mayor Sinka:

The U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) has approved the ***City of Kotlik Hazard Mitigation Plan*** as a local plan as outlined in 44 CFR Part 201. With approval of this plan, the City of Kotlik is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through December 4, 2018.

The plan's approval provides eligibility to apply for hazard mitigation projects through your State. All requests for funding will be evaluated individually according to the specific eligibility and other requirements of the particular program under which the application is submitted. For example, a specific mitigation activity or project identified in the plan may not meet the eligibility requirements for FEMA funding, and even eligible mitigation activities are not automatically approved for FEMA funding under any of the aforementioned programs. Approved mitigation plans may be eligible for points under the National Flood Insurance Program's Community Rating System (CRS). Additional information regarding the CRS can be found at www.fema.gov/business/nfip/crs.shtm or through your local floodplain manager.

Over the next five years, we encourage your community to follow the plan's schedule for its monitoring and updating, and to develop further mitigation actions. The plan must be reviewed, revised as appropriate, and resubmitted for approval within five years in order to continue project grant eligibility.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact our State counterpart, Alaska Division of Homeland Security and Emergency Management, which coordinates and administers these efforts for local entities.

Sincerely,

Mark Carey, Director
Mitigation Division

cc: Ann Gravier, Alaska Division of Homeland Security and Emergency Management

Enclosure

BH:bb

Table of Contents

Tables

Figures

List of Acronyms and Abbreviations

ºF	degrees Fahrenheit
AFG	Assistance to Firefighters Grant
AS	Alaska Statute
AVCP	Association of Village Council Presidents
CD	compact disc
CDBG	Community Development Block Grant
CHEMS	Community Health and Emergency Medical Services
DEC	Department of Environmental Conservation
DHS&EM	State of Alaska, Department of Homeland Security and Emergency Management
DHSS	Department of Health and Social Services
DHS	Department of Homeland Security
DMA2000	Disaster Mitigation Act of 2000
DNR	Department of Natural Resources
DOF	Department of Forestry
DOT&PF	Department of Transportation and Public Facilities
FMA	Flood Mitigation Assistance
FEMA	Federal Emergency Management Agency
GIS	Geographic Information Systems
HAZUS-MH	Hazards U.S. – Multi-Hazard
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
KTC	Emmonak Traditional Council
LYSD	Lower Yukon School District
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
PDM	Pre-Disaster Mitigation
STAPLE+E	Social, Technical, Administrative, Political, Legal, Economic and Environmental
URS	URS Corporation
U.S.	Unites States
USGS	U.S. Geological Survey

1 Introduction

This section provides a brief introduction to hazard mitigation planning, the grants associated with these requirements, and a description of this Hazard Mitigation Plan (HMP).

1.1 HAZARD MITIGATION PLANNING

On October 30, 2000, Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) (P.L. 106-390) which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) (Title 42 of the United States Code [USC] 5121 et seq.) by repealing the act's previous mitigation planning section (409) and replacing it with a new mitigation planning section (322). This new section emphasized the need for State, Tribal, and local entities to closely coordinate mitigation planning and implementation efforts. In addition, it provided the legal basis for the Federal Emergency Management Agency's (FEMA) mitigation plan requirements for mitigation grant assistance.

To implement these planning requirements, FEMA published an Interim Final Rule in the Federal Register on February 26, 2002 (FEMA 2002a), 44 CFR Part 201 with subsequent updates. The planning requirements for local entities are described in detail in Section 2 and are identified in their appropriate sections throughout this HMP.

FEMA's October 31, 2007, July 2008, and October 2012 changes to 44 CFR Part 201 combined and expanded flood mitigation planning requirements with local hazard mitigation plans (44CFR §201.6). Furthermore, all hazard mitigation assistance program planning requirements were combined eliminating duplicated mitigation plan requirements. This change also required participating National Flood Insurance Program (NFIP) communities' risk assessments and mitigation strategies to identify and address repetitively flood damaged properties. Local hazard mitigation plans now qualify communities for several Federal Hazard Mitigation Assistance (HMA) grant programs.

This HMP complies with Title 44 CFR current as of September 28, 2012 and applicable guidance documents.

1.2 GRANT PROGRAMS WITH MITIGATION PLAN REQUIREMENTS

FEMA HMA grant programs provide funding to States, Tribes, and local entities that have a FEMA-approved State, Tribal, or Local Mitigation Plan. Two of the grants are authorized under the Stafford Act and DMA 2000, while the remaining three are authorized under the National Flood Insurance Act and the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act. The Hazard Mitigation Grant Program (HMGP) is a competitive, disaster funded, grant program. Whereas the other Unified Mitigation Assistance Programs: Pre-Disaster Mitigation (PDM), Flood Mitigation Assistance (FMA), Repetitive Flood Claims (RFC), and Severe Repetitive Loss (SRL) programs although competitive, rely on specific pre-disaster grant funding sources, sharing several common elements.

"Hazard mitigation is any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects. This definition distinguishes actions that have a long-term impact from those that are more closely associated with immediate preparedness, response, and recovery activities. Hazard mitigation is the only phase of emergency management specifically dedicated to breaking the cycle of damage,

reconstruction, and repeated damage. As such, States, Territories, Indian Tribal governments, and communities are encouraged to take advantage of funding provided by HMA programs in both the pre- and post-disaster timeframes.

Together, these programs provide significant opportunities to reduce or eliminate potential losses to State, Tribal, and local assets through hazard mitigation planning and project grant funding. Each HMA program was authorized by separate legislative action, and as such, each program differs slightly in scope and intent.

The Hazard Mitigation Grant Program (HMGP) may provide funds to States, Territories, Indian Tribal governments, local governments, and eligible private non-profits (PNPs) following a Presidential major disaster declaration. The Pre-Disaster Mitigation (PDM), Flood Mitigation Assistance (FMA), Repetitive Flood Claims (RFC), and Severe Repetitive Loss Pilot (SRL) programs may provide funds annually to States, Territories, Indian Tribal governments, and local governments. While the statutory origins of the programs differ, all share the common goal of reducing the risk of loss of life and property due to natural hazards" (FEMA 2010).

1.2.1 Hazard Mitigation Assistance (HMA) Unified Programs

HMA grant program activities include:

Table 1-1 FEMA 2012 HMA Eligible Activities

Activities	HMGP	PDM	FMA	RFC	SRL
1. Mitigation Projects	√	√	√	√	√
Property Acquisition and Structure Demolition	√	√	√	√	√
Property Acquisition and Structure Relocation	√	√	√	√	√
Structure Elevation	√	√	√	√	√
Mitigation Reconstruction					√
Dry Floodproofing of Historic Residential Structures	√	√	√	√	√
Dry Floodproofing of Non-residential Structures	√	√	√	√	
Minor Localized Flood Reduction Projects	√	√	√	√	√
Structural Retrofitting of Existing Buildings	√	√			
Non-Structural Retrofitting of Existing Buildings and Facilities	√	√			
Safe Room Construction	√	√			
Infrastructure Retrofit	√	√			
Soil Stabilization	√	√			
Wildfire Mitigation	√	√			
Post-disaster Code Enforcement	√				
5% Initiative Projects	√				
2. Hazard Mitigation Planning	√	√	√		
3. Management Costs	√	√	√	√	√

The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. Projects must provide a long-term solution to a problem, for example, elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight the flood. In addition, a project's potential savings must be more than the cost of implementing the project. Funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. The amount of funding available for the HMGP under a particular disaster declaration is limited. FEMA may provide a State or Tribe with up to 20 percent of the total aggregate disaster damage costs to fund HMGP project or planning grants. In Fiscal Year (FY) 2006, HMGP funding was approximately $232 million, FY 2007 was $316 million, FY 2008 was $1.246 billion, FY 2009 was $359 million, and FY 2010 was $23 million. The cost-share for these grants is 75 percent Federal/25 percent non-Federal. Communities that fulfill "Impoverished Community" criteria and receive FEMA Regional Administrator approval may be funded at percent 90 percent Federal/10 percent non-Federal.

The PDM grant program provides funds to State, Tribes, and local entities, including universities, for hazard mitigation planning and mitigation project implementation prior to a disaster event. PDM grants are awarded on a nationally competitive basis. Like HMGP funding, a PDM project's potential savings must be more than the cost of implementing the project. In addition, funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. The total amount of PDM funding available is appropriated by Congress on an annual basis. In FY 2008, PDM program funding totaled approximately $114 million, FY 2009 was $90 million, and FY 2010 was $100 million. The cost-share for these grants is 75 percent Federal/25 percent non-Federal.

The goal of the FMA grant program is to reduce or eliminate flood insurance claims under the NFIP. Particular emphasis for this program is placed on mitigating repetitive loss (RL) properties. The primary source of funding for this program is the National Flood Insurance Fund. Grant funding is available for three types of grants, including Planning, Project, and Technical Assistance. Project grants, which use the majority of the program's total funding, are awarded to States, Tribes, and local entities to apply mitigation measures to reduce flood losses to properties insured under the NFIP. In FY 2010, FMA funding totaled $32.3 million. The cost- share for these grants is 75 percent Federal/25 percent non-Federal. However, 90 percent Federal/10 percent non-Federal to mitigate SRL properties is available in certain situations.

The City of Kotlik does not currently participate in the NFIP and is therefore ineligible for National Flood Insurance Act Grant Programs until they become a NFIP participant.

The SRL program provides funding to reduce or eliminate the long-term risk of flood damage to residential structures insured under the NFIP. Structures considered for mitigation must have at least four NFIP claim payments over $5,000 each, when at least two such claims have occurred within any 10-year period, and the cumulative amount of such claim payments exceeds $20,000; or for which at least two separate claim payments have been made with the cumulative amount of the building portion of such claims exceeding the value of the property, when two such claims have occurred within any 10-year period. Congress authorized $40 million for FY 2006 and FY

2007, $80 million for FY 2008, $80 million for FY 2009, and $70 million for FY 2010. The cost-share for these grants is 75 percent Federal/25 percent non-Federal. However, a 90 percent Federal/10 percent non-Federal cost share is available for SRL property mitigation when the State or Tribal plan addresses ways to mitigate SRL properties.

The RFC program provides funding to reduce or eliminate the long-term flood damage risk to residential and nonresidential structures insured under the NFIP. Up to $10 million is available annually to assist States and communities with reducing flood damages to structures having one or more claim payments for flood damages. All RFC grants are eligible for up to 100 percent Federal assistance.

At the time of this writing, historical HMA grant funding award levels information is not available for FY 2012 and 2013.

HMP Description

The HMP consists of the following sections and appendices:

Introduction

Section 1 defines a hazard mitigation plan, delineates federal requirements and authorities, and introduces the Hazard Mitigation Assistance program listing the various grant programs and their historical funding levels.

Community Description

Section 2 provides a general history and background of the City, including historical trends for population, demographics, and economic forces shaping the community.

Planning Process

Section 3 describes the HMP update's planning process, identifies the Planning Team Members, the meetings held as part of the planning process, and the key stakeholders within the City of Kotlik and the surrounding area. This section documents public outreach activities (Appendix D), the review and incorporation of relevant plans, reports, and other appropriate information, actions the City of Kotlik plans to implement to assure continued public participation, and their methods and schedule for keeping the plan current.

This section also describes the Planning Team's formal plan maintenance process to ensure that the HMP remains an active and applicable document throughout its 5-year lifecycle. The process includes monitoring, reviewing, evaluating (Appendix F – Maintenance Documents), updating the HMP; and implementation initiatives.

HMP Adoption

Section 4 Section 8 describes the community's HMP adoption process and supporting documentation.

Hazard Analysis

Section 5 describes the process through which the Planning Team identified, screened, and selected the hazards to be profiled in this version of the HMP. The hazard analysis includes the nature, previous occurrences (history), location, extent, impact, and probability of future events for each hazard. In addition, historical and hazard location figures are included.

Vulnerability Analysis

Section 6 identifies potentially vulnerable assets—people, residential and nonresidential buildings, dwelling units (where available), critical facilities, and critical infrastructure in the City of Kotlik. The resulting information identifies the full range of hazards the City could face and potential social impacts, damages, and economic losses. Land use and development trends are also considered.

Mitigation Strategy

Section 7 defines the mitigation strategy which provides a blueprint for reducing the potential losses identified in the vulnerability analysis. This section lists the community's governmental authorities, policies, programs and resources.

The Planning Team developed a list of mitigation goals and potential actions to address the risks facing the City of Kotlik. Mitigation actions include preventive actions, property protection techniques, natural resource protection strategies, structural projects, emergency services, and public information and awareness activities. Mitigation strategies were developed to address NFIP insured properties (if applicable) while encouraging participation with the NFIP and the reduction of flood damage to flood-prone structures.

References

Section 8 lists the reference materials used to prepare this HMP.

Appendices

Appendix A provides the FEMA Local Mitigation Plan Review Tool.

Appendix B is the adoption resolution for the City of Kotlik.

Appendix C provides public outreach information, including newsletters.

Appendix D contains the Benefit-Cost Analysis Fact Sheet used to prioritize mitigation actions.

Appendix E provides the annual plan review tables.

This section describes the location, geography, history; demographics; and land use development trends of the City of Kotlik.

2.1 LOCATION, GEOGRAPHY, AND HISTORY

Figure 2-1, Kotlik Location Map

Kotlik is located on the east bank of the Kotlik Slough, 35 miles northeast of Emmonak in the Yukon-Kuskokwim Delta. It lies 165 air miles northwest of Bethel and 460 miles from Anchorage. It lies at approximately 63.034170 North Latitude and -163.553330 West Longitude. (Sec. 25, T028S, R026W, Kateel River Meridian.) Kotlik is located in the Bethel Recording District. The area encompasses 3.8 sq. miles of land and 0.8 sq. miles of water.
(Department of Community, Commerce, and Economic Development [DCCED], Division of Community and Regional Affairs [DCRA] 2012).

Climate: Situated south of the Arctic Circle, Kotlik has a typical subarctic climate. Consistent with these characteristics, Kotlik has a large temperature range of between -50 and 87 degrees Fahrenheit (ºF) with 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 totals approximately 16 inches, with 60 inches of snow annually. The area also experiences high winds coupled with poor visibility during fall and winter.

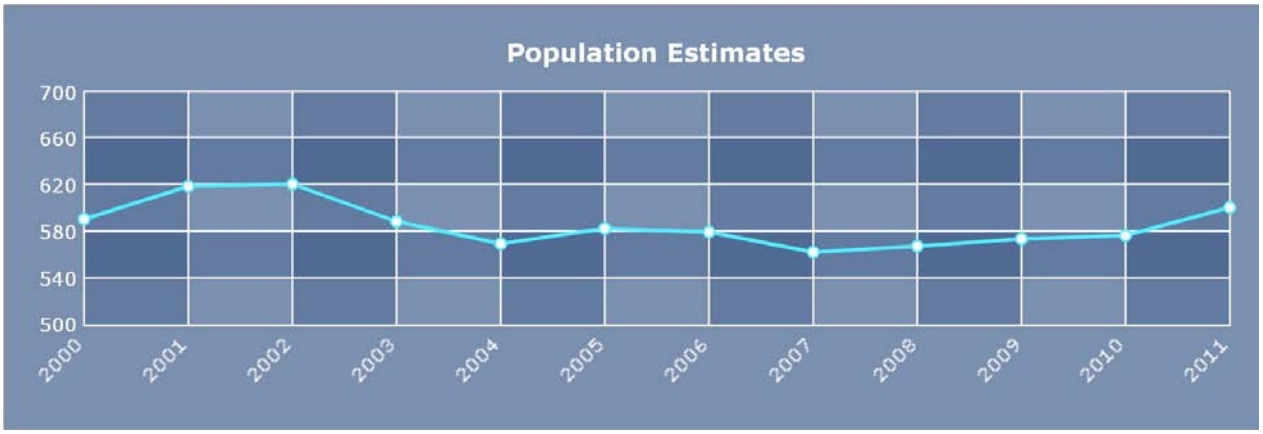
History:

The community grew during the mid-1960s when a BIA school was constructed at Kotlik, and residents of the nearby villages of Channiliut, Hamilton, Bill Moore's Slough, and Pastolaik relocated. Due to its location with easy access by large riverboats and barges, Kotlik became one of the larger ports and commercial centers of the lower Yukon River. Many residents are descendants of Russian traders that settled in the area surrounding Saint Michael after 1867. The city was incorporated in1970. (Department of Community, Commerce, and Economic Development [DCCED], Division of Community and Regional Affairs [DCRA] 2012).

2.2 DEMOGRAPHICS

*The population of Kotlik fluctuated between 8 and 83 between 1880 and 1960. The 1970 census recorded a 300 percent increase in population from 1970 with 228 individuals residing in Kotlik. This increase was largely due to the relocation of Channiliut and several other communities to Kotlik including: Hamilton, Bill Moore's Slough, and Pastolaik. (*Department of Community, Commerce, and Economic Development [DCCED], Division of Community and Regional Affairs [DCRA] 2012).

Figure 2-2 Population Estimates for Kotlik



The 2000 census recorded 591 residents, of which the median age was 18, while the 2010 Census recorded 577 residents with a median age of 21.5, indicating an overall young population. According to City records, the current population of Kotlik has increased slightly to 601residents. Nearly half of the population are 22 years of age and younger. Kotlik is identified as a Yupik Eskimo village and 97.6 percent of residents recognize themselves as such. The male and female composition is approximately 53 and 47 percent respectively. The 2010 census revealed that there are 128 households with an average of five occupants each. However, two new housing units were constructed in 2011 having at least one occupant. *(Source: State of Alaska, Department of Labor).*

2.3 ECONOMY

The economy of Kotlik is similar to other rural Alaska communities and can be described as a mixed cash-subsistence economy. The economy relies on subsistence, government jobs, seasonal construction jobs, and to a lesser extent commercial fishing. Government jobs are provided through the City, federal agencies, federally funded tribal entities, and the school. Construction jobs are associated with new housing, the new school, and water and sewer improvements. Some Kotlik residents hold commercial salmon permits, although poor salmon runs in recent years have reduced income from this activity. In addition, Kotlik is a member of the Yukon Fisheries Development Association, a Community Development Quota corporation.

According to the 2010 census, the median household income in Kotlik was $33,750. Approximately 174 individuals (30.1 percent) were estimated to be living below the poverty level. The potential work force (those aged 16 years or older) in Kotlik was estimated to be 388, of which 151 were actively employed. About 80 individuals were seeking work and were not part of the active labor force. In 2010 the unemployment rate was 34.6 percent; however, this rate included part-time and seasonal jobs, and practical unemployment or underemployment is likely to be significantly higher. State of Alaska, Department of Labor Employment Estimates for 2011 are displayed in figure 2-3 and tables 2-1 and 2-2.

Figure 2-3 Worker Demographics 2011

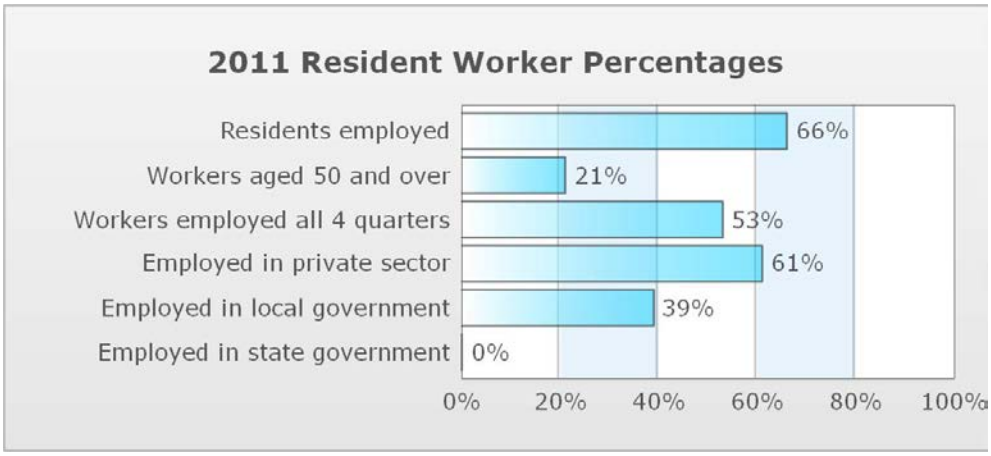


Table 2-1 2011 Labor Industry Classification

Industry	Number of workers	Percent of total employed	Female	Male	Age 45 and over	Age 50 and over
Construction	8	3.3	0	8	1	0
Manufacturing	29	11.8	9	20	0	0
Trade, Transportation and Utilities	56	22.8	22	34	13	8
Information	4	1.6	0	4	2	1
Financial Activities	21	8.5	0	21	9	7
Educational and Health Services	12	4.9	10	2	2	2
Local Government	95	38.6	57	38	39	28

Table 2-4 identifies the Top 2011 Occupations for the City of Kotlik.

Table 2-2 2011 Top Occupations, Gender, and Age Group

2011 Top Occupations	Number of workers	Female	Male	Age 45 and over	Age 50 and over
Meat, Poultry, and Fish Cutters and Trimmers	22	5	17	0	0
Teacher Assistants	18	18	0	10	9
Cashiers	13	12	1	1	1
Retail Salespersons	13	7	6	4	2
Carpenters GASLINE TOP JOB	13	0	13	6	5
Construction Laborers GASLINE TOP JOB	11	1	10	4	1
Stock Clerks and Order Fillers GASLINE	10	1	9	3	2
First-Line Supervisors of Office and Administrative Support Workers GASLINE TOP JOB	10	2	8	4	4
Janitors and Cleaners, Except Maids and Housekeeping Cleaners GASLINE	10	5	5	4	4
Police and Sheriff's Patrol Officers TOP JOB	8	4	4	0	0
Water and Wastewater Treatment Plant and System Operators TOP JOB	8	0	8	2	0
Laborers and Freight, Stock, and Material Movers, Hand GASLINE	7	2	5	1	1
Cooks, All Other	7	6	1	2	2
Elementary School Teachers, Except Special Education TOP JOB	5	5	0	3	2
Bookkeeping, Accounting, and Auditing Clerks GASLINE	5	5	0	0	0
Helpers, Construction Trades, All Other GASLINE	**5**	**0**	**5**	**0**	**0**

GASLINE means the occupation has been identified as a core occupation involved in the gasline project.
TOP JOB means the occupation is projected to have a high growth rate and numerous openings, and has an above average wage.
means the occupation has been identified as green. *(Source: State of Alaska Department of Labor*

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3 Planning Process

This section provides an overview of the planning process; identifies the planning team members and key stakeholders; documents public outreach efforts; and summarizes the review and incorporation of existing plans, studies, and reports used to develop this HMP. Outreach support documents and meeting information regarding the planning team and public outreach efforts are provided in Appendix D.

The requirements for the planning process, as stipulated in DMA 2000 and its implementing regulations are described below.

DMA 2000 Requirements
1. REGULATION CHECKLIST
Local Planning Process §201.6(b): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include: Element §201.6(b)(1): An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval; §201.6(b)(2): An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and nonprofit interests to be involved in the planning process; and §201.6(b)(3): Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information. §201.6(c)(1): [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved. §201.6(c)(4)(i): The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle. §201.6(c)(4)(iii): The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.
ELEMENT A. Planning Process
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1)) A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2)) A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1)) A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3)) A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii)) A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle?) (Requirement §201.6(c)(4)(i))
Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?
Source: FEMA, October 2011.

3.1 OVERVIEW OF PLANNING PROCESS

The City of Kotlik developed the plan update with assistance from the State of Alaska, Division of Homeland Security and Emergency Management (DHS&EM). Updates to this plan include:

1 A review of the local hazards facing the City of Kotlik.

2 An assessment of the progress towards minimizing or eliminating those hazards.

3 A revised hazard vulnerability assessment.

4 Revised community demographic and economic information.

The planning team reviewed their roles in the planning process, such as: advocating community participation, creating opportunities for public participation, and gathering and organizing information. The planning team identified applicable City resources and capabilities. They also discussed hazards affecting the community such as erosion, flooding, and permafrost.

The planning team asked participants to review hazards affecting the City, reassess risks to residential and critical facilities, and assist the team with reviewing and prioritizing mitigation actions.

The following five-step process took place from March 2013 through April:

1. Organize resources: Members of the planning team identified information resources, such as local experts and various organizations, capable of providing the technical expertise and historical information necessary for a thorough plan update.
2. Monitor, evaluate, and update the plan: The planning team evaluated their implementation process to ensure compatibility with community needs.
3. Assess risks: The planning team reviewed the hazards specific to Kotlik and the associated risk assessments to include the vulnerability analysis.
4. Assess capabilities: The planning team reviewed current administrative and technical, legal and regulatory, and fiscal capabilities to determine whether existing provisions and requirements adequately address relevant hazards.
5. Update the mitigation strategy: The planning team reviewed the mitigation goals and actions. Subsequently, they identified completed projects and prioritized future projects.

3.2 HAZARD MITIGATION PLANNING TEAM

The local Planning Team members are Kotlik City Administrator Lori Mike (Planning Team Leader), Director of Public Safety Kevin Okitkun, Police Chief Joseph Okitkun, City Clerk Flora Tonuchuk, and Kotlik City Mayor Thomas Sinka.

Table 3-1 identifies the hazard complete mitigation Planning Team.

Table 3-1A Hazard Mitigation Planning Team

Name	Title	Organization	Key Input
Lori Mike	City Administrator	City of Kotlik	Planning Team Lead, HMP review.
Kevin Okitkun	Director of Public Safety	City of Kotlik	Planning Team Member, data input and HMP review.
Joseph Okitkun	Chief of Police	City of Kotlik	Planning Team Member, data input and HMP review.
Thomas Sinka	Mayor	City of Kotlik	Planning Team Member, Tribal data input and HMP review.
Flora Tonuchuk	City Clerk	City of Kotlik	Planning Team Member, data input and HMP review.
Scott Nelsen	Mitigation Planner	State of Alaska	HMP development, lead writer, project coordination

Table 3-1B Planning Team Meetings

Date	Type	Subject	Summation
March 8, 2013	Initial Meeting	Plan Update Process	Team Began reviewing the plan and learning the update process.
March 19, 2013	Plan Update Kickoff Meeting	Community Awareness	Team drafted and distributed a public newsletter announcing the HMP.
March 29, 2013	Review and Outreach	Hazards and Goals	Team reviewed their hazards and goals, other plans and distributed a public survey.
April 16, 2013	Plan Review	Project Review & Prioritization	Team reviewed and prioritized their projects to meet their goals.
April 22, 2013	Plan Review	Draft Plan Review	Final plan review session.

The planning team meetings were held in Kotlik with Scott Nelsen, State Mitigation Planner participating telephonically.

3.3 PUBLIC INVOLVEMENT PROCESS

Initial Public Meeting On March 15, 2013, the Kotlik planning team held a public meeting announcing the hazard mitigation plan update project. An invitation was extended to the entire community. A project newsletter describing the plan update process and a hazard survey questionnaire was distributed to the residents. During the meeting, the community reviewed the five hazards profiled in their original mitigation plan: earthquake, erosion, flood, tsunami, and severe weather. The participants identified riverbank erosion and river flooding as the two primary natural hazards in the City of Kotlik.

The planning team conducted a risk assessment of assets within their community. They evaluated buildings and City infrastructure for their vulnerability to each hazard. The results revealed a community hazard risk profile.

3.4 INCORPORATION OF EXISTING PLANS

During the planning process, the planning team reviewed and incorporated information from existing plans into the HMP. The following were referenced during the risk assessment of the HMP for the City (Table 3-2).

Table 3-2 Incorporated Planning Documents

Existing Plans, Studies, Reports & Ordinances	Contents Summary
Kotlik Comprehensive Economic Development Strategic Plan, June 2004	Defined the City's future economic goals.
Kotlik Community Development Plan, June 2010	Addresses the City's housing trends, goals, and initiatives.
Former Dump Site Action Plan, September 2008	Action plan to mitigate the impact of the City's old dumpsite upon the area watershed.
Earthquakes in Alaska, USGS Open-File Report 95-624, by Peter Haeussler and George Plafker	Defined the City's earthquake threat potential
DNR/DGGS, Preliminary Volcano-Hazard Assessment for Makushin Volcano, Alaska Report of Investigation 2000-4	Defined the area's volcanic threat
State of Alaska, Department of Commerce Community and Economic Development Profile	Provided historical and demographic information
State of Alaska Hazard Mitigation Plan (SHMP), 2010	Defined statewide hazards and potential risks.
Kotlik Sanitation and Feasibility Study, 2003	Identified potential sanitation projects, such as sewer.
Kotlik Bank Protection Feasibility Study, 2003	Identified potential riverbank erosion mitigation projects.

Refer to section 8 for a complete list of references.

3.5 PLAN MAINTENANCE

This section describes a formal plan maintenance process ensuring the HMP remains an active and applicable document. It explains the Planning Team's coordination of efforts ensuring an efficient improvement and revision process.

The following three process steps are addressed in detail here:

1. Implementation through existing planning mechanisms
2. Continued public involvement
3. Monitoring, reviewing, evaluating, and updating the HMP

3.5.1 Incorporating Existing Planning Mechanisms

The DMA 2000 requirements for implementation through existing planning mechanisms are described below.

DMA 2000 Requirements
1. REGULATION CHECKLIST
Incorporation into Existing Planning Mechanisms §201.6(b)(3): Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.
ELEMENT A Planning Process (Continued)
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information?
Source: FEMA, October 2011.

The planning team will incorporate planning mechanisms into their Hazard Mitigation Plan by undertaking the following activities:

- ☐ Research community-specific regulatory tools to facilitate mitigation strategy integration as defined in the capability assessment section.
- ☐ Involve community departments and tribal organizations when researching information.
- ☐ Update or amend existing planning mechanisms as necessary.

3.5.2 Continued Public Involvement

The DMA 2000 requirements for continued public involvement are described below.

DMA 2000 Requirements
1. REGULATION CHECKLIST
Continued Public Involvement §201.6(c)(4)(iii): The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.
ELEMENT A Planning Process (Continued)
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))
Source: FEMA, October 2011.

The City of Kotlik is dedicated to involving the public directly in the continual reshaping and updating of the HMP. A paper copy of the HMP and any proposed changes will be available at the City Office.

An address and phone number of the planning team leader to whom people can direct their comments or concerns will also be available at the City Office.

Through community outreach activities, the planning team will continue to raise awareness about their local HMP. Outreach activities could include attendance and provision of materials at City-sponsored events, outreach programs, and public mailings. Any public comments received regarding the HMP will be collected by the planning team leader, included in the annual report, and considered during future HMP updates.

3.5.3 Monitoring, Reviewing, Evaluating, and Updating the HMP

The DMA 2000 requirements for monitoring, evaluating, and updating the HMP, are below.

DMA 2000 Requirements
Monitoring, Evaluating and Updating the Plan §201.6(c)(4)(i): The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.
1. REGULATION CHECKLIST
ELEMENT A. Planning Process (Continued)
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle?)
Source: FEMA, October 2011.

This section addresses activities ensuring improvements and revisions occur in an efficient and coordinated manner.

The following three activities form the process:

1. Update the HMP to reflect revisions to goals, actions, and priorities.
2. Submit a plan update at the end of the five year life cycle for State and FEMA approval.
3. Continue implementing mitigation initiatives.

3.5.3.1 Monitoring the HMP

The HMP was prepared as a collaborative effort. To maintain momentum and build upon previous hazard mitigation planning efforts, the City planning team will continue their involvement in monitoring, evaluating, and updating the HMP. Each authority identified in Table 7-4 will be responsible for implementing the Mitigation Action Plan. The hazard mitigation planning team leader or designee will serve as the primary point of contact and will coordinate local efforts to monitor, evaluate, and revise the HMP.

3.5.3.2 Reviewing the HMP

The City will review their success for achieving the HMP's mitigation goals and implementing the Mitigation Action Plan's activities and projects during the annual review process.

During each annual review, each agency or authority administering a mitigation project will submit a progress report (Appendix F) to the planning team. The report will include the current status of the mitigation project, including any project changes, impediments (including strategies to overcome them), and a comparison of the project to the corresponding goal identified in the plan.

3.5.3.3 Evaluating the HMP

The planning team leader will initiate the annual review two months prior to the planning meeting

date. The findings from the review will be presented at the annual planning team meeting. Each review, as shown on the annual review worksheet, will include an evaluation of the following:

- ☐ Efforts to involve City authorities, outside agencies, stakeholders, and residents.
- ☐ Changes in risk for each identified and newly considered natural or human- caused hazards.
- ☐ Impact upon land development activities and related programs.
- ☐ Mitigation Action Plan implementation progress.
- ☐ HMP local resource implementation for HMP identified activities.

3.5.3.4 Updating the HMP

In addition to the annual review, the planning team will update the HMP every five years. The following section explains how the HMP will be reviewed, evaluated.

DMA 2000 Requirements
Reviewing, Evaluating, and Implementing the Plan §201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit if for approval within 5 years in order to continue to be eligible for mitigation project grant funding.
ELEMENT D. Planning Process (Continued) *Update activities not applicable to the plan version*
D1. Was the Plan revised to reflect changes in development? (Requirement §201.6(d)(3))
D2. Was the Plan revised to reflect progress in local mitigation effort? (Requirement §201.6(d)(3))
D3. Was the Plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))
Source: FEMA, October 2011.

The City of Kotlik will review the HMP annually per Section 3.5.3.2 and update the HMP every five years, or when changes to hazards, actions, or priorities are made. The planning team will solicit community involvement through the distribution of annual review questionnaires. The Annual Review Questionnaire (Appendix F) documents the Community's assessment of the Mitigation Action Plan and identifies potential changes to hazards, actions, and resource allocations.

No later than the beginning of the fourth year following HMP adoption, the planning team will undertake the following activities:

- ☐ Request grant assistance for DHS&EM to update the HMP (it can take up to one year to obtain and one year to update the plan).
- ☐ Require each authority administering a mitigation project to submit a comprehensive progress report to the planning team.
- ☐ Develop a chart to identify those HMP sections needing improvement.
    - o Determine the current status of the mitigation actions (projects) in progress.
    - o Identify completed, deleted, or delayed projects. For statuses other than "completed", include a reason for the designation.
    - o Document changes to priorities.
    - o Assess the impact of completed projects.
    - o Identify any barriers preventing the implementation of mitigation projects such as financial, legal, or political restrictions and develop strategies to overcome them.

- Thoroughly analyze and update their risks to natural hazards.
- Prepare a "new" Mitigation Action Plan Matrix for the City of Kotlik.

☐ Prepare a draft of the updated HMP.

☐ Submit the updated draft HMP to the Division of Homeland Security and Emergency Management (DHS&EM) and FEMA for review and approval.

3.5.3.5 Formal State and FEMA HMP Review

Completed Hazard Mitigation Plans do not qualify the City of Kotlik for mitigation grant program eligibility until they have been reviewed and adopted by the City Council, and received State and FEMA final approval.

The City of Kotlik will submit the draft HMP to the Division of Homeland Security and Emergency Management (DHS&EM) for initial review and preliminary approval. Upon preliminary approval, DHS&EM will forward the HMP to FEMA for their review and conditional approval. Conditional approval is granted prior to passage of the City of Kotlik HMP Adoption Resolution. Upon receipt of the Adoption Resolution, FEMA will grant final approval and return the approved plan to the City of Kotlik.

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4. ADOPTION BY LOCAL GOVERNING BODIES AND SUPPORTING DOCUMENTATION

The DMA 2000 requirements for the adoption of this HMP by the local governing body are described below.

DMA 2000 Requirements
Local Plan Adoption §201.6(c)(5): [The plan shall include…] Documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County commissioner, Tribal Council). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.
1. REGULATION CHECKLIST ELEMENT E. Plan Adoption
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval??) (Requirement §201.6(c)(5))
Source: FEMA, October 2011.

The City of Kotlik is represented in this HMP and meets the requirements in Section 409 of the Stafford Act and Section 322 of DMA 2000, and 44 CFR §201.6(c)(5).

The Kotlik City Council adopted the HMP on October 2, 2013 and submitted the final draft HMP to FEMA for formal approval.

A scanned copy of Kotlik's formal adoption is included below.

Kotlik City Council

P.O. Box 20268

Kotlik, Alaska 99620-0268

(907) 899-4313

Fax (907) 899-~~4826~~ 4925

A RESOLUTION REQUESTING ADOPTING
HAZARD MITIGATION PLAN
RESOLUTION 13-5

WHEREAS: The City of Kotlik (City) has experienced damages to commercial, residential, and public health and safety concerns from both Spring and Fall floods,

WHEREAS: The City's Hazard Mitigation Plan was written by the Department of Military and Veterans Affairs Division of Homeland Security and Emergency Management

WHEREAS: The Hazard Mitigation Plan was reviewed by federal, state, and local agencies, and has been updated to reflect their concerns,

THEREFORE BE IT RESOLVED: The City adopts the Hazard Mitigation Plan as an official plan of the City of Kotlik. The Hazard Mitigation Planning Group consists of the City Council. The Council agrees to follow the plan for the best interest and safety of the community of Kotlik.

PASSED AND APPROVED by the Council this 2nd day of October, 2013.

Signed _____
Thomas Sinka, Mayor

ATTEST: _____
Flora Tonuchuk, City Clerk

This section identifies and profiles the hazards potentially impacting the City of Kotlik.

5.1 OVERVIEW OF A HAZARD ANALYSIS

A hazard analysis includes the identification, screening, and profiling of each hazard. Hazard identification is the process of recognizing the natural events threatening a populated area. A natural phenomenon, such as a volcanic eruption, must have an element of human involvement to be deemed a natural hazard. Human, Technological, and Terrorism related hazards are beyond the scope of this plan. All natural hazards potentially impacting the study area are considered, and those found unlikely to occur or where the risk of damage is very low, are eliminated from consideration.

Hazard profiling is the act of describing hazards in terms of their nature, history, magnitude, frequency, location, extent, and probability. Hazards are identified through historical and anecdotal information, reviews of existing plans and studies. The hazards are mapped to determine their geographic extent and define their boundaries.

5.2 HAZARD IDENTIFICATION AND SCREENING

Describe below are the DMA 2000 requirements for hazard identification.

DMA 2000 Requirements
Identifying Hazards §201.6(c)(2)(i): The risk assessment shall include a] description of the type, location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events. §201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.
1. REGULATION CHECKLIST
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction?
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction?
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction?
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods?
Source: FEMA, October 2011.

During February 2013, the planning team reviewed the five natural hazards profiled in their hazard mitigation plan: earthquake, erosion, flood, severe weather, and tsunami. All five hazards were considered even if any particular one had not occurred within the past five years. They evaluated hazards based on a range of factors, including their prior history, relative risk, mitigation potential, and availability of information, (Table 5-1).

Table 5-1 Identification and Screening of Hazards

Hazard Type	Should It Be Profiled?	Explanation
Earthquake	Yes	Periodic, unpredictable occurrences. The City experienced no damage from the 11/2003 Denali EQ, and experienced less than 10% damage throughout the area from the 1964 Good Friday Earthquake.
Erosion	Yes	The City experiences storm surge, coastal ice run-up, and coastal wind erosion along the shoreline and riverine erosion along the area's river, streams, and creek embankments from high water flow, riverine ice flows, wind, surface runoff, and boat traffic wakes.
Flood	Yes	Snowmelt run-off and rainfall flooding occurs during spring thaw and the fall rainy season. Events occur from soil saturation. Several minor flood events cause damage. Severe damages occur from major floods.
Ground Failure (Avalanche, Landslide/Debris Flow, Permafrost, Subsidence)	No	This hazard does not exist for this City.
Tsunami & Seiche	No	This hazard does not exist for this City
Volcano	No	This hazard does not exist for this City.
Weather, Severe	Yes	Annual weather patterns, severe cold, heavy rain, freezing rain, snow accumulations, storm surge, and wind, are the predominate threats. Intense wind and heavy rain are the primary impacts to the community. Severe weather events cause fuel price increases and frozen pipes. Heavy snow loads potentially damage house roofs. Winds potentially remove or damage roofs and moved houses off their foundations. Complex weather systems are the most severe bringing severe cold, wind, freezing rain, storm surge, and flooding.
Wildland/Urban Interface Fire	Yes	Wildland fires have not been documented within the boundaries of Kotlik, however, wildland fires have occurred in the vicinity.

5.3 HAZARD PROFILE

Described below are the DMA 2000 requirements for profiling hazards.

DMA 2000 Requirements
Profiling Hazards Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.
1. REGULATION CHECKLIST
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction? (Requirement §201.6(c)(2)(i)) B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction?
Source: FEMA, October 2011.

The planning team reviewed their five local hazards using the following criteria:

- ☐ Nature (Type)
- ☐ History (Previous Occurrences)
- ☐ Location
- ☐ Extent (to include magnitude and severity)
- ☐ Impact (Section 5 provides general impacts associated with each hazard. Section 6 provides detailed impacts to Kotlik's residents and critical facilities)
- ☐ Probability of future events

NFIP insured Repetitive Loss Structures (RLS) are addressed in Section 6.0, Vulnerability Analysis.

Each hazard receives a rating based on the following criteria for probability (Table 5-2) and magnitude/severity (Table 5-3).

Table 5-2 Hazard Probability Criteria

Probability	Criteria
4 - Highly Likely	☐ Event is probable within the calendar year. ☐ Event has up to 1 in 1 year chance of occurring (1/1=100 percent). ☐ History of events is greater than 33 percent likely per year. ☐ Event is "Highly Likely" to occur.
3 - Likely	☐ Event is probable within the next three years. ☐ Event has up to 1 in 3 years chance of occurring (1/3=33 percent). ☐ Occurrence is greater than 20per cent but less than or equal to 33 percent likely per year. ☐ Event is "Likely" to occur.
2 - Possible	☐ Event is probable within the next five years. ☐ Event has up to 1 in 5 years chance of occurring (1/5=20 percent). ☐ Occurrence is greater than 10 percent but less than or equal to 20 percent likely per year. ☐ Event could "Possibly" occur.
1 - Unlikely	☐ Event is possible within the next ten years. ☐ Event has up to 1 in 10 years chance of occurring (1/10=10 percent). ☐ History of events is less than or equal to 10 percent likely per year. ☐ Event is "Unlikely" but possible to occur.

Table 5-3 Hazard Magnitude/Severity Criteria

Magnitude / Severity	Criteria
4 - Catastrophic	☐ Multiple deaths. ☐ Complete shutdown of facilities for 30 or more days. ☐ More than 50 percent of property is severely damaged.
3 - Critical	☐ Injuries and/or illnesses result in permanent disability. ☐ Complete shutdown of critical facilities for at least two weeks. ☐ More than 25 percent of property is severely damaged.
2 - Limited	☐ Injuries and/or illnesses do not result in permanent disability. ☐ Complete shutdown of critical facilities for more than one week. ☐ More than 10 percent of property is severely damaged.
1 - Negligible	☐ Injuries and/or illnesses are treatable with first aid. ☐ Minor quality of life lost. ☐ Shutdown of critical facilities and services for 24 hours or less. ☐ Less than 10 percent of property is severely damaged.

Warning Time and Duration are derived using probability and magnitude, as shown in Table 5-4. Also indicated is the "Weighting" factor for each of the four parts of the Calculated Priority Risk Index. The Probability factor is "Weighted" at 0.45, Magnitude / Severity at 0.30, Warning Time at 0.15, and Duration at 0.10. These "Weights" of significance are used to assign relative importance to each of these factors when combined to generate the Calculated Priority Risk Index value.

Table 5-4 Calculated Priority Risk Index

Calculated Priority Risk Index			
.45 Probability	.30 Magnitude / Severity	.15 Warning Time	.10 Duration
4 - Highly Likely	4 - Catastrophic	4 - Less Than 6 Hours	4 - More Than 1 Week
3 - Likely	3 - Critical	3 - 6-12 Hours	3 - Less Than 1 Week
2 - Possible	2 - Limited	2 - 12-24 Hours	2 - Less Than 1 Day
1 - Unlikely	1 - Negligible	1 - 24+ Hours	1 - Less Than 6 Hours

Table 5-5 reveals the Calculated Priority Risk Index for each hazard facing the community:

Table 5-5 Calculated Priority Risk Index by Hazard

Hazard	Probability	Magnitude / Severity	Warning Time	Duration	Priority Risk Index
Earthquake	1 Unlikely	1 Negligible	4 < 6 Hours	1 < 6 Hours	1.45
Erosion	4 Highly Likely	3 Critical	1 24+ Hours	4 > One Week	3.25
Flooding	4 Highly Likely	3 Critical	2 12-24 Hours	3 < One Week	3.3
Severe Winter Storm	3 Likely	1 Negligible	1 24+ Hours	3 < One Week	2.1
Tsunami	- Not Specified -	- Not Specified -	4 < 6 Hours	1 < 6 Hours	0.7
Wildfires	2 Possible	1 Negligible	4 < 6 Hours	- Not Specified -	1.8

The hazards profiled for the City of Kotlik are presented throughout the remainder of Section 5.3. The presentation order does not signify their importance or risk level.

5.3.1 Earthquake

5.3.1.1 Nature

An earthquake is a sudden motion or trembling caused by a release of strain accumulated within or along the edge of the earth's tectonic plates. The effects of an earthquake can be felt far beyond the epicenter. Earthquakes usually occur without warning and after only a few seconds can cause massive

damage and extensive casualties. The immediately perceived effect of earthquakes is ground motion.

Ground motion generally increases with the amount of energy released and decreases with distance from the fault or epicenter of the earthquake. An earthquake causes seismic waves travelling through the earth's interior and surface waves along the earth's surface. There are two basic types of seismic waves: body waves and surface waves: The first jolt felt during an earthquake is the push-pull body wave, or P (primary) wave. P waves are compression waves moving through the earth. The second wave felt is another type of body wave, called an S (secondary) wave. S waves, also known as shear waves, are slower than P waves and are similar in character to sound waves. The rolling motion felt along the surface is an R or Raleigh wave. R waves move continuously forward, although the individual particles move in an elliptical path, similar to water waves. L (Love) waves, like R waves, are continuously forward travelling surface waves, but the individual particles move side to side, perpendicular to the direction of travel. Surface waves are responsible for much of the ground motion experienced during an earthquake.

In addition to ground motion, several secondary natural hazards occur from earthquakes:

- **Surface Faulting** is the differential ground movement of a fault at the earth's surface. Displacement along faults varies but may be significant (e.g., over 20 feet), as may the length of the surface rupture (e.g., over 200 miles). Surface faulting may severely damage linear structures, including railways, highways, pipelines, and tunnels.
- **Liquefaction** occurs when seismic waves pass through saturated granular soil, distorting its granular structure, and causing s the empty spaces between granules to collapse. The increase in pore water pressure will cause the soil to behave like a fluid and deform. There are three telltale signs indicating liquefaction has taken place:
    1. Lateral spread, horizontal movements commonly ten to fifteen feet, possibly reaching over one hundred feet in length.
    2. Debris flows, massive flows of soil, typically hundreds of feet, possibly reaching over twelve miles in length.
    3. Loss of bearing strength, soil deformations causing structures to settle or tip.
- **Landslides** occur as a result of horizontal seismic inertia forces induced by ground shaking. The most common earthquake-induced landslides are rock falls, rockslides, and soil slides.

The severity of an earthquake is expressed in terms of intensity and magnitude. Intensity is determined from the effects on people and their environment. It varies depending upon the location with respect to the earthquake epicenter, which is the point on the earth's surface that is directly above the spot, (Focus), where the earthquake occurred. The intensity generally increases with the amount of energy released and decreases with distance from the epicenter. The scale most often used in the U.S. to measure intensity is the Modified Mercalli Intensity (MMI) Scale. As shown in Table 4-4, the MMI Scale consists of 12 increasing levels of intensity that range from imperceptible to catastrophic destruction. Peak ground acceleration (PGA) is also used to measure earthquake intensity by quantifying how hard the earth shakes in a given location. PGA can be measured as acceleration due to gravity (g) (MMI 2012).

Magnitude (M) is the measure of the earthquake strength. It is related to the amount of seismic energy released at the earthquake's hypocenter, the actual location of the energy released inside the earth. It is based on the amplitude of the earthquake waves recorded on instruments, known as the Richter magnitude test scales, which have a common calibration (see Table 5-4).

Table 5-6 Magnitude / Intensity / Ground-Shaking Comparisons

Magnitude	Intensity	PGA (% g)	Perceived Shaking
0 – 4.3	I	<0.17	Not Felt
	II-III	0.17 – 1.4	Weak
4.3 – 4.8	IV	1.4 – 3.9	Light
	V	3.9 – 9.2	Moderate
4.8 – 6.2	VI	9.2 – 18	Strong
	VII	18 – 34	Very Strong
6.2 – 7.3	VIII	34 – 65	Severe
	IX	65 – 124	Violent
	X	124 +	Extreme
7.3 – 8.9	XI		
	XII		

(MMI 2012)

5.3.1.2 History

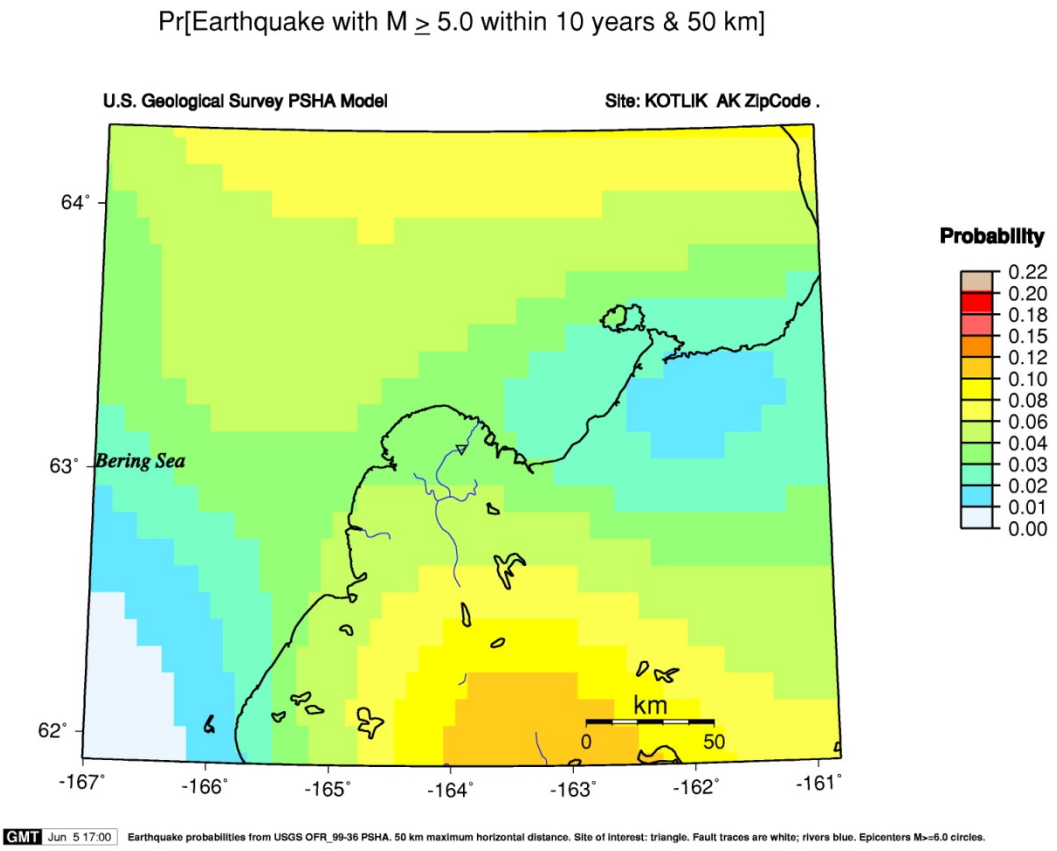
On Good Friday, March 27, 1964, North America's strongest recorded earthquake, with a moment magnitude of 9.2, rocked central Alaska. On a global level, three of the ten strongest earthquakes ever recorded occurred in Alaska. No damaging earthquakes have occurred in Kotlik.

5.3.1.3 Location, Extent, Impact, and Probability of Future Events

Location

The entire geographic area of Alaska is prone to the effects of an earthquake. Figure 5-1 was generated using the U.S. Geologic Survey (USGS) Earthquake Mapping model and indicates a three percent probability of a 5.0 magnitude or greater earthquake occurring within ten years in the vicinity of Kotlik.

Figure 5-1 Kotlik Earthquake Probability.



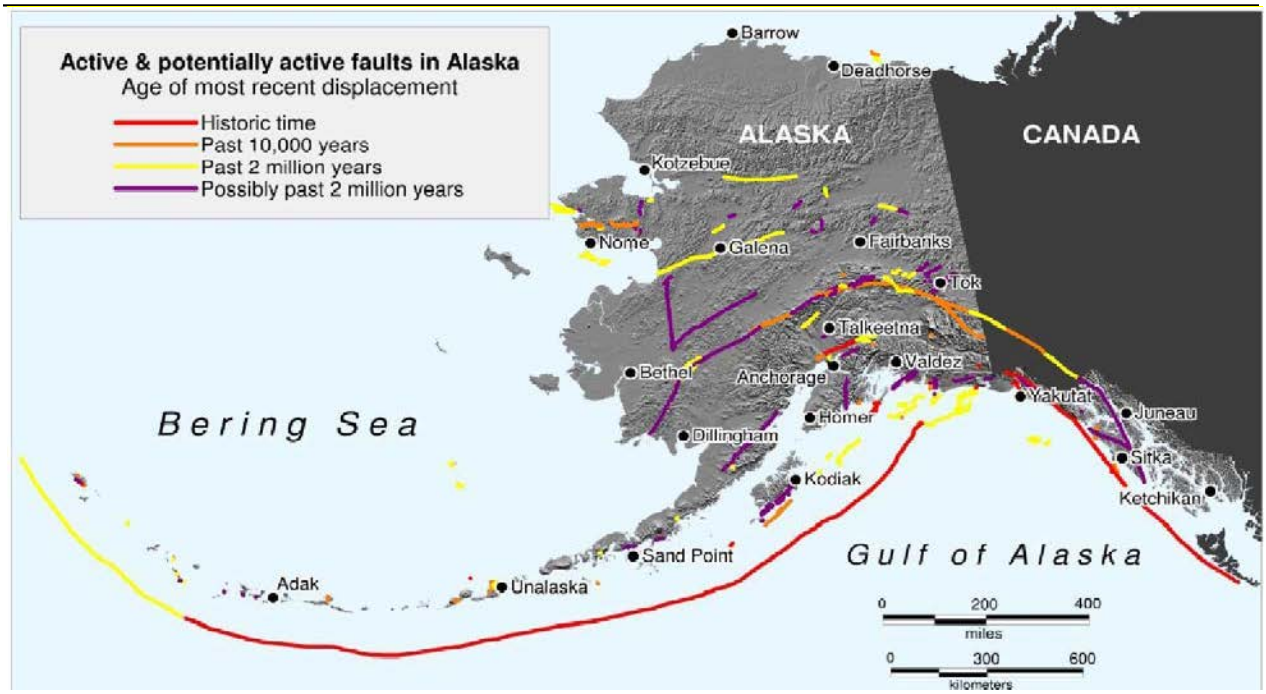


Figure 5-2 Active and Potentially Active Faults in Alaska

The Department of Geological and Geophysical Survey (DGGS) Neotectonic Map of Alaska (Figure 5-2) depicts Alaska's known earthquake fault locations. DGGS states,

> *"The Neotectonic Map of Alaska is the most comprehensive overview of Alaskan Neotectonics published to date; however, users of this map should be aware of the fact the map represents the author's understanding of Alaskan Neotectonics at the time of publication. Since publication of the Neotectonic map, our understanding of Alaskan Neotectonics has changed and earthquakes have continued to occur. For example, M7.9 Denali fault earthquake ruptured three faults, including the Susitna Glacier fault, which was previously undiscovered..."* (DGGS 2009).

Extent

Each year Alaska has approximately 5,000 earthquakes, including 1,000 that measure above 3.5 on the Richter scale. Alaska is vulnerable to three types of earthquakes. One type is called a **subduction zone earthquake**, which is caused by one crustal plate moving beneath another plate. This is the case in Southcentral Alaska and along the Aleutian Islands, where the Pacific Plate dives beneath the North American Plate. The Good Friday Earthquake in Alaska was the result of movement along the Aleutian Megathrust subduction zone.

Another type of earthquake common in Alaska is the **transform fault earthquake**. These earthquakes occur when crustal plates slide by each other. A popular example is the San Andreas Fault in California. A transform fault exists just offshore of southeastern Alaska, where the North American Plate and the Pacific Plate slide past each other on the Fairweather Queen Charlotte Fault.

Intraplate earthquakes occur within a tectonic plate, occasionally at a great distance from the plate boundaries. These types of earthquakes can have magnitudes of 7.0 and greater. Shallow earthquakes in the Fairbanks area are an example of intraplate earthquakes.

Impact

Kotlik is located in an area that is less active than others in the state, although the effects of earthquakes cantered elsewhere are expected to be felt in Kotlik. The magnitude of impacts to the community would be considered negligible with minor injuries, less than 10 percent of property damaged, and little to no permanent damage to transportation, infrastructure, or the economy.

Probability of Future Events

Based on the geographic location of Kotlik, Figure 5-1 and Table 5-5, it is unlikely that an earthquake would be centered in an area around Kotlik. Figure 5-1 was generated using the USGS Earthquake probability mapping model, also known as a Shake Map, and indicates a 3 percent probability of a 5.0 magnitude or greater earthquake occurring within 10 years near Kotlik.

This 2009 Shake Map incorporates current seismicity in its development and is the most current map available for this area. Peter Haeussler, USGS, Alaska Region states, it is a viable representation to support probability inquiries.

> *"The occurrence of various small earthquakes does not change earthquake probabilities. In fact, in the most dramatic case, the probability of an earthquake on the Denali fault was/is the same the day before the 2002 earthquake as the day afterward. Those are time-independent probabilities. The things that change the hazard maps is changing the number of active faults or changing their slip rate" (Haeussler, 2009).*

As indicated in Figure 5-3, earthquake recurrence probability is rated "Highly Likely." An event which exceeds M 5.0 is probable within the calendar year with a 1 in 1 year chance of occurring (1/1=100 percent) as the earthquake event history is events is greater than 33 percent likely per year.

5.3.2 Erosion

5.3.2.1 Nature

Erosion is a process that involves the gradual wearing away, transportation, and movement of land. However, not all erosion is gradual. It can occur quite quickly as the result of a flash flood, coastal storm, or other event. Most of the geomorphic change that occurs in a river system is in response to a peak flow event. Erosion is a natural process but its effects can be exacerbated by human activity. Erosion is a problem in developed areas where the disappearing land threatens development and infrastructure. Three main types of erosion affect human activity in Alaska:

- Coastal erosion
- Riverine erosion
- Wind erosion

Kotlik is primarily vulnerable to riverine erosion, which results from the force of flowing water in and adjacent to river channels. This erosion affects the bed and banks of the channel and can alter or

preclude any channel navigation or riverbank development. In less stable braided channel reaches, erosion, and deposition of material are a constant issue. In more stable meandering channels, episodes of erosion may only occur occasionally. Riverine erosion in Kotlik threatens both critical and non-critical facilities.

Attempts to control erosion using shoreline protective measures such as groins, jetties, seawalls, or revetments can lead to increased erosion however the City Council feels that “no action leads to increased damages”.

Land surface erosion results from flowing water across road surfaces due to poor or improper drainage during rain and snowmelt run-off which typically result from fall and winter sea storms.

5.3.2.2 History

A 1971 U.S. Army Corps of Engineers study showed that just less than 11 percent of Alaska's coastline was undergoing "significant" erosion.

Examples of riverine erosion are found throughout Alaska threatening both public and private property. Attempts to control erosion have met with very limited success. For example, armored dikes have helped control erosion for a short period of time, but eventually fail in most circumstances. In Kotlik, some houses have been moved due to threats from erosion.

5.3.2.3 Location, Extent, Impact, and Probability of Future Events

Location

Approximately 5 miles upstream from the mouth of the Yukon River, the community of Kotlik is situated where the Kotlik River, Little Kotlik River, and Apoon Pass meet. A large amount of the community’s development is located along the south bank of the Kotlik River. Some homes are also located along the north bank of the river on East Island, and on the peninsula (i.e., West Island) between the Kotlik and Little Kotlik rivers. All river bank developments are susceptible to erosion.

Extent

Erosion rarely causes death or injury. However, erosion causes the destruction of property, development, and infrastructure. In Alaska, coastal erosion is the most destructive, riverine erosion a close second, and wind erosion a distant third.

Rivers constantly alter their course, changing shape and depth, trying to find a balance between the sediment transport capacity of the water and the sediment supply. This process, called riverine erosion, is usually seen as the wearing away of riverbanks and riverbeds over a period of time. Riverine erosion is often initiated by high sediment loads or heavy rainfall. This generates high volume and velocity run-off which concentrates in the lower drainages within the river's catchment area. Erosion occurs when the force of the flowing water exceeds the resistance of the riverbank material. The water continues to increase its sediment load as it flows downstream. Eventually, the river deposits its sediment in slower moving sections such as dams or reservoirs. The river may eventually change course or develop a new channel. In less stable braided channel reaches, erosion and deposition are constant issues. In more stable meandering channels, erosion episodes may infrequently occur.

Erosion along the banks of the Kotlik and Little Kotlik rivers and Apoon Pass results from several simultaneous elements. Bank slumping (also known as slab failure) is one of the most obvious

elements of erosion on the riverbanks in Kotlik. Bank slumping indicates the degree of riverbank erosion and is a natural and inevitable process that occurs when the riverbank becomes undercut to a degree that gravity pulls the overhanging material downward. According to the 2003 Kotlik Bank Protection Feasibility Study, there are six primary factors that have led to bank slumping in the area including:

1) *Fine bank material and silty soil* are easily carried away by water even when armored by boulders or other large rip-rap. As the fine material is washed away from underneath the larger material, the larger material gives way and collapses.

2) *Wave action and currents* also contribute to erosion. Currents generally exert more erosion forces on the bottom of the river because as the depth of water increases, so does the force of the water. Waves exert more erosion forces on the riverbanks, weakening the soil structure and removing loose soil. Waves can be created by boat wakes or naturally by wind.

3) *High water.* As a higher water level increases pressure on and exposure to the riverbank, so the rate of erosion also increases. During a flood event, as water levels fall, the saturated soil has less cohesion and the susceptible soils may be overcome by gravitational forces, especially if accompanied by rainfall or melting snow.

4) *The annual freeze-thaw cycle.* This occurs in the upper 3 to 5 feet of riverbank soil also has a role in riverine erosion processes. The freeze-thaw cycle may reduce soil cohesion and ultimately weaken the riverbank.

5) *Break-up ice flows.* Rafting ice traveling through the river may strike and scour the river bank.

6) *Foot traffic.* Destroys vegetation and prevents the establishment of new vegetation. Without vegetation the riverbank is more vulnerable to erosion forces.

Impact

The primary impact from erosion is the loss of land and anything on it. Erosion may increase sedimentation of river deltas and hinder channel navigation. Other impacts include reduction in water quality due to high sediment loads, loss of native aquatic habitats, damage to public utilities (fuel headers and electric and water/wastewater utilities), and economic impacts associated with the costs of trying to prevent or control erosion sites. Possible impacts to the community resulting from erosion are injury, illness, and death, complete shutdown of critical facilities for at least 2 weeks, and more than 25 percent of property severely damaged. Erosion may increase sedimentation of the river and hinder channel navigation. Additional problems include reduction in water quality due to high sediment loads, loss of native aquatic habitats, damage to public utilities such as roads, bridges, and dams, and maintenance costs attributed to erosion prevention and control.

Probability

Historical information provided in the 2003 Bank Protection Feasibility Study and by the community indicates that erosion of the Kotlik River has been actively occurring each year since at least the early 1980s. Based on this recurrence level, and the criteria identified in table 5-5, the probability of erosion occurring in Kotlik is highly likely.

5.3.3 Flood

5.3.3.1 Nature

Flooding is the accumulation of water where usually none occurs or the overflow of excess water from a stream, river, lake, reservoir, glacier, or coastal body of water onto adjacent floodplains. Floodplains are lowlands adjacent to water bodies that are subject to recurring floods. Floods are natural events that are considered hazards only when people and property are affected.

Four primary types of flooding occur in the City: rainfall-runoff, snowmelt, storm surge, and ice override floods.

Rainfall-Runoff Flooding occurs in late summer and early fall. The rainfall intensity, duration, distribution, and geomorphic characteristics of the watershed all play a role in determining the magnitude of the flood. Rainfall runoff flooding is the most common type of flood.

Snowmelt Floods typically occur from April through June. Snowpack depths, spring weather patterns, and geomorphic characteristics of the watershed determine the magnitude of flooding.

Ice jam floods occur after an ice jam develops on a river or stream and blocks the path of flowing water. This type of flood may occur any time when ice is present. Ice jams form during the following three situations:

- fall freeze up
- Midwinter when stream channels freeze forming anchor ice.
- Spring breakup, when the existing ice cover weakens and breaks apart, flows downstream and jams together at narrow sections of the stream channel.

Ice jams commonly develop in areas where the channel slope decreases, becomes shallower, or where constrictions occur such as at bridges, bends in the river, headwaters, and reservoirs. Ice jams frequently impede water along big rivers during spring breakup.

The water level rises upstream behind the ice jam. If the ice jam is higher than the riverbank, flooding occurs. .Little to no damage occurs upstream of an ice jam, however, the damage downstream may be catastrophic. As soon as the ice jam is breached there is usually rapid draining of the excess water. The water level downstream will rise quickly and behave much like a flash flood, carrying large chunks of ice, trees, bank vegetation, and other debris in it's current. Notable large floods in recent years on the Kenai, Susitna, Kuskokwim, and Yukon rivers were all caused by ice jams in conjunction with water from melting snow.

Flash floods are characterized by a rapid rise in water. They often result from heavy rain, ice jam formations, or by dam failure. They are usually swift moving and debris filled, causing them to be very powerful and destructive. Steep coastal areas typically experience flash floods.

Problems related to riverine flooding are sediment deposition and stream bank erosion. Deposition is the accumulation of soil, silt, and other particles on a river bottom or delta. Deposition leads to the destruction of fish habitat and presents a challenge to river navigation. Deposition also decreases channel capacity and increases risk to flooding and bank erosion.

Seasonal Occurrences

In the City of Kotlik, the highest risk to ice jams and snow melt flooding occurs in early summer, also referred to as breakup season. The highest risk to rainfall flooding occurs during late summer and early fall seasons. Most of the annual precipitation occurs April through October with August typically being the wettest month. The risk to rainfall generated floods corresponds to this cycle.

5.3.3.2 History

The following is a list of previous flood events in Kotlik:

- 1974 – This record rainfall flood is the most severe the community ever experienced. The entire village was inundated to a depth of 4 feet.

- 1987 – This flood was the result of stream overflow and inundated the village to a depth of 2 feet. Almost all houses were affected, in particular the Teen Center and several public buildings. The old and new runways were the only parts of town to not be affected by the flood. Coastal Management Plan summarized the City's environmentally impacted areas and potential mitigation opportunities that could reverse existing hazard impacts. As with erosion, the Coastal Management Plan identified the City's flood impacted areas within their project narratives as well as a few photos to highlight extent:
  - October 7, 1989 – 50-year flood, 58 people were evacuated and $195,000 in damages occurred to 16 homes.
  - August 18, 1992 – The level of water was 2 feet above the average first floor of the affected homes, 108 people were evacuated, and 23 homes suffered damages totaling nearly $1.9 million.

A historic flood insurance rate map (FIRM) exists from 1977 for the Kotlik area; however, there is not a current FIRM.

5.3.3.3 Location, Extent, Impact, and Probability of Future Events

Location

The entire community of Kotlik is vulnerable to the effects of flooding

Extent

The majority of Kotlik's infrastructure is located along the Kotlik, Little Kotlik, Apoon Pass, and Yukon rivers and is subject to flooding.

Impact

Critical impacts to the community from flooding events could occur including injuries and/or illnesses resulting in permanent disability, complete shutdown of critical facilities for at least 2 weeks, and more than 25 percent of property could be severely damaged. Specific impacts resulting from floods include water damage to boardwalks, infrastructure, buildings (both critical and non-critical facilities) and structural damage caused by floating debris such as ice.

Probability

Recorded historical flooding information indicates that Kotlik experiences flooding every 2 to 13 years, and it is expected these intervals of flood events will continue. Therefore the probability of a flooding event impacting Kotlik is highly likely.

5.3.4 Severe Weather

5.3.4.1 Nature

Winter weather includes heavy snows, ice storms, extreme cold, and high winds.

Heavy Snow generally means:

- Snowfall accumulating to 4 inches or more in depth in 12 hours or less.
- Snowfall accumulating to 6 inches or more in depth in 24 hours or less.

Snow Squalls are periods of moderate to heavy snowfall, intense, but of limited duration, accompanied by strong, gusty surface winds and possibly lightning.

A **Snow Shower** is a short duration of moderate snowfall.

Snow Flurries are an intermittent light snowfall of short duration with no measurable accumulation.

Blowing Snow is wind-driven snow that reduces surface visibility. Blowing snow can be falling snow or snow that already has accumulated but is picked up and blown by strong winds.

Drifting Snow is an uneven distribution of snowfall and snow depth caused by strong surface winds. Drifting snow may occur during or after a snowfall.

A **Blizzard** means that the following conditions are expected to prevail for a period of 3 hours or longer:

- Sustained wind or frequent gusts to 35 miles per hour or greater.
- Considerable falling and / or blowing snow reducing visibility to less than 1/4 mile.

Freezing Rain or **Drizzle** occurs when rain or drizzle freezes on surfaces. Excessive accumulation may immobilize a community and hamper rescue efforts.

Extreme Cold varies according to the normal climate of a region. In areas unaccustomed to winter weather, near freezing temperatures are considered "extreme cold." In Alaska, extreme cold usually involves temperatures less than -40ºF. Excessive cold may accompany winter storms or high barometric pressure and clear skies.

Ice Storms The term ice storm is used to describe occasions when damaging accumulations of ice are expected during a freezing rain event. Freezing rain most commonly occurs in a narrow band within a winter storm that is also producing heavy amounts of snow and sleet in other locations.

5.3.4.2 History

A series of storms struck the west coast of Alaska causing major coastal flooding November 11 through 13, 1974. Significant damage occurred in the communities of Deering, Shishmaref, Nome, Wales, Brevig Mission, Teller, Golovin, Elim, Koyuk, Shaktoolik, Unalakleet, St. Michael, Stebbins, Kotlik, Alakanuk, Scammon Bay, Sheldon Point, Hooper Bay and Kotzebue. Unalakleet was the

hardest hit due to a combination of flooding and wind damage. Portions of the Nome community were submerged in 10 feet of sea water.

DHS&EM's Disaster Cost Index records the following severe weather disaster events which impacted the area:

83. Omega Block Disaster, January 28, 1989 & FEMA declared (DR-00826) on May 10, 1989: *The Governor declared a statewide disaster to provide emergency relief to communities suffering adverse effects of a record breaking cold spell, with temperatures as low as -85 degrees. The State conducted a wide variety of emergency actions, which included: emergency repairs to maintain & prevent damage to water, sewer & electrical systems, emergency resupply of essential fuels & food, & DOT/PF support in maintaining access to isolated communities.*

119. Hazard Mitigation Cold Weather, 1990: *The Presidential Declaration of Major Disaster for the Omega Block cold spell of January and February 1989 authorized federal funds for mitigation of cold weather damage in future events. The Governor's declaration of disaster provided the State matching funds required for obtaining and using this federal money.*

(New numbering system began in 1995 to begin with event year)

07-221, 2006 October Southern Alaska Storm (AK-07-221) declared October 14, 2006 by Governor Murkowski FEMA declared (DR-1669) on December 8, 2006. *Beginning on October 8, 2006 and continuing through October 13, 2006, a strong large area of low pressure that developed in the Northern Pacific and moved into the Southwest area of the state, produced hurricane force winds throughout much of the state and heavy rains in the Southcentral and Northern Gulf coast areas, which resulted in severe flooding and wind damage and threats to life in the Southern part of the state… Federal declaration was made December 2006 including assistance for Public Assistance and Hazard Mitigation but not including Individual Assistance.*

00-191, Central Gulf Coast Storm declared February 4, 2000 by Governor Murkowski Murkowski then FEMA declared (DR-1316) on February 17, 2000: *On Feb 4 2000, the Governor declared a disaster due to high impact weather events throughout an extensive area of the state. The State began responding to the incident since the beginning of December 21, 1999. The declaration was expanded on February 8 to include City of Whittier, City of Valdez, Kenai Peninsula Borough, Matanuska-Susitna Borough and the Municipality of Anchorage. On February 17, 2000, President Bill Clinton determined the event warranted a major disaster declaration under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93-288 as amended ("the Stafford Act). On March 17, 2000, the Governor again expanded the disaster area and declared that a condition of disaster exists in Aleutians East, Bristol Bay, Denali, Fairbanks North Star, Kodiak Island, and Lake and Peninsula Boroughs and the census areas of Dillingham, Bethel, Wade Hampton, and Southeast Fairbanks, which is of sufficient severity and magnitude to warrant a disaster declaration. Effective on April 4, 2000, Amendment No. 2 to the Notice of a Major Disaster Declaration, the Director of FEMA included the expanded area in the presidential declaration. Public Assistance, for 64 applicants with 251 PW's, totaled $12.8 million. Hazard Mitigation totaled $2 million. The total for this disaster is $15.66 million.*

12-236. 2011 West Coast Storm declared by Governor Parnell on December 5, 2011 then FEMA declared December 22, 2011 (DR-4050). *On November 7, 2011 the National Weather Service (NWS) issued the first of several coastal flood warnings for the western coastline of Alaska from Hooper Bay to the North Slope. The NWS warned of "a rapidly intensifying storm…expected to be an extremely powerful and dangerous storm…one of the worst on record." Over the next three days additional warnings in response to the 942 millibar low pressure system were issued for coastal villages as the storm moved northerly from the Aleutian Islands into the Bering and Chukchi Seas. The west coast was impacted with hurricane force winds exceeding 85 mph, high tidal ranges, and strong sea surges up to 10-ft above mean sea level (msl). Before the first storm had passed, a second equally-low pressure system (e.g., 942 millibar) impacted the western coastline from the Yukon-Kuskokwim Delta south to Bristol Bay. This combined weather extended the incident period for the state to November 13, 2011. The FEMA declaration was limited to the incident period from November 8 – 10, 2011.*

5.3.4.3 Location, Extent, Impact, and Probability of Future Events

Location

The entire community of Kotlik is vulnerable to the effects of a severe winter storm.

Extent

Severe weather experienced by the City of Kotlik include thunderstorms, lightning, hail, heavy and drifting snow, freezing rain/ice storm, extreme cold, and high winds. The City experiences periodic severe weather events such as the following:

- **Heavy Rain**
- **Heavy Snow**
- **Drifting Snow**
- **Freezing Rain and Ice Storms**
- **Extreme Cold**
- **Winter Storms**

Impact

The impact to the community resulting from a severe winter storm is negligible. Structures and infrastructure have largely been constructed to withstand annual occurrences of severe winter storms. Thus, there is a small potential for injuries, less than 10 percent of property would be damaged, quality of life would be degraded to a minor degree, and the shutdown of critical facilities and services would occur for less than 24 hours. High winds resulting from the storms would pose the greatest risk. They can combine with loose snow to produce blinding blizzard conditions and dangerous wind chills. In addition, high winds have the potential to reach hurricane speed. Such winds may damage community facilities and infrastructure.

Probability

Severe winter storms occur annually along the western coast of Alaska, therefore the probability of a severe winter storm impacting Kotlik is highly likely.

5.3.5 Tsunami and Seiche

5.3.5.1 Nature

A tsunami is a series of waves generated in a body of water by an impulsive disturbance along the seafloor that vertically displaces the water. A seiche is an oscillating wave occurring within a partially or totally enclosed water body.

Subduction zone earthquakes along plate boundaries often cause tsunamis. However, submarine landslides, submarine volcanic eruptions, and the collapses of volcanic edifices may also generate tsunamis. A single tsunami may involve a series of waves, known as a train.

In open water, tsunamis exhibit long wave periods (up to several hours) and wavelengths that can extend up to several hundred miles, unlike typical wind-generated swells on the ocean, which might have a period of about 10 seconds and a wavelength of 300 feet.

The actual height of a tsunami wave in deep water is generally only 1 to 3 feet and is often undetected by people at sea. The energy of a tsunami passes through the entire water column to the seabed and may travel at speeds up to 700 miles per hour (mph). As the front portion of the wave approaches land, it drags on the rising sea bed and slows down, while the still rapidly travelling rear portion catches up to the front and the tsunami becomes compressed into a steeper and shorter wave. Therefore, the wave can increase to a height of 90 feet or more as it approaches the coastline and compresses.

Tsunamis will impact beaches open to the ocean, bay mouths, tidal flats, and the shores of large coastal rivers. Tsunami waves will also diffract around land masses and islands. Local tsunamis and seiches may be generated from earthquakes, underwater landslides, atmospheric disturbances, or avalanches and last from a few minutes to a few hours. Initial waves typically occur with very little advance warning. They occur more in Alaska than any other part of the United States.

Seiches occur within an enclosed water body such as a lake, harbor, cove or bay. They are locally event generated waves characterized as a “bathtub effect” where successive water waves move back and forth within the enclosed area, repeatedly impacting the shore until the energy is fully spent.

5.3.5.2 History

Tsunami events have not been officially documented in Kotlik; however, during the hazard screening process, a community elder reported that tsunami events have previously occurred on two occasions. The first account is of a tsunami Impacting Kotlik on November 10, 1952. The day was very calm and then someone noticed water coming onto land. Suddenly the sea ice burst, water rolled into the slough and raced through the City. Gasoline tanks drifted away with various other belongings. All homes in the community were flooded about knee high. The entire population (approximately 200) stayed in the Catholic Church for a couple of nights until water drained from the homes.

The second account of a tsunami event occurred in January 2005. Water remained in low-lying areas for more than 6 hours.

5.3.5.3 Location, Extent, Impact, and Probability of Future Events

Location

A tsunami would affect the entire community of Kotlik.

Extent

The most vulnerable areas of the State are the low-lying coastal areas in the Gulf of Alaska and those areas bordering the Pacific Ocean. Tsunami events usually occur in the heavily glaciated areas of Prince William Sound and the part of Southeast Alaska. Volcano-generated tsunamis are rare. However, they are a threat to the Aleutian Chain and parts of Cook Inlet. In Alaska, landslide generated tsunamis are responsible for most of the tsunami deaths as they allow virtually no warning period. Tsunamis generated by landslides in lakes occur more in Alaska than any other part of the U.S. They are associated with the collapse of deltas in glacial lakes having great depths. They may also be associated with delta deposits from rapidly flowing streams and rivers carrying glacial debris.

Impact

Impacts to the community are considered negligible with little potential for injuries, less that 10 percent of property damaged, minor quality of life lost, and shutdown of critical facilities and services for 24 hours or less. Specific impacts from a tsunami are similar to those resulting from flood events, including water damage to boardwalks, infrastructure and buildings (both critical and non-critical facilities) and structural damage to buildings caused by floating debris and ice being carried by the tsunami. All residents and critical and non-critical facilities are at risk of being impacted by a tsunami event, thus Kotlik is highly vulnerable to a tsunami event.

Probability

Historical information provided by community elders indicates that tsunami events are rare occurrences, and it is unlikely that a tsunami will impact Kotlik.

5.3.6 Wildfires

5.3.6.1 Nature

Fires can be divided into the following categories:

Structure Fires – Fires involving man made structures.

Prescribed Fires – ignited under predetermined conditions to meet specific objectives, to mitigate risks to people and their communities, and / or to restore and maintain healthy, diverse ecological systems.

Wildland Fire – any non-structure fire, other than prescribed fire, that occurs in the wildland.

Wildland Fire Use – a wildland fire functioning in its natural ecological role and fulfilling land management objectives.

Wildland-Urban Interface Fires – fires burning in an, area where human development meets undeveloped wildland. The potential exists in areas of wildland-urban interface for extremely dangerous and complex fire burning conditions, which pose a tremendous threat to public and firefighter safety.

5.3.6.2 History

Wildland fires have not been documented within the boundaries of Kotlik; however, wildland fires have occurred in the vicinity.

Table 5-7 identifies wildland fires that have occurred within 60 miles of Kotlik in the past 50 years.

Table 5-7. Wildland Fires near Kotlik

Fire Year	Fire Name/Number	Acres Burned
1959	91	15,290
1962	32	1,300
1962	30	2,000
1973	7718	914
1974	7788	2,700
1991	b239	1,770
1991	b242	10,181
1993	b221	335
1994	a204	569
1997	b610	324
1997	b609	257
1997	b615	412
2000	a383	12,891
2002	a301	101
2002	New Hamilton	10
2004	Pastolik River	17
2007	Kotlik River	71
2007	Pastolik River	692

Source: Alaska Fire Service, 2013

5.3.6.3 Location, Extent, Impact, and Probability of Future Events

Location

There are no wooded or wildland-urban interface areas within Kotlik. However, secondary effects of wildland fires, such as poor air quality, can be found throughout the community. Over the past 50 years, 14 significant fire events have occurred within 60 miles of Kotlik (Table 5-7, Figure 5-3).

Extent

Fuel, weather, and topography influence wildland fires. Given ideal conditions, wildland fires may advance rapidly and endanger all life in their path. Wildland fires have been observed advancing in excess of 50 miles per hour.

Impact

Impacts to the community are considered catastrophic with the potential for multiple deaths, complete shutdown of facilities for 30 or more days, and more than 50 percent of property severely damaged. Kotlik is considered a Level I Isolated village with no professional fire department. The City administers Rural Basic Firefighter training within the volunteer fire department. Residents have limited air and marine access to larger hub communities and must rely on their own resources for a significant period of time during a wildland fire.

Probability

Given the history of wildland fires near Kotlik, it is possible future wildland fire events will occur around Kotlik. While conditions in Kotlik are generally wet, the possibility of a dry season combined with high winds could lead to a catastrophic wildland fire event. The entire population and all critical and non-critical facilities are likely to be affected by wildland fire events, thus Kotlik is highly vulnerable to the effects of wildland fire.

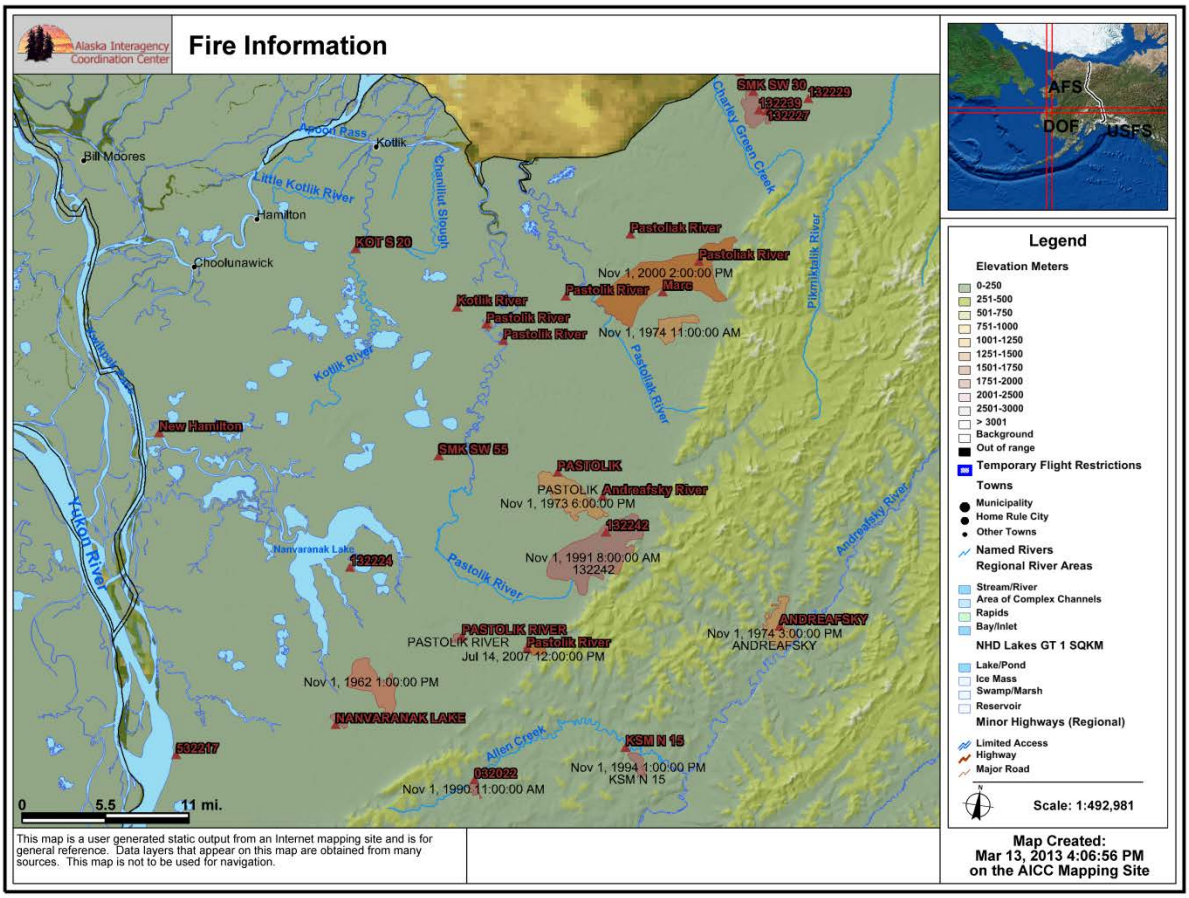


Figure 5-3 Kotlik Fire History Map

Source: Alaska Fire Service, 2013

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6.1 VULNERABILITY ANALYSIS OVERVIEW

According to recommendations stipulated in DMA 2000, a risk assessment and vulnerability analysis should include the following elements:

- A summary of the community's vulnerability to each hazard that addresses the impact of each hazard on the community.
- Identification of the types and numbers of RL properties in the hazard areas.
- Identification of the types and numbers of existing vulnerable buildings, infrastructure, and critical facilities and, if possible, the types and numbers of vulnerable future development.
- Estimation of potential dollar losses to vulnerable structures.
- Documentation of the methodology used to prepare the estimate.

A vulnerability analysis is divided into eight steps:

1. Asset Inventory
2. Asset Exposure Analysis
3. Repetitive Loss Properties
4. Land Use and Development Trends
5. Vulnerability Analysis Methodology
6. Identify Data Limitations
7. Vulnerability Exposure Analysis
8. Future Development

DMA 2000 Recommendations
Assessing Risk and Vulnerability, and Analyzing Development Trends §201.6(c)(2)(ii): The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. *All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods.* The plan should describe vulnerability in terms of: §201.6(c)(2)(ii)(A): The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; §201.6(c)(2)(ii)(B): An estimate of the potential dollar losses to vulnerable structures identified in … this section and a description of the methodology used to prepare the estimate. §201.6(c)(2)(ii)(C): Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.
1. REGULATION CHECKLIST
ELEMENT B. Risk Assessment, Assessing Vulnerability, Analyzing Development Trends
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))
B4. Does the Plan address NFIP insured structures within each jurisdiction that have been repetitively damaged by floods?
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements As appropriate? (Requirement §201.6©(3)(ii))
Source: FEMA, October 2011.

Table 6-1 lists the City of Kotlik infrastructures' hazard vulnerability.

Table 6-1 Vulnerability Overview

Hazard	Percent of Jurisdiction's Geographic area	Percent of Population	Percent of Building Stock	Percent of Critical Facilities and Utilities
Earthquake	**100%**	**100%**	**100%**	**100%**
Erosion	**30%**	**60%**	**62%**	**17%**
Flood	**100%**	**100%**	**100%**	**100%**
Ground Failure	**100%**	**100%**	**100%**	**100%**
Tsunami / Seiche	**100%**	**100%**	**100%**	**100%**
Volcano	**100%**	**100%**	**100%**	**100%**
Weather	**100%**	**100%**	**100%**	**100%**
Tundra / Wildland Fire	**100%**	**100%**	**100%**	**100%**

6.2 ASSET ANALYSIS

6.2.1 Asset Inventory

Assets that may be affected by hazard events include population (for community-wide hazards), residential buildings (where data is available), and critical facilities and infrastructure. The assets and associated values throughout the City of Kotlik are identified and discussed in detail in the following sections.

6.2.1.1 Population and Building Stock

Population data for the City were obtained from the 2010 U.S. Census and the State of Alaska Division of Community and Regional Affairs (DCRA). The U. S. Census reports the City's total population for 2010 as 577 and 2011 DCRA data reported a population of 601. (Table 6-2)

Table 6-2 Estimated Population and Building Inventory

Population		Residential Buildings	
2010 Census	**DCCED 2011 Data**	**Total Building Count**	**Total Value of Buildings1**
577	601	148	Census: $9,620,000 City: $14,060,000

Sources: U.S. Census 2010, and 2011 DCCED/DCRA Certified population data listed housing value at $65,000.
[1] Planning Team determined the average replacement value of all single-family residential buildings to be $95,000 per structure.

Estimated replacement values for those structures, as shown in Table 6-2, were obtained from the 2010 U.S. Census, and DCRA. A total of 148 single-family residential buildings were considered in this analysis. The City determined the residential replacement values are generally understated by the US Census. The City considers increased replacement cost in a remote environment.

6.2.1.2 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 6-3.

Table 6-3 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

6.2.1.3 Non-Critical Facilities

Table 6-4 identifies each residential household and the population of the household for year 2013.

Table 6-4 Kotlik Non-Critical Facilities

Household / Facility Name	Occupants	Household / Facility Name	Occupants
Mr. Anthony Akaran	5	Mr. David Mike	5
Mr. Ignatius Akaran	5	Mr. Ignatius Mike	5
Mr. Michael Akaran	1	Mr. Joseph Mike	2
Mr. Pius Akaran	2	Mr. Simeon Mike	4
Mr. Richie Akaran	5	Ms. Mary Ann Mike	9
Mr. Theodore Akaran	8	Ms. Lena Moses	5
Ms. Irene Akaran	1	Ms. Alvina Murphy	4
Mr. Anthony Aketachunak	4	Mr. William Murphy Sr.	7
Mr. Felix Aketachunak	0	Mr. Danny Odinzoff	6
Mr. Gregory Aketachunak	9	Mr. Joseph Odinzoff	6
Ms. Mary Rose Aketachunak	0	Mr. William Odinzoff Jr.	6
Ms. Mollie Aketachunak	2	Mr. Benedict Okitkun	3
Mr. Alfred Andrews	4	Mr. Darryl Okitkun	6
Mr. Brian Andrews	6	Mr. Harold Okitkun	5
Mr. Cyril Andrews	6	Mr. John Okitkun	9
Mr. Phillip Andrews	5	Mr. Marvin Okitkun	3
Mr. Ronald Andrews	9	Mr. Peter Okitkun	7
Ms. Clara Andrews	4	Mr. Reynold Okitkun	5
Ms. Margaret Andrews	2	Mr. Robert Okitkun	7
Mr. Hermes Aparezuk	6	Mr. Wayne Okitkun	5
Mr. Joe Aparezuk	3	Ms. Adela Okitkun	3
Mr. Robin Bender	1	Ms. Linda Okitkun	5
Ms. Rose Cheemuk	6	Ms. Maggie Okitkun	5
Ms. Felicity Demers	2	Mr. Jack Okitkun Sr.	6

Household / Facility Name	Occupants	Household / Facility Name	Occupants
Mr. Leonard Elachik	1	Mr. Martin Okitkun Sr.	7
Mr. Peter Elachik	10	Mr. Stan Paulson	1
Mr. James Fancyboy	8	Mr. Rodrick Pete	3
Ms. Martha Hootch	9	Mr. David Prince	0
Mr. Bernard Hunt	5	Mr. Ephrim Prince	0
Mr. Cyril Hunt	6	Mr. Joseph Prince	4
Mr. Hermus Hunt	1	Mr. Michael Prince	7
Mr. Isadore Hunt	3	Mr. Thomas Prince	6
Mr. Martin Hunt	6	Ms. Angela Prince	8
Ms. Darlene Hunt	4	Ms. Francis Prince	0
Ms. Francis Hunt	3	Ms. Laurie Prince	7
Ms. Maggie Hunt	1	Ms. Lorrena Prince	2
Ms. Marie Hunt	5	Ms. Sara Prince	6
Ms. Pauline Hunt	1	Ms. Elaine Savetilik	6
Mr. Andy Hunt Jr.	8	Mr. Ike Seton Sr.	4
Mr. Michael Hunt Sr.	7	Mr. Thomas Sinka	3
Ms. Martina Jack	8	Ms. Laurentia Sinka	5
Mr. Joe Johnson	6	Mr. Abraham Teeluk	7
Mr. Pat Kameroff	2	Mr. Alfred Teeluk	1
Mr. Benny Kamkoff	5	Mr. Billy Teeluk	6
Mr. Clifford Kamkoff	7	Mr. Raymond Teeluk	8
Ms. Anna Kamkoff	4	Mr. Robert Teeluk	1
Mr. Emmanuel Keyes	5	Ms. Agnes Teeluk	9
Ms. Alma Keyes	1	Mr. Morris Teeluk Sr.	7
Mr. Mathew Kitsick	6	Mr. Edward Tom	1
Mr. Harold Kitsick Sr.	5	Mr. John A Tonuchuk	4
Mr. Ralph Martin	4	Mr. Victor Tonuchuk	7

Household / Facility Name	Occupants	Household / Facility Name	Occupants
Mr. Clement Matthias	6	Mr. Walter Tonuchuk	0
Mr. Wilbur Tonuchuk	8	Mr. George Williams	1
Ms. Theresa Tonuchuk	4	Mr. Rudy Williams Jr.	8
Mr. Joe Uisok	10	Mr. Percy Yunak	1
Mr. Al Unok	13	Mr. Peter Yunak	5
Mr. William Unok	3	Ms. Louise Yunak	4
Ms. Mildred Unok	6	Kotlik Yupik Enterprises	0
Mr. Ralph Waska	7	Old High School	0
Mr. Vincent Waska	2	Old Special Education	0
Mr. Thomas Wasuli	2	Old Shop (Old Electric Plant)	0
Ms. Liz Wasuli	2	Shop (Tank)	0

6.2.2 Property Assessment Value

Table 6-5 provides an estimated replacement value for residential and critical facilities in Kotlik. Structure values were obtained during the asset data inventory during the winter of 2013. The estimated contents values were calculated after each structure was classified by occupancy class using HAZUS-MH.

Table 6-5 Kotlik Loss Estimates by Occupancy Class

Type of Structure (Occupancy Class)	# in Hazard Area	Estimated Value of Structure	Contents	
			HAZUS Contents Value (%) by Occupancy Class	Estimated Value of Contents
Residential	**119**	$ 14,060,000.00	50%	$ 5,652,500.00
Commercial	**4**	$ 8,228,600.00	150%	$ 12,342,900.00
Industrial	**0**	0	0	0
Religious/Non-Profit	**2**	$ 190,000.00	100%	$ 190,000.00
Government	**11**	$ 855,000.00	150%	$ 1,282,500.00
Education**	**11**	$ 987,500.00	150%	$ 1,481,250.00
Utilities	**15**	$ 3,365,334.00	NA	$ 3,365,334.00
Total	**162**	**$27,686,434.00**	NA	**$ 24,314,484.00**

Note: Estimated value of contents does not include values for utilities category (not available in HAZUS-MH)

The functional value is calculated by adding the structure value to the contents value. Displace values were unable to be provided. When these figures become available they will be included in the plan. Table 6-6 provides the loss estimates for critical facilities in Kotlik based on structure value and content value (when available). The functional value is the sum of structure and content value.

Table 6-6 Kotlik Critical Facility Loss Estimates

Name	Functional	Displace	Structure	Content	Other
Airport					
New Airport	$15,000,000	$0	$15,000,000	$0	$0
Cemetery					
Cemetery (new)	$0	$0	$0	$0	$0
Cemetery2					
Cemetery (old)	$0	$0	$0	$0	$0
Church					
Assembly of God	$400,000	$0	$200,000	$200,000	$0
Catholic Church	$400,000	$0	$200,000	$200,000	$0
Community Hall					
Community Center	$2,187,500	$0	$875,000	$1,312,500	$0
Fire Station					
Fire Station	$300,000	$0	$120,000	$0	$0
Fuel Storage Tanks (>500gal)					
Fuel Storage SE of Power Plant	$3,000,000	$0	$0	$0	$0
Kotlik Yupik Corp Fuel Farm	$0	$0	$0	$0	$0
Kotlik Yupik Corp Fuel Farm (2)	$0	$0	$0	$0	$0
Kotlik Yupik Corp Fuel Farm (3)	$0	$0	$0	$0	$0
Kotlik Yupik Corp Fuel Farm (4)	$0	$0	$0	$0	$0
Utility Fuel Tank (1)	$0	$0	$0	$0	$0
Utility Fuel Tank (2)	$0	$0	$0	$0	$0
Utility Fuel Tank (3)	$0	$0	$0	$0	$0
Utility Fuel Tank (5)	$0	$0	$0	$0	$0
Utility Fuel Tank (4)	$0	$0	$0	$0	$0
Generator					
Electric Plant/generator (New)	$2,500,000	$0	$1,000,000	$1,500,000	$0
School generator	$0	$0	$0	$0	$0
Hospital/Clinic/ER					
Health Clinic	$500,000	$0	$200,000	$300,000	$0
Landfill/Incinerator					
Municipal Landfill	$0	$0	$0	$0	$0
National Guard					
Armory	$2,750,000	$0	$1,100,000	$1,650,000	$0
Offices					
City Office	$200,000	$0	$80,000	$120,000	$0
Police Station					
Police Department	$300,000	$0	$120,000	$180,000	$0
Post Office					
Post Office	$212,500	$0	$85,000	$127,500	$0
Power Generation Facility					
Power Plant	$5,150,000	$0	$2,060,000	$3,090,000	$0
Reservoir/Water Supply					
Washeteria	$741,835	$0	$296,734	$445,101	$0
Water Plant	$32,500,000	$0	$13,000,000	$19,500,000	$0
Water Tank	$2,000,000	$0	$800,000	$1,200,000	$0

Satellite					
Cable Building	$15,000	$0	$15,000	$0	$0
School					
Head Start Pre-school	$500,000	$0	$200,000	$300,000	$0
LYSD School (Elementary & High)	$17,352,750	$0	$6,941,100	$10,411,650	$0
Sewage Lagoon					
City Sewage Lagoon	$0	$0	$0	$0	$0
Sanitation Garage	$36,100	$0	$36,100	$0	$0
Store					
A.C. Store Complex	$218,750	$0	$87,500	$131,250	$0
City Lodge/Hotel	$343,750	$0	$137,500	$206,250	$0
Laufkak	$218,750	$0	$87,500	$0	$0
Teachers Quarters					
Duplex (1)	$384,000	$0	$153,600	$230,400	$0
Duplex (2)	$384,000	$0	$153,600	$230,400	$0
Duplex (3)	$384,000	$0	$153,600	$230,400	$0
Principal's House	$384,000	$0	$153,600	$230,400	$0
Teacher Housing (1)	$384,000	$0	$153,600	$230,400	$0
Teachers Housing (2)	$384,000	$0	$153,600	$230,400	$0
Teachers Housing (3)	$384,000	$0	$153,600	$230,400	$0
Telephone					
United Utilities Telephone	$0	$0	$0	$0	$0
Totals	$89,514,935	$0	$43,716,634	$42,487,051	$0

Table 6-7 illustrates the vulnerability assessment, which includes the population and the number of residential and critical facility structures affected for each identified hazard.

Table 6-7 Vulnerability Assessment – Population, Residential Structures, and Critical Facilities

		Residential Structures				Critical Facilities				Total			
Hazard	Pop.	No.	Structure Value	Contents Value	Total Value	No.	Structure Value	Contents Value	Value	No.	Structure Value	Contents Value	Value
Earthquake	601	148	$14,060,000	$5,652,500	$19,712,500	35	$44,016,634	$42,798,301	$86,514,935	154	$58,076,634	$48,450,801	$106,527,435
Erosion	338	77	$7,315,000	$3,657,500	$10,972,500	6	$767,500	$951,250	$1,718,750	83	$8,082,500	$4,608,750	$12,691,250
Flooding	601	148	$14,060,000	$5,652,500	$19,712,500	35	$44,016,634	$42,798,301	$86,514,935	154	$58,076,634	$48,450,801	$106,527,435
Severe Weather	601	148	$14,060,000	$5,652,500	$19,712,500	35	$44,016,634	$42,798,301	$86,514,935	154	$58,076,634	$48,450,801	$106,527,435
Wildfire	601	148	$14,060,000	$5,652,500	$19,712,500	35	$44,016,634	$42,798,301	$86,514,935	154	$58,076,634	$48,450,801	$106,527,435
Tsunami	601	148	$14,060,000	$5,652,500	$19,712,500	35	$44,016,634	$42,798,301	$86,514,935	154	$58,076,634	$48,450,801	$106,527,435

6.3 VULNERABILITY ANALYSIS METHODOLOGY

A conservative exposure-level analysis was conducted to assess the risks of the identified hazards. This analysis is a simplified assessment of the potential effects of the hazards on values at risk without consideration of probability or level of damage.

The methodology used a two pronged effort. First, The Project Team used the State's Critical Facility Inventory and locally obtained GPS coordinate data to identify critical facility locations in relation to potential hazard's threat exposure and vulnerability. Second this data was used to develop a vulnerability assessment for those hazards where GIS based hazard mapping information was available.

Replacement structure and contents values were developed for physical assets. These value estimates were provided by the Planning Team. For each physical asset located within a hazard area, exposure was calculated by assuming the worst-case scenario (that is, the asset would be completely destroyed and would have to be replaced). Finally, the aggregate exposure, in terms of replacement value or insurance coverage, for each category of structure or facility was estimated. A similar analysis was used to evaluate the proportion of the population at risk. However, the analysis simply represents the number of people at risk; no estimate of the number of potential injuries or deaths was prepared.

6.4 DATA LIMITATIONS

The vulnerability estimates provided herein use the best data currently available, and the methodologies applied result in a risk approximation. These estimates may be used to understand relative risk from hazards and potential losses. However, uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning hazards and their effects on the built environment as well as the use of approximations and simplifications that are necessary for a comprehensive analysis.

It is also important to note that the quantitative vulnerability assessment results are limited to the exposure of people, buildings, and critical facilities and infrastructure to the identified hazards. It was beyond the scope of this HMP to develop a more detailed or comprehensive assessment of risk (including annualized losses, people injured or killed, shelter requirements, loss of facility/system function, and economic losses). Such impacts may be addressed with future updates of the HMP.

6.5 Exposure Analysis – Hazard Narrative Summaries

Earthquake

The City and surrounding area can expect to experience significant earthquake ground movement resulting in damage to infrastructure. Minor shaking may be seen or felt based on past events. Although all structures are exposed to earthquakes, buildings constructed of wood exhibit more flexibility than those utilizing unreinforced masonry, (URM).

Based on the geographic location of Kotlik, it is unlikely that an earthquake would be centered in an area around Kotlik. However, the entire population of Kotlik, residential structures and critical facilities are vulnerable to an earthquake. This includes 601 people in 148 residences valued at $19,712,500 and all 15 critical facilities worth approximately $86,514,935. The total economic loss is estimated to be $103,772,435.

Erosion

Based on estimates of potential erosion in 50 years from the Kotlik Bank Protection Feasibility Study completed in 2003, any future assets and infrastructure constructed within 300 feet of the riverbank would likely be vulnerable to the effects of erosion.

A. Population

Approximately 350 people are vulnerable, or 60 percent of the community's population.

B. Critical Facilities

(1) Approximately 20 percent of the community's critical facilities are vulnerable.

(2) The specific critical facilities vulnerable are:

- AC Store
- Head Start Preschool
- City Office
- Assembly of God Church
- Catholic Church
- Municipal Landfill

C. Non-Critical Facilities

(1) Approximately 62 percent of the community's non-critical facilities are vulnerable.

(2) There are 82 non-critical facilities at risk of damage from erosion, 77 of which are residential structures and the remaining 5 include the Kotlik Yupik Enterprises building, the old high school, the old special education building, the old shop, and the shop (tank).

D. Economic Loss

The economic loss resulting from this hazard is approximately $12,691,250.

E. Structure Loss

The loss from damage to structures from this hazard is approximately $8,082,50.

Flood

No detailed 100 year flood analysis has been prepared for the City. The USACE Floodplain Manager does not provide flood information or a 100 year floodplain map for the City of Kotlik.

The entire population of Kotlik, residential structures and critical facilities are vulnerable to flooding. This includes 601 people in 148 residences valued at $19,712,500 and all 15 critical facilities worth approximately $86,514,935. The total economic loss is estimated to be $103,772,435.

The City anticipates that impacts to future populations, residential structures, critical facilities, and infrastructure are at the same historical impact level.

Severe Weather

The entire population of Kotlik, residential structures and critical facilities are vulnerable to severe weather. This includes 601 people in 148 residences valued at $19,712,500 and all 15 critical facilities worth approximately $86,514,935. The total economic loss is estimated to be $103,772,435.

Tsunami and Seiche

The WC/ATWC indicates there is no threat from distant source tsunamis; however the WC/ATWC has indicated there is minimal threat from potential unknown local source tsunamis. The entire population of Kotlik, residential structures and critical facilities are vulnerable to tsunami and seiche. This includes 601 people in 148 residences valued at $19,712,500 and all 15 critical facilities worth approximately $86,514,935. The total economic loss is estimated to be $103,772,435.

Wildland Fire

Recorded wildland fires occurring within 60 miles of Kotlik recur approximately every 5 years. Given the history of wildland fires near Kotlik, it is possible future wildland fire events will occur around Kotlik. The entire population of Kotlik, residential structures and critical facilities are vulnerable to wildland fires. This includes 601 people in 148 residences valued at $19,712,500 and all 15 critical facilities worth approximately $86,514,935. The total economic loss is estimated to be $103,772,435.

6.6 REPETITIVE LOSS PROPERTIES

This section estimates the number and type of structures at risk to repetitive flooding.

DMA 2000 Requirements
Addressing Risk and Vulnerability to NFIP Insured Structures §201.6(c)(2)(ii): The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. *All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods.* The plan should describe vulnerability in terms of: §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of] the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; §201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; §201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions. §201.6(c)(3)(ii): The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.
1. REGULATION CHECKLIST
ELEMENT B. NFIP Insured Structures
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods?
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate?
Source: FEMA, October 2011.

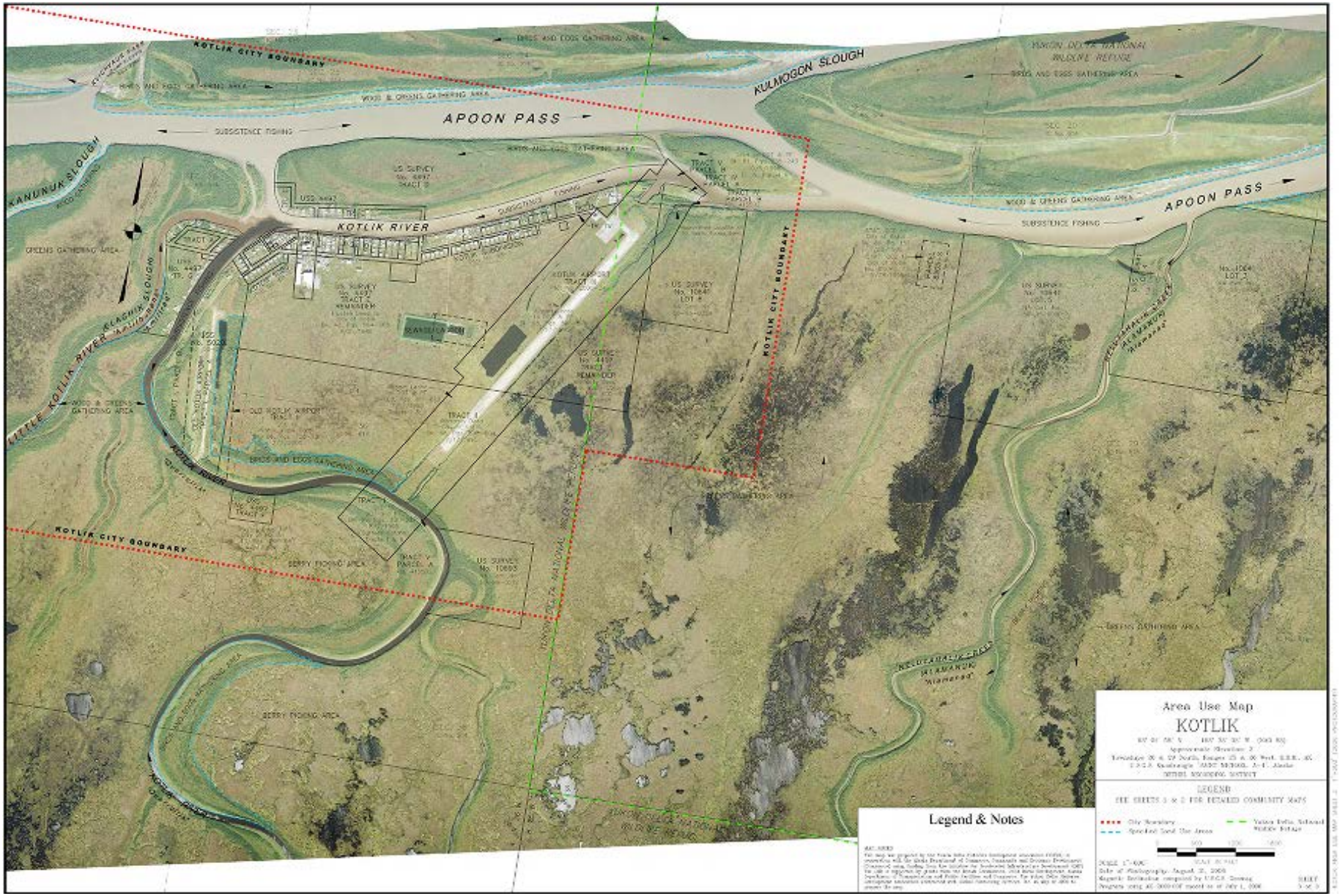
RL properties have had at least two $1,000 claims within any 10-year period since 1978. SRL properties have experienced four or more separate building and content claims since 1978 each exceeding $5,000 with cumulative claims exceeding $20,000; or at least two separate building claims with cumulative losses exceeding the value of the main living structure.

The City of Kotlik does not participate in the NFIP neither do they have a repetitive flood property inventory that meets the RL or SRL criteria as the loss thresholds are substantially below FEMA values.

6.7 LAND USE AND DEVELOPMENT TRENDS

6.7.1 Kotlik Land Use

Land use in Kotlik is predominately residential with some areas of commercial and services, light industrial, and community facilities (or institutional). Suitable developable vacant land is in short supply within the boundaries of Kotlik, and open space and various hydrological bodies surround the community. Two areas of town are classified as airport land use. Figure 6-1 is a land use map for the City of Kotlik.


KOTLIK CITY BOUNDARY
KULAGGON SLOUGH
APOON PASS
SUBSISTENCE FISHING
KANUNUK SLOUGH
KOTLIK RIVER
APOON PASS
SUBSISTENCE FISHING
KOTLIK CITY BOUNDARY
KOTLIK CITY BOUNDARY
Area Use Map
KOTLIK
Legend & Notes

Although the City of Kotlik has no formal zoning or other land use controls, the Community Plan provides a framework for future land use classifications. The following identifies existing structures in the community and places them in land use categories in accordance with the Kotlik Community Plan:

Commercial land uses within Kotlik include the KYE building as well as some critical facilities such as: the AC Store, washeteria, and City Lodge.

Light industrial land in Kotlik is grouped into occupancy classes such as government, utilities, and educational facilities. Industrial land uses are generally kept a safe distance from residential development due to pollution or other potentially hazardous or dangerous byproducts that can develop and occur with industrial activity. The following list identifies critical structures classified as light industrial:

- Fuel Storage
- Kotlik Yupik Corp. Fuel Farm
- School (new and old) Generator
- Kotlik Class 3 Landfill
- Power Plant
- Water Plant and Tank
- Honey Bucket Lagoon
- School Sewage Lagoon

Community facilities, such as schools and government are classified under institutional land. They include:

- Baptist Church
- Catholic Church
- Community Center
- Assembly of God
- Public Safety Building
- Health Clinic
- Armory
- Post Office
- High School
- Elementary School
- Head Start Pre-School
- Teen Center
- Cemetery

6.7.2 Kotlik Development Trends

State of Alaska Division of Community and Regional Affairs estimates the 2011 population of Kotlik at 601, up from the 2010 census count at 577. There are currently 148 total housing units with 128 full time, 7 seasonal use, and 13 vacant houses. Development will likely keep pace with any future population growth in the City of Kotlik.

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This section outlines the six-step process for preparing a mitigation strategy including:

1. Identifying each jurisdiction's existing authorities for implementing mitigation action initiatives
2. NFIP Participation
3. Developing Mitigation Goals
4. Identifying Mitigation Actions
5. Evaluating Mitigation Actions
6. Implementing Mitigation Action Plans

DMA 2000 Requirements
Identification and Analysis of Mitigation Actions §201.6(c)(3): [The plan shall include the following:] A *mitigation strategy* that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing tools. §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards. §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. §201.6(c)(3)(iii): [The hazard mitigation strategy shall include an] action plan, describing how the action identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs. §201.6(c)(3)(iv): [For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan. Requirement §201.6(c)(4): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvements, when appropriate.
ELEMENT C. Mitigation Strategy
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs?
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? *(Addressed in Section 6.4)*
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards?
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction?

7.1 CITY OF KOTLIK CAPABILITY ASSESSMENT

The City's capability assessment reviews the technical and fiscal resources available to the community.

DMA 2000 Requirements
Incorporation into Existing Planning Mechanisms §201.6(c)(3): [The plan shall include the following:] A *mitigation strategy* that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs, and resources, and its ability to expand on and improve these existing tools.
ELEMENT C. Incorporate into Other Planning Mechanisms
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs?
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate?
Source: FEMA, October 2011.

This section outlines the resources available to the City of Kotlik for mitigation, mitigation related funding and training. Tables 7-1, 7-2, and 7-3 delineate the City's regulatory tools, technical specialists, and financial resource available for project management. Additional funding resources are identified in Appendix A.

Table 7-1 Regulatory Tools

Regulatory Tools (ordinances, codes, plans)	Existing?	Comments (Year of most recent update; problems administering it, etc.)
Comprehensive Plan	Yes	Comprehensive Economic Development Strategic Plan, June 2004. Prepared by the Kotlik Tribal Council, provides goals and actions for economic development.
Land Use Plan	Yes	Kotlik Community Development Plan, June 2010. Prepared by the Kotlik Tribal Council, includes City of Kotlik.
Tribal Corporation Land Use Plan	Yes	Kotlik Community Development Plan, June 2010. Prepared by the Kotlik Tribal Council, plans land usage with regard to economic development.
Emergency Response Plan	No	
Wildland Fire Protection Plan	No	
Building codes	No	
Fire Insurance Rating	No	
Zoning ordinances	No	
Subdivision ordinances or regulations	No	
Special purpose ordinances	No	

Local Resources

The City has a number of planning and land management tools that will allow it to implement hazard mitigation activities. The resources available in these areas have been assessed by the hazard mitigation planning team, and are summarized below.

Table 7-2 Technical Specialists for Hazard Mitigation

Staff/Personnel Resources	Y/N	Department/Agency and Position
Planner or engineer with knowledge of land development and land management practices	No	
Engineer or professional trained in construction practices related to buildings and/or infrastructure	No	
Planner or engineer with an understanding of natural and/or human-caused hazards	No	
Floodplain Manager	No	
Surveyors	No	
Staff with education or expertise to assess the jurisdiction's vulnerability to hazards	No	
Personnel skilled in Geospatial Information System (GIS) and/or Hazards Us-Multi Hazard (Hazus-MH) software	No	
Scientists familiar with the hazards of the jurisdiction	No	
Emergency Manager	No	
Grant Writers	No	
Public Information Officer	No	

Table 7-3 Financial Resources Available for Hazard Mitigation

Financial Resource	Accessible or Eligible to Use for Mitigation Activities
General funds	Can exercise this authority with voter approval
Community Development Block Grants	Can exercise this authority with voter approval
Capital Improvement Project Funding	Can exercise this authority with voter approval
Authority to levy taxes for specific purposes	Can exercise this authority with voter approval
Incur debt through general obligation bonds	Can exercise this authority with voter approval
Incur debt through special tax and revenue bonds	Can exercise this authority with voter approval
Incur debt through private activity bonds	Can exercise this authority with voter approval
Hazard Mitigation Grant Program (HMGP)	FEMA funding which is available to local communities after a Presidentially-declared disaster. It can be used to fund both pre- and post-disaster mitigation plans and projects.
Pre-Disaster Mitigation (PDM) grant program	FEMA funding which available on an annual basis. This grant can only be used to fund pre-disaster mitigation plans and projects only
Flood Mitigation Assistance (FMA) grant program	FEMA funding which is available on an annual basis. This grant can be used to mitigate repetitively flooded structures and infrastructure to protect repetitive flood structures.
United State Fire Administration (USFA) Grants	The purpose of these grants is to assist state, regional, national or local organizations to address fire prevention and safety. The primary goal is to reach high-risk target groups including children, seniors and firefighters.
Fire Mitigation Fees	Finance future fire protection facilities and fire capital expenditures required because of new development within Special Districts.

The planning team developed the mitigation goals and potential mitigation actions for the City of Kotlik within Section 5.3.

7.2 DEVELOPING MITIGATION GOALS

The DMA 2000 required local hazard mitigation goals are described below.

DMA 2000 Requirements
Local Hazard Mitigation Goals §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.
Element C. Mitigation Goals
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards?
Source: FEMA, October 2011.

The exposure analysis results were used as source material for developing the mitigation goals and actions. Mitigation goals are long-range, policy-oriented statements representing community-wide

visions. As such, eleven goals were developed to reduce or avoid long-term vulnerabilities to the identified hazards (Table 7-4). **Update,** on January 23, 2013, the original goal statements were reviewed by the Planning Team. Goals 2, 4, 7, 8, 9 and 11 were changed from "promoting public education" to "promoting public awareness". "Public education" was determined to be a mitigation action used to achieve public awareness.

Table 7-4 Mitigation Goals

No.	Goal Description
1	Reduce Possibility of damage and losses from erosion.
2	Increase public awareness of erosion related problems and prevention.
3	Reduce the risk of damage and losses from flooding.
4	Promote public awareness of potential impacts from wildland fires.
5	Reduce the risk of damage and losses from wildland fires.
6	Reduce vulnerability of structures to earthquake damage.
7	Promote public awareness of earthquake hazards.
8	Increase public access to emergency advisory information.
9	Promote public awareness regarding severe winter storm hazards.
10	Reduce vulnerability of structures to severe winter storm damage.
11	Promote public awareness of tsunami hazards.

7.3 IDENTIFYING MITIGATION ACTIONS

The DMA 2000 requirements identifying and analyzing mitigation actions are below.

DMA 2000 Requirements
Identification and Analysis of Mitigation Actions §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.
ELEMENT C. Mitigation Actions
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure?
Source: FEMA, October 2011.

The Planning Team reviewed their local capabilities and risk assessment, and applied the results to their mitigation action review. Mitigation actions are activities, measures, or projects implemented to achieve the goals of a mitigation plan. Mitigation actions are grouped into three broad categories: property protection, public education and awareness, and structural projects. On January 23, 2013, the Planning Team reviewed their mitigation actions for the renewal of this HMP. The Planning Team placed particular emphasis on projects and programs that reduce the effects of hazards on both new and existing buildings and infrastructure as well as facilities located in potential flood zones in compliance with NFIP requirements should the City join the NFIP.

The City of Kotlik has not completed a detailed cost benefit analysis for their selected mitigation actions. However, cost-benefit methodology was addressed during the public planning forum.

Table 7-5 Mitigation Goals and Related Actions

Goals		Actions	
No.	**Description**	**ID**	**Description and Status**
1	Reduce possibility of damage and losses from erosion.	1.1	Identify buildings that are at risk of impact from erosion. **Completed in 2011**
		1.2	Identify riverbank protection methods and grants. **Ongoing**
2	Increase public awareness of erosion related problems and prevention.	2.1	Research information regarding riverbank erosion problems, prevention, and mitigation. **Research ongoing.**
3	Reduce the possibility of damage and losses from flooding.	3.1	Adopt and enforce floodplain management ordinances. **No movement, action retained pending further information from the State.**
		3.2	Identify and assess repetitively flooded properties. **Completed in 2011**
		3.3	Enhance warning and response activities to increase warning time for the community. **Ongoing collaboration with National Weather Service**
4	Promote public awareness of potential impacts from wildland fires.	4.1	Identify impacts resulting from excessive wildland fire and smoke. **Completed in 2010.**
		4.2	Identify techniques to guard against wildland fire and smoke damage. **Cpmpleted in 2010**
5	Reduce the risk of damage and losses from wildland fires.	5.1	Identify methods of alerting the community if wildfire threat develops. **Completed in 2010**
		5.2	Develop an evacuation plan for the community. **Adopted flood evacuation plan which also works for fire. 2009**
		5.3	Maintain Project Code Red Equipment. **Ongoing maintenance project**
		5.4	Promote FireWise building design, sites, and construction materials. **Ongoing but not mandated.**

Table 7-5 Mitigation Goals and Related Actions

Goals		Actions	
No.	**Description**	**ID**	**Description**
6	Reduce vulnerability of structures to earthquake damage	6.1	Encourage use of earthquake resistant materials and construction practices. **Ongoing but not mandated.**
		6.2	Ensure all future development meets all requirements for seismic protection. **Dropped during 2013 review.**
7	Promote public awareness of earthquake hazards	7.1	Educate the community about what to do in the event of an earthquake. **Ongoing through the local school.**
		7.2	Educate the community about ways to mitigate damages to structures and non-structures, such as book cases. **Ongoing**
8	Increase public access to emergency advisory information.	8.1	Provide access to a current weather watch and advisory information. **Partially complete and ongoing as of 2013.**
		8.2	Investigate emergency broadcast capabilities in western Alaska. **Completed in 2010.**
		8.3	Investigate opportunities to participate in the National Warning system to receive weather warning information from the NWS. **Completed in 2010**
		8.4	Obtain more accurate flood warning information. **Ongoing with the NWS**
9	Promote public awareness regarding severe winter storm hazards.	9.1	Participate in Winter Weather Awareness Week and Flood Awareness Week. **Action had been neglected, but is revived for 2013.**
		9.2	Conduct community alert tests for National Oceanic and atmospheric Administration (NOAA) warning tones. **No Siren, Goal Dropped in 2013..**
10	Reduce vulnerability of structures to severe winter storm damage	10.1	Encourage use of weather resistant materials and construction practices. **Ongoing**
11	Promote public awareness of tsunami hazards	11.1	Educate the community about what to do in the event of an earthquake. **Ongoing**

7.4 EVALUATING AND PRIORITIZING MITIGATION ACTIONS

The DMA 2000 requirements for evaluating and implementing mitigation actions are below.

DMA 2000 Requirements: Mitigation Strategy - Implementation of Mitigation Actions
Implementation of Mitigation Actions §201.6(c)(3)(iii): [The hazard mitigation strategy shall include an] action plan, describing how the action identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.
ELEMENT C. MITIGATION STRATEGY
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))
Source: FEMA, October 2011.

The planning team evaluated and prioritized each local hazard and corresponding mitigation action on January 23, 2013. The selected mitigation actions are included in the Mitigation Action Plan. The Mitigation Action Plan represents mitigation projects and programs to be implemented through the cooperation of the community.

The planning team reviewed the simplified social, technical, administrative, political, legal, economic, and environmental (STAPLEE) evaluation criteria (shown in Table 7-6) and the Benefit-Cost Analysis Fact Sheet (Appendix E) considering the opportunities and constraints of each mitigation action. Each action considered for implementation is accompanied by a qualitative statement addressing the benefits, costs and, where available, a technical feasibility study. A detailed cost-benefit analysis is anticipated as part of the project application process.

Table 7-6 Evaluation Criteria for Mitigation Actions

Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE)

Evaluation Category	Discussion "It is important to consider…"	Considerations
Social	The public support for the overall mitigation strategy and specific mitigation actions.	Community acceptance Adversely affects population
Technical	If the mitigation action is technically feasible and if it is the whole or partial solution.	Technical feasibility Long-term solutions Secondary impacts
Administrative	If the community has the appropriate personnel and administrative capabilities or if outside help is necessary.	Staffing Funding allocation Maintenance/operations
Political	Public perceptions related to the environment, economic development, safety, and emergency management.	Political support Local champion Public support
Legal	Whether the community has the legal authority to implement the action, or whether the community must pass new regulations.	Local, State, and Federal authority Potential legal challenge
Economic	If current or future funding sources may be applied. If the costs seem reasonable for the size of the project. If enough information is available to complete a Federal Emergency Management Agency (FEMA) Benefit- Cost Analysis.	Benefit/cost of action Contributes to other economic goals Outside funding required FEMA Benefit-Cost Analysis
Environmental	The impact on the environment because of public desire for a sustainable and environmentally healthy community.	Effect on local flora and fauna Consistent with community environmental goals Consistent with local, state, and Federal laws

On January 23, 2012, planning team prioritized eleven mitigation actions according to the hazard vulnerability assessment. The Team selected a high, medium, and low rating system. Actions receiving a High priority address hazards impacting the community on an annual or near annual basis and damage critical facilities or people. Actions receiving a medium priority address hazards impacting the community less frequently and are typically not a threat to critical facilities or people. Actions receiving a low priority rarely impact the community and have rarely impacted critical facilities or people.

The Mitigation Action Priority Matrix arranges goals for the Mitigation Action Plan, (Table 7-7).

7.5 IMPLEMENTING A MITIGATION ACTION PLAN

Table 7-7 Mitigation Action Priority Matrix

(See acronym and abbreviations list for complete titles)

Goals		Rank	Action Number and Action
1	Reduce possibility of damage and losses from erosion.	HIGH	ER1 – Create erosion hazard mapping.
			ER2 – Relocate buildings that are at risk of being affected by erosion.
			ER3 – Apply for grants and other funding mechanisms to implement riverbank protection methods.
2	Promote erosion prevention education.		ER4 – Hold a series of community meetings to provide information to residents.
			ER5 – Provide information on riverbank erosion and ways to halt and prevent it in a format that can be distributed to all residents.
3	Reduce the possibility of damage and losses from flooding.	HIGH	F1 – Join the NFIP, which regulates development in floodplains and provides federally-backed insurance to individuals who live in communities that have joined the program.
			F2 – Relocate, acquire, elevate, or otherwise flood-proof identified properties and critical facilities.
			F3 – Complete a detailed inventory of community structures and infrastructure, including all critical facilities that are susceptible to flooding in GIS.
			F4 – Install streamflow and rainfall measuring gauges.
			F5 – Develop “real-time” internet access and interagency cooperation to speed flood warning times.
4	Promote recognition of wildland fire and preparation for impacts from wildland fire.	MEDIUM	W1 – Provide information in a format that can be distributed to residents.
5	Reduce possibility of damage and losses from wildland fires.		W2 – Schedule and perform “fire drills” at least twice per year.
			W3 – Develop a workshop for builders.
			W4 – Retrofit structures with FireWise building design materials.

Goals		Rank	Action Number and Action
6	Reduce vulnerability of structures to earthquake damage.	MEDIUM	EQ1 – Implement Uniform International and State Building Codes.
			EQ2 – Have all new construction inspected and certified.
7	Promote public education regarding earthquake hazards.		EQ3 – Hold a series of community meetings to train on earthquake safety and hold drills at schools.
			EQ4 – Hold workshop to identify household mitigation measures.
8	Promote public access to emergency advisory information.	HIGH	SWS1 – Purchase NOAA radios and develop web portal (NWS, FEMA, The Weather Channel).
			SWS2 – Send at least two volunteers to NWS storm spotter training.
			SWS3 – Contact USGS and request meeting to discuss installation and maintenance of real-time stream and precipitation gage.
9	Promote public education regarding severe winter storm hazards.		SWS4 – Develop workshop at school and have students display mitigation projects.
			SWS5 – Contact NOAA, City Police and Fire Departments, and Volunteer Fire Department and to coordinate test.
10	Reduce vulnerability of structures to severe winter storm damage.		SWS6 – Implement Uniform International and State Building Codes.
11	Promote public education regarding tsunami hazards.	LOW	T1 – Conduct a series of community meetings to train on tsunami safety and hold drills at schools.

The planning team and the Kotlik City Mayor reviewed the list, and voted to implement six mitigation actions into their mitigation action plan. The results are outlined in Table 7-8.

Table 7-8 Mitigation Action Plan Matrix

ER2	Action Item	Relocate buildings that are at risk of being affected by erosion.
	Ranking	High
	Department / Agency	City Council; KTC
	Potential Funding Source	DHS Preparedness Technical Assistance Program; PDM Grants
	Implementation Timeline	1 to 5 years
	Benefit-Costs	This mitigation action addresses buildings at risk of destruction due to forces caused by erosion.
ER3	Action Item	Apply for grants and other funding mechanisms to implement riverbank protection methods.
	Ranking	High
	Department / Agency	City Council; KTC
	Potential Funding Source	DHS Preparedness Technical Assistance Program; HMGP; PDM Grants
	Implementation Timeline	1 to 2 years
	Benefit-Costs	This mitigation action has the potential to prevent future development in hazard-prone areas. Also, this mitigation action may provide funding for action item ER2.
F1	Action Item	Join NFIP, which regulates development in floodplains and provides federally backed insurance to individuals who live in communities that have joined the program.
	Ranking	High
	Department / Agency	City Council
	Potential Funding Source	DHS Preparedness Technical Assistance Program; HMGP; PDM Grants
	Implementation Timeline	1 to 5 years
	Benefit-Costs	Joining NFIP will provide the opportunity to be insured against the devastating financial losses of flood damage and reduce future flood damage through required sound floodplain management practices.
EQ3	Action Item	Hold a series of community meetings to train on earthquake safety and hold drills at schools.
	Ranking	Medium
	Department / Agency	City Council; LYSD
	Potential Funding Source	Lindbergh Grants Program
	Implementation Timeline	1 to 5 years
	Benefit-Costs	Education based on-going mitigation action improving earthquake safety in the community and providing skills and safety behaviors for use when traveling to earthquake prone areas.
SWS4	Action Item	Develop a workshop at school and have students display mitigation projects.
	Ranking	High
	Department / Agency	City Council; LYSD
	Potential Funding Source	Lindbergh Grants Program
	Implementation Timeline	1 to 5 years
	Benefit-Costs	Education based on-going mitigation action improving severe winter storm safety in the community, and providing skills and safety behaviors for use when traveling to areas of severe winter weather.
T1	Action Item	Conduct a series of community meetings to train on tsunami safety and hold drills at schools.
	Ranking	Low
	Department / Agency	City Council; LYSD
	Potential Funding Source	Lindbergh Grants Program
	Implementation Timeline	1 to 5 years
	Benefit-Costs	Education based on-going mitigation action improving tsunami safety in the community and providing skills and safety behaviors for use when traveling to tsunami prone areas.

7.6 IMPLEMENTATION THROUGH EXISTING PLANNING MECHANISMS

DMA 2000 Requirements
Incorporation into Existing Planning Mechanisms §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.
ELEMENT C. Incorporate into Other Planning Mechanisms
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate?
Source: FEMA, October 2011.

Upon adoption of the HMP, the planning team will ensure its incorporation into existing planning mechanisms by undertaking the following activities:

- ☐ Review the community-specific regulatory tools to determine where to integrate the mitigation philosophy and implementable initiatives. These regulatory tools are identified in Section 7.1 capability assessment.
- ☐ Involve community departments when implementing HMP goals and actions into relevant planning mechanisms, such as the Economic Development Plan.
- ☐ Implementing HMP goals and actions may require updating or amending specific planning mechanisms.

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APPENDIX A:
LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: **City of Kotlik**	**Title of Plan:** **Local Hazard Mitigation Plan**	**Date of Plan:** **May 2013**
Local Point of Contact: **Lori Mike**	**Address:** **City of Kotlik** **P. O. Box 20268** **Kotlik, AK 99620**	
Title: **City Manager**		
Agency: **City of Kotlik**		
Phone Number: **907-899-4313**	**E-Mail:** **cityofkotlik@yahoo.com**	

State Reviewer: **Scott Nelsen**	**Title: Mitigation Planner**	**Date: 4-24-2013**

FEMA Reviewer: Brett Holt	**Title:** Mitigation Planner	**Date:** June 3, 2013; July 12, 2013
Date Received in FEMA Region X	April 24, 2013; July 11, 2013	
Plan Not Approved		
Plan Approvable Pending Adoption	July 12, 2013	
Plan Approved	December 5, 2013	

SECTION 1:
REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Ch. 3-2 to 3-4	X	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Ch. 3-3	X	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	3-3; Appendix F	X	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Ch. 3-3 to 3-4; Ch. 8	X	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	3-5 to 3-6	X	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	3-6 to 3-7	X	
ELEMENT A: REQUIRED REVISIONS			

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	5-2, 5-5 to 5-22	X	
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	5-2, 5-5 to 5-22	X	
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	5-5 to 5-22, 6-11 to 6-13	X	
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	1-3, 6-13 to 6-14	N/A	
ELEMENT B: REQUIRED REVISIONS			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	7-1 to 7-4	X	
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	6-13 to 6-14	N/A	
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	7-4 to 7-5	X	
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	7-5 to 7-7, 7-12	X	
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	7-8 to 7-12	X	
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	7-13	X	
ELEMENT C: REQUIRED REVISIONS			

1. REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Ch. 2, 6-14 to 6-16	X	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	pp. 7-5 to 7-7	X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	pp. 7-4 to 7-12	X	
ELEMENT D: REQUIRED REVISIONS			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	4-1, appendix B-pg. 3	X	
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	N/A		
ELEMENT E: REQUIRED REVISIONS **Element E1**: The plan will need to be adopted by the community upon FEMA providing APA status.			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1.			
F2.			
ELEMENT F: REQUIRED REVISIONS			

SECTION 2:

PLAN ASSESSMENT

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

Plan Strengths

- The plan provides detail on how to monitor and update the plan.

Opportunities for Improvement

- Consider documenting each specific meeting, the agendas and meeting minutes from each one. This will help the next plan developer in updating the plan so they can repeat the same process. It's not guaranteed that the same person who develops this plan will be the same person next time so documenting everything is critical to ensure the plan is updated without much difficulty.

Element B: Hazard Identification and Risk Assessment

Plan Strengths

- The vulnerability analysis provides a good level of detail for the community to prioritize strategies based on most vulnerable areas.
- The vulnerability analysis methodology is described very well.

Opportunities for Improvement

- For the vulnerability analysis, the plan states on page 6-11 that GIS data was obtained but there are no maps identifying any locations or losses. Consider displaying maps in the next plan update.
- Consider the use of maps to show the location, probability, and impacts of the hazards within the community. This includes erosion, flood, wildfire and tsunami.
- The State is working on new tsunami inundation maps. Contact the State to see when they will be released for Kotlik.

Element C: Mitigation Strategy

Plan Strengths

- Focusing on six identified strategies to implement in the next 5 years is a good decision.

Opportunities for Improvement

- On page 7-5, The plan states "The Planning Team placed particular emphasis on projects and programs that reduce the effects of hazards on both new and existing buildings and infrastructure as well as facilities located in potential flood zones in compliance with NFIP requirements should the City join the NFIP". This is great but the prioritized strategies do not reflect this statement. Yes, the City expresses interest in joining the NFIP but no other actions in terms of ordinance enforcement or building code requirements support this decision. Consider strengthening the strategies to tie in with the vulnerability analysis, which shows the areas of greatest vulnerability.
- There are 11 goals identified in the plan. Consider consolidating the goals to be higher level (e.g., public awareness, reduce vulnerability, etc.) and focusing on additional strategies specific to hazards.
- Table 7-8 identifies six prioritized strategies but only the majority are not mitigation actions. The actions generally address preparedness (EQ3, SWS4, T1), response (SWS4, T1), or administrative (F1, ER3) actions. Consider focusing on a majority of mitigation actions.
- For the six identified strategies, consider a detailed action plan or ideas for implementation so that there is a clear path to follow on implementing the strategies.

Element D: Plan Update, Evaluation, and Implementation (*Plan Updates Only*)

Plan Strengths

- Though the community is small, the plan did well in showing changes in development.

Opportunities for Improvement

- This is an opportunity to show what worked well in the last plan and what changes need to occur in monitoring, evaluation, committee structure, methodologies, etc. Document all of this in the plan (even if it's an appendix) to show what changed due to issues that arose. Again, this is good information to have as the plan continues to be updated and improves each time.

B. Resources for Implementing Your Approved Plan

- The City identifies wanting to join the National Flood Insurance Program (NFIP). Contact Taunnie Boothby, State NFIP Coordinator with the State of Alaska Department of Commerce, Community, and Economic Development for more information. Her phone is (907) 269-4583 or taunnie.boothby@alaska.gov.
- The **Local Mitigation Plan Review Guide and Tool** resource is available through FEMA's Library and should be referred to for the next plan update. http://www.fema.gov/library/viewRecord.do?id=4859
- The **Local Mitigation Planning Handbook** is available. While the requirements under §201.6 have not changed, the *Handbook* provides guidance to local governments on developing or updating hazard mitigation plans to meet the requirements is available through the FEMA Library website. http://www.fema.gov/library/viewRecord.do?id=7209

- The **Mitigation Ideas: A Resource for Reducing Risk from Natural Hazards** resource presents ideas for how to mitigate the impacts of different natural hazards, from drought and sea level rise, to severe winter weather and wildfire. The document also includes ideas for actions that communities can take to reduce risk to multiple hazards, such as incorporating a hazard risk assessment into the local development review process.
  http://www.fema.gov/library/viewRecord.do?id=6938
- The **Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials** resource provides practical guidance on how to incorporate risk reduction strategies into existing local plans, policies, codes, and programs that guide community development or redevelopment patterns. It includes recommended steps and tools to assist with local integration efforts, along with ideas for overcoming possible impediments, and presents a series of case studies to demonstrate successful integration in practice.
  http://www.fema.gov/library/viewRecord.do?id=7130
- The FEMA Region X Risk Mapping, Analysis, and Planning program (RiskMAP) releases a monthly newsletter that includes information about upcoming events and training opportunities, as well as hazard and risk related news from around the Region. Past newsletters can be viewed at http://www.starr-team.com/starr/RegionalWorkspaces/RegionX/Pages/default.aspx. If you would like to receive future, email rxnewsletter@starr-team.com.
- The mitigation strategy includes projects that are eligible for FEMA's grant programs. Contact the State Hazard Mitigation Officer, Ann Gravier, at ann.gravier@alaska.gov for application information.

Kotlik City Council
Regular Meeting
April 10, 2013

1. Meeting called to order by Thomas Sinka @ 10:14 a.m.
2. Roll Call:

Mayor Thomas Sinka	present	Vice Mayor Mary Ann Mike	present
Sec/Treas	vacant	Members: Regina Hunt	present
John Tonuchuk	present	Benjamin Kamkoff	absent excused
Reynold Okitkun	present		

3. Quorum Established with 5 present, 1 absent excused, 1 vacant
4. Invocation: Mary Ann Mike
5. Reading/approval of agenda- Mary Ann Mike moved and second by John Tonuchuk to accept agenda as read and to table March 2013 minutes. All in favor, motion carried.
6. Reading/approval of last minutes-tabled
7. Introduction of guests – none
8. People to be heard-none
9. Reports
   a. Financial-read by Lori Mike. Suggestion to raise cable rate to supplement cable. Mary Ann Mike moved and second by Regina Hunt to accept financial report. All in favor, motion carried.
   b. Mayor/Manager- Mayor requesting higher pay rate or salary. Suggestion to put in ordinance. ARUC meeting, projects discussed, water/sewer on islands. Still coming up with ideas. Once decision made, come back to city and discuss. Mary Ann Mike added her part on the meeting. Hondas and fluoride were brought up and discussed. Eric is resigning as rural utility maintenance. Any question's, direct to Francine. John Tonuchuk questioned about health insurance. Scott Nelsen updated the Hazard Mitigation Plan for City. Council approves to use it as their 5 year plan.
   c. VPO- discussion on VPO's taking off while on duty. Need to let supervisor know. Needs to be clear on their job. Suggestion to hire another VPO to have each working and have 1 week off each alternating. Suggestion to hire 1 more male and on oncall female. Personnel policies need to be followed.
   d. Landplanner-suggestion to have zone Kotlik.
   e. Bingo-bingo still afternoons. Stop donations for cab fare when people requesting. John Tonuchuk move to and second by Reynold Okitkun to disregard the $25.00 donation for

medical only for emergency. All in favor, motion carried. Edward Tom requesting stove oil, denied.

10. Correspondence
    a. FEMA- city shop and teen center foundation approved, roofs for city office and hall also approved.
11. New Business
    a. Odinzoff family- called for donation for Brenda and Stubby to see Alverna to support her. Total $1,500.00 for 1 person. Wait on this for further information.
    b. Check signers- Mary Ann Mike move and second by Reynold Okitkun to have John Tonuchuk and Regina Hunt as check signer. All in favor, motion carried.
12. Old Business
    a. Ordinance- post in public place then do 2nd reading. Tabled until next meeting.
13. Board Comments- Mayor stated that ARUC is reducing reconnect fee from $200 to $100. Suggestion to increase cable monthly billing after research is done. Mary Ann Mike questioned on per diem rates. Rates are based on Government rates. John Tonuchuk questioned per diem rates for them when they go training. Dogs are issue still. Council seat still needs to be filled. Suggestion to have an elder, council to appoint. Suggestion to post up seat. VPSO and troopers requested for the mini potlatch but no one responded. City donating gas to pick up people from Stebbins. SAR has no more supplies. Supplies taken from cabinet.
14. Notice and place of next mtng- May 9, 2013 10:00 a.m.
15. Adjournment- Reynold Okitkun move and second by Regina Hunt. All in favor, motion carried. Meeting adjourned at 11:28 a.m.

Community Hazard Awareness and Mitigation Survey 2013

Mitigation is action taken to limit damage due to natural or man-made hazards. Your response to these questions will help us to develop appropriate hazard mitigation measures.

1. How concerned are you about each of the following natural and man-made hazards directly affecting your local community? Please check one box for each hazard listed.

HAZARD	Very Concerned	Somewhat Concerned	No Opinion	Not Very Concerned	Not Concerned
Earthquake					
Flood					
Ash fall from volcanic activity					
Wildfire					
Severe weather					
Erosion					
Wind					
Natural gas line rupture or explosion					
Hazardous material spill					
Extended power outage					
Tsunami					
Other?					
Other?					

2. Has one or more of these natural or man-made hazards directly affected you? If yes, which one(s)?

3. What could be done to limit damage from these hazards? 4. In your opinion, what steps should Emmonak take to reduce possible damage or loss of life?

4. In your opinion, what steps should Emmonak take to reduce possible damage or loss of life?

Mitigation Action	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
Riverbank Reinforcement					
Structure (house) Elevation					
Structure (house) Relocation					
Create Flood Levees					
Create Wildfire Barriers					
Design Emergency Evacuation Routes					
Dump Relocation					
Encourage weather resistant building practices					
Promote FireWise building practices					
Other?					
Other?					

Additional suggestions

5. How long have you lived in Kotlik?_____

6. In what part of the City do you live?_____

Thank you for helping create a disaster resistant Community!

Please return your completed survey to Lori Mike, Administrator

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Benefit-Cost Analysis Fact Sheet

Hazard mitigation projects are specifically aimed at reducing or eliminating future damages. Although hazard mitigation projects may sometimes be implemented in conjunction with the repair of damages from a declared disaster, the focus of hazard mitigation projects is on strengthening, elevating, relocating, or otherwise improving buildings, infrastructure, or other facilities to enhance their ability to withstand the damaging impacts of future disasters. In some cases, hazard mitigation projects may also include training or public-education programs if such programs can be demonstrated to reduce future expected damages.

A Benefit-Cost Analysis (BCA) provides an estimate of the "benefits" and "costs" of a proposed hazard mitigation project. The benefits considered are avoided future damages and losses that are expected to accrue as a result of the mitigation project. In other words, benefits are the reduction in expected future damages and losses (i.e., the difference in expected future damages before and after the mitigation project). The costs considered are those necessary to implement the specific mitigation project under evaluation. Costs are generally well determined for specific projects for which engineering design studies have been completed. Benefits, however, must be estimated probabilistically because they depend on the improved performance of the building or facility in future hazard events, the timing and severity of which must be estimated probabilistically.

All Benefit-Costs must be:

- Credible and well documented
- Prepared in accordance with accepted BCA practices
- Cost-effective (BCR $\geq$ 1.0)

General Data Requirements:

- All data entries (other than Federal Emergency Management Agency [FEMA] standard or default values) MUST be documented in the application.
- Data MUST be from a credible source.
- Provide complete copies of reports and engineering analyses.
- Detailed cost estimate.
- Identify the hazard (flood, wind, seismic, etc.).
- Discuss how the proposed measure will mitigate against future damages.
- Document the Project Useful Life.
- Document the proposed Level of Protection.
- The Very Limited Data (VLD) BCA module cannot be used to support cost-effectiveness (screening purposes only).
- Alternative BCA software MUST be approved in writing by FEMA HQ and the Region prior to submittal of the application.

Damage and Benefit Data:

- Well documented for each damage event.
- Include estimated frequency and method of determination per damage event.
- Data used in place of FEMA standard or default values MUST be documented and justified.
- The Level of Protection MUST be documented and readily apparent.
- When using the Limited Data (LD) BCA module, users cannot extrapolate data for higher frequency events for unknown lower frequency events.

Building Data:

- Should include FEMA Elevation Certificates for elevation projects or projects using First Floor Elevations (FFEs).
- Include data for building type (tax records or photos).
- Contents claims that exceed 30 percent of building replacement value (BRV) MUST be fully documented.
- Method for determining BRVs MUST be documented. BRVs based on tax records MUST include the multiplier from the County Tax Assessor.
- Identify the amount of damage that will result in demolition of the structure (FEMA standard is 50 percent of pre-damage structure value).
- Include the site location (i.e., miles inland) for the Hurricane module.

Use Correct Occupancy Data:

- *Design occupancy* for Hurricane shelter portion of Tornado module.
- *Average occupancy per hour* for the Tornado shelter portion of the Tornado module.
- *Average occupancy* for Seismic modules.

Questions to Be Answered:

- Has the level of risk been identified?
- Are all hazards identified?
- Is the BCA fully documented and accompanied by technical support data?
- Will residual risk occur after the mitigation project is implemented?

Common Shortcomings:

- Incomplete documentation.
- Inconsistencies among data in the application, BCA module runs, and the technical support data.
- Lack of technical support data.
- Lack of a detailed cost estimate.
- Use of discount rate other than FEMA-required amount of 7 percent.
- Overriding FEMA default values without providing documentation and justification.
- Lack of information on building type, size, number of stories, and value.
- Lack of documentation and credibility for FFEs.
- Use of incorrect Project Useful Life (not every mitigation measure = 100 years).

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Table D-1: List of Tasks to Update			
Update Category	**Task**	**Time Frame**	**Key Personnel**

Table D-2: Update Team Members			
Name	**Title**	**Organization**	**Key Input**

Table D-3: Documents Reviewed		
Document Title	**Information Relevant to the Update**	**Used in the Update?**

Table D-4: Recommendations from FEMA Review Crosswalk of TMP		
TMP Section	**Section Title**	**Recommendation**

Table D-5: Sections Identified as Requiring Revision				
TMP Section	**Section Title**	**Revise**	**Delete**	**Add**

Table D-6: Summary of Update Team Meetings		
Meeting Date	**Meeting Attendees**	**Meeting Summary**

Table D-7: Vulnerability Overview				
	Vulnerability to a Hazard in a Hazard Area			
Hazard	Percent of Jurisdictio Geographic Area	Percent of Population	Percent of Building Stock	Number or Percent of Critical Facilities and Utilities

Table D-8: Completed, Deleted, or Deferred Mitigation Actions		
Mitigation Action No.	Mitigation Action: Completed, Deleted, or Deferred	Justification

Table D-9: Mitigation Action Plan					
Mitigation Action No.	**Description**	**Priority**	**Responsible Department**	**Potential Funding**	**Time Frame**

Table D-10: Pre- and Post-Disaster Mitigation Policies, Programs, and Capabilities			
Type of Regulatory Tool	**Name**	**Description**	**Changes to Regulatory Tool**

Table D-11: Capability Assessment		
Type / Name	**Description**	**Amount**