Napakiak, Alaska

Local Hazard Mitigation Plan

2018

Revised April 2018

Plan Administration

The Napakiak Hazard Mitigation Plan Update 2018, including appendices, will be updated every five years, after a disaster response, or as appropriate in response to community mitigation activities. This Hazard Mitigation Plan (HMP) has been reviewed by the Community and sent to the State of Alaska Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency for approval.

Record of Plan Changes

All updates and revisions to the plan will be tracked and recorded in the following table. This process will ensure that the most recent version of the plan is disseminated and implemented as appropriate.

Date	Change No.	Purpose of Update or Revision
2011	Initial HMP	Original Plan
2018	HMP Update	Update of Napakiak HMP

Plan Distribution List

Copies of this HMP Update will be provided to the following communities, agencies, and persons. Updates will be provided when available. Recipients will be responsible for updating their respective HMP copies when they receive changes. The City administrator is ultimately responsible for dissemination of all plan Updates.

Date	No. of Copies	Community/Agency/Person
		City of Napakiak
		Native Village of Napakiak
		Napakiak Corporation
		Lower Yukon School District
		Denali Commission

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1 Introduction

Historically, communities and regions within the state of Alaska have been impacted from natural hazard events, and many of these events have devastated homes and other vital infrastructure, resulting in injuries or death in the aftermath of the event. Costs to repair, rebuild, or to replace homes, critical facilities, and infrastructure, particularly in remote Alaska communities are staggering. One proven way to minimize these costs is for communities to develop a Hazard Mitigation Plan (HMP). Throughout the HMP process, communities work with other local partners, stakeholders, individuals within the communities, state, and federal planning partners. Section 1.4 of this plan provides a list of FEMA hazard mitigation assistance programs that provide funding support for a community to pursue mitigation projects that were listed during development of their HMP or HMP Update.

The HMP creates a framework for identifying hazards, vulnerabilities and determining a community's priorities "to reduce or eliminate long-term risk to human life and property from natural hazards." (44 CFR, Part 201.2) This plan is designed to fulfill the requirements set forth in the 44 Code of Federal Regulations (CFR) 201.4 Disaster Mitigation Act 2000 (DMA 2000) to identify hazards facing the community, to complete a risk assessment and vulnerability analysis, and to identify and coordinate mitigation efforts with State, Federal, and local partners. Specifically, this HMP describes the planning process and methodology used; introduces the community and its location and unique characteristics that make up the community and its people; identifies unique hazards the community faces; assesses the vulnerabilities of the community to these hazards; and puts forth sustainable mitigation strategies to create a more resilient community.

The Napakiak 2018 HMP Update provides documentation of the planning process and how hazard mitigation resources have been organized (Sections 1 and 2); provides a profile of the community (Section 3); characterization of natural hazards and a risk assessment (Section 4); a capability assessment of funding sources and resources (Section 5); introduction of goals and strategies (Section 6); includes a maintenance plan for the HMP, including plan adoption, monitoring, evaluating, and updating the HMP (Section 7); and references for the HMP (Section 8).

1.1 Hazard Mitigation Planning

The DMA 2000 highlights the importance of mitigation planning and emphasizes planning for disasters before they occur. This act provides funding for mitigation planning and projects. Mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risk to, and the capabilities of, the individual communities.

1.2 The Planning Process Tasks

Hazard mitigation planning, whether developing a plan for the first time or a plan update, is implemented in a series of tasks. The figure below, based on FEMA's handbook illustrates these tasks.

Figure 1-1 FEMA Recommended Mitigation Planning Tasks

Source: FEMA Local Mitigation Planning Handbook, March 2013

1.3 Authorities

The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), Title 42 of the United States Code 5121 et seq. Section 322, provides the legal basis for FEMA mitigation plan requirements as a precondition for receiving FEMA mitigation project grants. The Disaster Mitigation Act of 2000 (DMA 2000), Title 44 of the Code of Federal Regulations (CFR), Part 201, amends the Stafford act by establishing mitigation planning requirements that emphasize the need for State, Tribal, and local entities to closely coordinate mitigation planning and implementation efforts. Other state, regional and national programs may also reference the community's HMP as a funding condition. Table 1-1 identifies applicable legal authorities and other planning documents that support the HMP.

Table 1-1 Legal Authorities and Other Supporting Documents

▪ Federal
▪ Disaster Mitigation Act 2000, PL 106-390 ▪ Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-707 ▪ Code of Federal Regulations, Part 201. ▪ National Flood Insurance Act of 1968, 42 USC 4104c, as amended by the National Flood Insurance Reform Act of 1944, Public Law 103-325 ▪ The Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, Public Law 108-264
▪ State
▪ State of Alaska Hazard Mitigation Plan, October 2010 ▪ Alaska Statute 26.23, Department of Military and Veterans Affairs, Disasters
▪ Local Supporting Plans
▪ 2011 Napakiak Local HMP ▪ 2014 Community Plan ▪ 2018 Community Plan (Plan update in process) ▪ Memorandum of Agreement(s) between City, IRA and Coroporation for Joint Planning on Hazard Mitigation and Community Planning ▪ City of Napakiak, Alaska Ordinance No. 2013-02 An Ordinance to the Napakiak City Code to Amend Title 1 to Adopt Chapter 1: The Acquisition, Management, and Disposal of Municipal Land

1.4 Hazard Mitigation Assistance (HMA) Programs

FEMA's Hazard Mitigation Assistance (HMA) Guidance introduces three primary programs that provide funding for eligible mitigation planning and mitigation projects to reduce disaster losses and to protect life and property from future disaster damages. The three HMA programs are the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance (FMA) Program, and the Pre-Disaster Mitigation (PDM) Program. The application cycles for these programs are announced via http://www.grants.gov/.

- HMGP assists in implementing long-term hazard mitigation planning and projects following a Presidential major disaster declaration

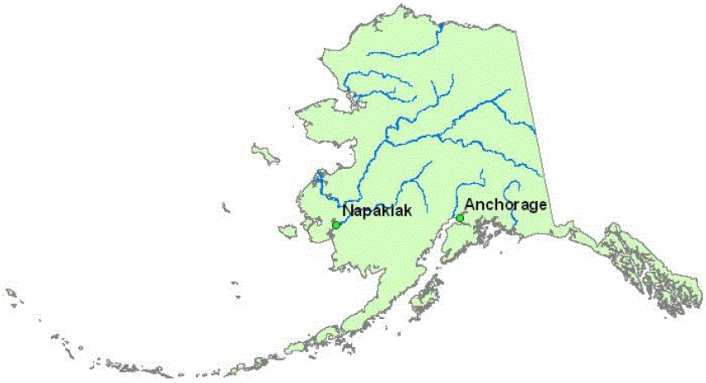
FMA provides funds for planning and projects to reduce or eliminate risk of flood damage to buildings that are insured under the National Flood Insurance Program (NFIP) on an annual basis. FMA facilitates Severe Repetitive Loss (SRL) and Repetitive Flood Claim (RFC) programs
PDM provides funds for hazard mitigation planning and projects on an annual basis.

The HMA grant programs provide funding to States, Tribes, and local entities that have a FEMA-approved State, Tribal, or Local HMPs. The HMGP and the PDM grants are authorized under the Stafford Act and DMA 2000, while the FMA is authorized under the National Flood Insurance Act. The HMGP is a directly-funded competitive disaster grant program. The PDM and FMA programs, also competitive, rely on specific pre-disaster grant funding sources, sharing several common elements. Each of the HMA programs have a percentage of Federal/non-Federal cost-share requirements. For further information regarding the HMGP, PDM, and FMA Programs, refer to Appendix A.

Napakiak is not a participant in the NFIP and may not be eligible for grant funding through FMA programs.

FEMA has issued several policies that facilitate the mitigation of adverse effects from climate change on the built environment, structures and infrastructure. Recognizing that the risk of disaster is increasing because of multiple factors, including the growth of population in and near high-risk areas, aging infrastructure, and climate change, FEMA promotes climate change adaptation. Potential impacts to hazards are discussed the hazard profiles in Section 4.3.

2 Planning Process



In June 2017, the City of Napakiak began work to update the 2011 Local Hazard Mitigation Plan. The Denali Commission contracted Meridian Management, Inc. to assist the City in the plan update. In November 2017, the State of Alaska Division of Homeland Security and Emergency Management, contracted with Ecology and Environment, Inc. to complete the plan update with the City. The plan was completed, following a series of communities meetings and consultations with the City and Tribal Councils in March 2018, then submitted to the DHS&EM and FEMA for review and approval. This process is discussed in greater detail in Section 2.3. Appendix 2 includes documentation of the public meetings and a summary of informational meetings, conversations and other communications.

2.1 Planning Area

The planning area for this HMP is based on the 2011 LHMP and coincides with the City boundaries and the developed area of Napakiak, as shown on Alaska Department of Commerce, Community, and Economic Development (DCCED) Community Profile Maps available online at https://www.commerce.alaska.gov/web/dcra/PlanningLandManagement/CommunityProfileMaps.aspx.

2.2 Planning Team

The City Clerk, Katrina Andrews is identified as the point of contact in the community and has coordinated the efforts of the HMP Planning Team. The Planning Team consists of a local Planning Committee working with Coordinating Partners and Stakeholders to include local organizations, programs and businesses; regional organizations such as regional health corporations and native associations; and State and Federal agencies responsible for review, approval and funding to implement the HMP.

The local Planning Committee is responsible for initiating and maintaining the HMP strategy and coordinating with the greater planning team. The Planning Team, made up of the Planning Committee and Coordinating Partners, is a necessary resource for updating the HMP and will be the primary source of data and information used to maintain the HMP.

2.2.1 Local Planning Committee

The City of Napakiak, Native Village of Napakiak and Napakiak Corporation have entered into an Memorandum of Agreement in 2006 for joint and cooperative planning. As such, this HMP was prepared with the full cooperation and involvement of these three organizations and representatives from these were selected to serve on the Local Planning Committee. Table 2-1 provides the names and contact information for the Napakiak Planning Committee.

Table 2-1 Local Planning Committee

Name	Title	Organization	Email or Phone
Gordon Nelson	Community member	NA	589-2714
Susan Aluskak	Community Member	NA	589-2135
Joann Slats	City Mayor	City of Napakiak	589-6352 cityofnapakiak@hotmail.com
Michael Black	City Council Member	City of Napakiak	cityofnapakiak@hotmail.com
Walter Nelson	City Council Member, Napakiak Corporation Member,	City of Napakiak, Napakiak Corporation,	589-6574 cityofnapakiak@hotmail.com
Caryn Black	CVRF Representative, Community Member	Coastal Villages Region Fund (CVRF)	589-2300
Jacob N. Black	Tribal Council President	Native Village of Napakiak	589-6266 naparyaraq@hughes.net
Sally Billy	Environmental Program/ Indian General Assistance Program (IGAP) Coordinator	Native Village of Napakiak	589-2140 naparyaraq@hughes.net
Nicholas Paul	Tribal Council Member	Native Village of Napakiak	naparyaraq@hughes.net
Brent Nichols	State Hazard Mitigation Officer	The Alaska Division of Homeland Security and Emergency Management (DHS&EM)	Brent.Nichols@alaska.gov

2.2.2 Coordinating Partners and Stakeholders

The Planning Committee will coordinate with Local, Regional, State, and Federal organizations in coordinating Hazard Mitigation Planning. These Coordinating Partners include stakeholders, those who may be involved by the mitigation actions proposed in the HMP, and others able to provide resources or share data. Together the local Planning Committee and the Coordinating Partners and Stakeholders make up the community's Hazard Mitigation Planning Team.

Table 2-2 shows the names and contact information for the HMP Coordinating Stakeholders. Those organizations marked with an asterix (*) were contacted as part of the plan development as they will be directly impacted or involved in the proposed mitigation actions. All of these Stakeholders are actively involved in projects, operations and other initiatives in Napakiak which is summaries in Section 2.5.

Table 2-2 Coordinating Partners and Stakeholders

Local Organizations	Contact Name	Phone	Address
City of Napakiak*	Katrina Andrew	(907) 589-2611	CityofNapakiak@hotmail.com
Native Village of Napakiak*	Jacob N. Black	907-589-2135	naparyaraq@hughes.net
Napakiak Corporation*	Lloyd Black	(907) 589-2227	P.O. Box 34030 Napakiak, AK 99634
William Miller Memorial (K-12) School*	Linda Jennings, Principal	(907) 589-2420	linda_jennings@lksd.org
Regional or State-Wide Organizations	**Contact Name**	**Phone**	**Address**
Association of Village Council Presidents*	Alvin Jimmie	(907) 543-7300	ajimmie@avcp.org
Alaska Village Electric Cooperative	Billy Jenkins	907-527-5226	PO Box 21 Napakiak, AK 99641
ANTHC Grant Writers	Melodie Fair Max Neale	(907) 729-2418	MDFair@ANTHC.org MDNeale@ANTHC.org
Alaska Department of Environmetnal Conservations, Village Safe Water*	Donna Lee	(907)269-7611	Donna.Lee@alaska.gov
U.S. Army Corp of Engineers*	Wendy Shaw, P.E.	(907) 223-6895	POA.Floodplain@usace.army.mil
Alaska Department of Transportation and Public Facilities	Don Fancher Airport Planner	(907)269-0516	donald.fancher@alaska.gov
Denali Commission	Chris Allard Don Antrobus	(907) 271-1414	CAllard@denali.gov DAntrobus@denali.gov
Rural Alaska Community Action Program Inc. (RurAL CAP),	Mitzi Barker, Planning & Const. Division Director	(907) 279-2511	info@weatherizeme.org
State Hazard Mitigation Officer	Brent Nichols	(907) 428-7016	Brent.Nichols@Alaska.gov
Alaska State Trooper (Bethel Post)	Anderson or Wood	800-478-9112	
Yukon Kuskokwim Health Corporation*	Brian Lefferts Bob White	(907) 543-6423 (907) 545-0916	Brian_Lefferts@YKHC.org Robert_White@YKHC.org
Lower Kuskokwim School District*	Superintendent Dan Walker Ryan _____, Project Manager	(907) 543-4800	PO Box 305, Bethel, AK 99559 http://www.lksd.org/

2.3 Public Involvement

A series of meetings were held in Napakiak as part to the process to produce the Napakiak HMP 2018 Update. Meeting sign-in sheets, agendas and summaries are included in Appendix 2.

Community consensus and cooperation between the City and Native Village of Napakiak and their respective councils are cornerstones of the decision making and planning process in Napakiak. It should also be noted for any contract or State planners assisting Napakiak with future planning efforts, that meetings are generally conducted in Yup'ik and English.

July 19, 2017: HMP 2018 Update Kick-off Meeting and Public Input Session: A plan update kick-off meeting and public input session was held in Napakiak July 19, 2017 to initiate the HMP Update process. Public notice was provided by a posting at the City office, General Store, and at the Napakiak Post Office. The meeting was also announced on the local citizen band radio channel.

Meridian Management Inc. and DHS&EM planners traveled to the community to assist in facilitating the public involvement meeting. The meeting was attended by 23 Napakiak residents, including members of the Planning Committee and the public. Participation was robust.

Following review of the planning process by the Meridian and DHS&EM Planners, meeting attendees discussed the local hazards to be addressed in the HMP. Napakiak residents were in consensus that the priority hazard to the community is the Kuskokwim riverbank erosion. Additionally, permafrost degradation, flooding and severe weather were the other primary hazards identified. On-going and future climate changes was also identified as a concern, particularly how it impacts the above hazards.

The following is an inventory of the significant comments from the July 19, 2017 meeting:

- *Building relocation planning has begun with DCCED.*
- *How do we get money from FEMA programs?*
- *Relocate structures to avoid erosion impacts.*
- *The permafrost is melting and foundations are sinking.*
- *Would like wind turbines.*
- *Recently relocated one house to avoid erosion.*
- *Need a feasibility study completed to consider relocation options.*
- *Severe winter weather (wind) damages some homes of poor construction*
- *People get lost in severe weather.*
- *Blizzards delay activity and travel.*

August 10, 2017 Hazard Mitigation Planning Committee Meeting The planning committee reviewed and updated the critical facilities list for the HMP 2018 Update.

August 24, 2017 Hazard Mitigation Planning Committee Meeting The planning committee continued work updating the critical facilities list for the HMP 2018 Update.

March 7, 2018 Public meeting and work session of the Planning Committee, City Council and Tribal Council: On the afternoon of March 7, 2018 a public meeting was held to review the hazard profiles and determine the mitigation action plan in the HMP. Ecology and Environment, Inc.

attended the meeting, attended by __ Napakiak residents. At the meeting, the participants cooperatively completed a risk assessment survey, discussed mitigation actions and strategies. This meeting ended with an agreement that with the inclusion of the mitigation action plan and changes to the draft plan recommended by the Planning Committee, the City Council anticipates no concerns in adopting the HMP 2018 Update.
(Note: Walter Nelson, representing the City Council and Planning Committee and David Andrew, Native Village of Napakiak tribal adimimstratior met with the E&E Planner to review the initial HMP draft and recommend on the morning of March 8, 2018.)

March 8, 2018 Public meeting and work session of the City Council, Tribal Council and Corporation Board of Directors on the 2018 Community Plan: On the afternoon of March 8, 2018, a public meeting was held to review and update the 2014 Community Plan. The City and Tribe requested that this plan revision occur concurrent with the HMP process to better synchronize the plan content and priorities and streamline the planning efforts. This meeting was a joint meeting of the City Council, Tribal Council, Corporation Board of Directors and any interested members of the community. The meeting was facilitiated by a Local Government Specialist from the State Division of Community and Regional Affairs. This meeting directly related to the HMP planning process as the subject of land use, development and the impact of and response to erosion were key topics. The necessity of building and infrastructure relocation within the community was discussed, including the future relocation lots as identified in the Community Plan. They also discussed the necessity of focusing on relocation within the community versus relocation of the village itself to a new site given the imminent threat of the erosion and limited availability of funding. Essentially, the councils and community overall, acknowledge that the immediate relocation of buildings and facilities cannot be delayed pending plans and funding of an overall whole community relocation.

2.4 Incorporating other Plans

As noted previously, the process to update this HMP coincided with the update to the 2014 Community Plan. In addition to that plan, several other plans related to Napakiak and the hazards threatening Napakiak were reviewed for inclusion by reference in this HMP. These plans include the following:

- State of Alaska Hazard Mitigation Plan 2013
- U.S. Army Corps of Engineers, Section 14 Preliminary CAP Fact Sheet, 2014
- U.S. Army Corps of Engineers Alaska Baseline Erosion Assessment 2009
- U.S. Army Corps of Engineers Erosion Information Paper – Napakiak, Alaska 2007 (Appendix 6)
- ADEC Solid Waste Program, Waste Erosion Assessment & Review (WEAR), Final Report. May 2015. (Available online at http://dec.alaska.gov/eh/sw/wear.html; Appendix 4)
    - Detailed Action Plans for Napakiak School Tank Farm, and
    - Detailed Action Plans for Napakiak Corporation Tank Farm.
- 2006 and 2014 Napakiak Community Plan (Available online at Alaska Division of Community and Regional Affairs, Community Plans Library at https://www.commerce.alaska.gov/dcra/dcrarepoext/Pages/CommunityPlansLibrary.aspx)

2.5 Coordination with Regional and Statewide Organizations

Coordination with regional and statewide organizations is necessary to identify and incorporate other infrastructure planning and land use developments that could impact Napakiak. Coordination of planning needs to be an ongoing effort to accomplish mitigation actions and maintain an effective mitigation strategy for the community. The following agencies are already actively engaged in on-going or anticipated projects related to the mitigation strategy established in the HMP.

Association of Village Council Presidents The Native Village of Napakiak has a compact with the Association of Village Council Presidents (AVCP), headquartered in Bethel, Alaska, which has entered into an agreement with the Bureau of Indian Affairs (BIA) Indian Reservation Roads (IRR) program for road maintenance and improvements, and the expansion to the new subdivision in Napakiak necessary for building relocations.

Lower Kuskokwim School District (LKSD) Napakiak's Kindergarten to 12th grade school, the William N. Miller Memorial School, is part of the LKSD. LKSD is the property owner and operator and responsible for all associated facilities and infrastructure, including the tank farm. (However, two unused Napakiak Corporation tanks are located adjacent to the school tank farm.)

Alaska Department of Commerce, Community and Economic Delovpment (DCCED) DCCED, specifically, the Division of Community and Regional Affairs (DCRA) have been engaged in recent years issues related to potential relocation of the napakiak to a new site, identification of sites within the current city boundaries for relocation of facilities and the update to the Community Plan.

Alaska Department of Environmental Conservations/Village Safe Water The Village Safe Water project is the lead agency working with the City for the relocation of the community well, water treatment and storage facility, water supply/distribution point. This project is expected to be completed in 2018.

U.S. Army Corp of Engineers (USACE) Since the mid 1970s, the USACE has studied erosion on the Kuskokwim River at or near Napakiak. Most recently, the USACE prepared "Section 14 Preliminary CAP Fact Sheet, 2014" which determined that a seawall or other revetment to armor the shoreline at Napakiak would need to be 12,000 feet long by 50 feet deep to provide adequate protection and would exceed the $1.5 million allowed under Section 14 of the Flood Control Act of 1946 (PL-79-526 for emergency streambank and shoreline protection for public facilities and services. This report acknowledged that the erosion threat is imminent and that the erosion rates may increase if the majority streamflow on the Kuskokwim River shifts from the north to south channel. The "Erosion Information Paper – Napakiak, Alaska 2007" provides the erosion estimates that are the basis for erosion mitigation planning in Napakiak.

Yukon Kuskokwim Health Corporation (YKHC) The YKHC operates the Ellie Willie Memorial Clinic. The new clinic facility was constructed in 2013.

Moravian Mission The Moravian Church is the largest facility located west of the runway. During flood events, travel is not possible between the the east side and west side of the community and the church is the identified community shelter for all residents on the west side of Napakiak.

2.6 Current Plan Maintenance

In addition to the required five year update in accordance with DMA 2000, it is recommended that the Planning Committee work with other coordinating organizations to update the HMP annually. The HMP should be considered a living document to be referenced and annotated as needed. There is no documentation of any reviews or revisions to the 2011 HMP between 2012-2017. See Section 7 for details on Plan Maintenance, and blank plan maintenance forms in Appendix 1.

2.6.1 Review and Approval

The initial HMP for Napakiak received approval following formal adoption by both the City of Napakiak and the Napakiak Traditional Council in September 2011.

The HMP 2018 update was reviewd in March 2018 by the City and Tribal Councils in a joint meeting and work session. The HMP 2018 Update received approval and formal adoption by the City of Napakiak, City Council on [INSERT DATE] under [INSERT RESOLUTION NAME/NUMBER.]

Although, this HMP is not a multi-jurisdictional plan, in accordance with the 2006 MOA between the City, Native Village of Napakiak and Napakiak Corporation, the tribal council also endorses the adoption of this plan and have jointly adopted it under [INSERT RESOLUTION NAME/NUMBER] on [DATE].

2.6.2 Implementation

The Local Planning Committee is responsible for implementing this HMP. Communicating need, procuring funding, scheduling mitigation projects, and executing mitigation actions are necessary tasks for the planning team for successful implementation.

2.6.3 Monitoring Evaluating and Updating

Monitoring and evaluating the mitigation efforts provides the necessary content for regular, periodic updates of the HMP. The Planning Committee is responsible for collecting, documenting and evaluating information on the progress and completion of mitigation actions. This will be part of the annual plan review conducted each Janaury-February.

ACTION:

Progress on the mitigation actions and planned upcoming mitigation projects will be presented and discussed as necessary at the annual year-end general meeting of the City Council, Tribal Council and Corporation Board of Directors, held in November of each year.

The City Council and Tribal Council will conduct an review and update on the status of mitigation actions in January-February each year. Any changes made during planning committee working sessions will be presented at public council meetings.

3 Community Profile

This section describes the location, geography, governance, demographics and land use development trends of Napakiak.

3.1 Culture

Napakiak is a Yup'ik community and the residents maintain a blend of modern with a subsistence lifestyle, rooted in a traditional, culturally Yup'ik way of life. Many residents speak Yup'ik and English. The 2018 Community Plan includes a more detailed section on the history of Napakiak.

3.2 Location and Geography

Napakiak is located approximately 8 miles by air and 12 miles by river, downstream (southwest) of Bethel in the Yukon-Kuskokwim Delta. The community is on an island on the west bank of the lower Kuskokwim River, between the river and Johnson Slough, approximately 25 miles upriver from the Bering Sea. The lower Kuskokwim River is in the tidal zone, with tidal ranges of up to 4.3 feet recorded in Bethel. Storms, especially from the south, may also bring even higher, wind-driven tides. Napakiak covers approximately 4.7 square land miles and approximately 0.3 square miles of water. It lies at 60.6941 latitude and -161.9709 longitude.

The Yukon-Kuskokwim Delta is predominately a tundra region. The weather patterns include long, cold winters and shorter, warm summers. Winter averages four feet of snowfall with average temperatures between -2 to 19°F. The summer months see 16 inches of rainfall with moderate temperatures between 42 to 62°F.

Figure 3-1 Napakiak Aerial Image

3.3 Local Government

Napakiak is a Yu'pik village served by two local governments: the City of Napakiak and Native Village of Napakiak. The City of Napakiak is a second class city incorporated within Alaska's Unorganized Borough in 1969. The Native Village of Napakiak is a federally-recognized tribe with approximately 600 members, chartered in 1946.

Napakiak is in Alaska's State Senate District S, State House District 38, and State Judicial District 4.

3.4 Transportation

Water travel is the principal mode of transportation during the summer. Cargo and fuel arrives by barge. The community is accessible by ATV, boat and small aircraft, weather permitting. A 3,000-foot, state-maintained gravel airstrip provides regular access with daily scheduled flights from Bethel. Boat landing areas area located on beach areas of the Johnson Slough and Kuskokwim River. During the winter, snow machines are commonly used as well as dog teams. When the river ice adequate, trucks also travel on the Kuskowkim River on an ice road maintained cooperatively by Kuskowim River villages. In Winter 2017/2018, this ice road extended over 200 miles from Napakiak to Crooked Creek. Napakiak has a network of winter trails also used access to neighboring villages.

Within Napakiak, gravel roads are the maintained by the AVCP and Bureau of Indian Affairs (BIA) Indian Reservation Roads (IRR). Most people use ATVs or snowmachines for motorized travel, although there are some cars or trucks in use. Some boardwalks are used as walkways in marshy areas, however most are in a condition of disrepair and upgrades and new boardwalks are needed for safety and protection of the environment.

3.5 Demographics

The 2010 census recorded 354 residents, of which the median age was 24.6 indicating a relatively young population. The most recent 2016 Department of Labor and Workforce Development estimated population is 355. Over half of the population is younger than 25 years of age.

Approximately 95.8 percent of residents recognize themselves as Alaska Native and most are members of the Native Village of Napakiak. According to the 2010 census revealed that there are 132 households with the average household having approximately 4.0 individuals. Figure 3-2 illustrates the recent population trend of Napakiak.

3.6 Economy

There are limited employment opportunities in Napakiak. Established government agencies such as the City and Tribal Offices, the school district, and the health clinic, provide the bulk of the employment opportunities. The summer months bring local and outside construction job opportunities; however, subsistence is critical to the economy of the residents of Napakiak. Figure 3-3 illustrates local jobs as workers by industry.

According to the U.S. Census Bureau, the 2015 median household income in Napakiak was $35,833. Approximately 258 individuals (43.9 percent) were reported to be living below the poverty level. The potential work force (those aged 16 years or older) in Napakiak was estimated to be 329, of which 258 were actively employed. In 2015 the unemployment rate was 21.5 percent; however, this rate included part-time and seasonal jobs, and practical unemployment or underemployment is likely to be significantly higher. (Source: U.S. Census Bureau, 2011-2015 American Community Survey 5-Year Estimates).

3.7 Public Facilities and Utilities

The City of Napakiak operates a hauled water distribution and wastewater collection system serving the majority of homes. The City delivers treated groundwater from the treatment plant and collects wastewater from homes. Wastewater is hauled to one of three facultative wastewater treatment lagoons. The system is referred to as a "flush tank and haul" system and utilizes ATV vehicles to haul water and wastewater. The City also operates the washeteria, located at the city building. This building houses the city office, two rental rooms for visitor lodging. The new water well supply well, treatment and storage facility is adajecnt to the City buiding (expected to by online in Summer 2018)

Napakiak Ircinraq Power Company, a subsidiary of the Napakiak Corporation, generates electricity from diesel fuel and also purchases power from Alaska Village Electric Cooperative in Bethel. In 2015, a new triple line transmission line was extended from Bethel to Napakiak. The power company is exploring options for wind power electric generation.

A general store is owned and operated by the Napakiak Corporation. The store is also the fuel seller in town. The Napakiak Corporation operates a 70,000 gallon tank farm for both fuel sales and power generation fuel.

The William N. Miller Memorial School is a Kindergarten -12th Grade school, operated by the Lower Kuskokwim School District. Approximately 100 students attend the school. Associated with the school are seven teacher housing units and a tank farm for diesel fuel utilized by the school for heat.

The Yukon-Kuskokwim Health Corporation operates the Ellie Willie Memorial Clinic in Napakiak. This clinic provides both medical and dental care.

The critical faciliites inventory in Section 4.5 includes a complete list of critical public and private facilities and infrastructure in Napakiak.

4 Risk Assessment

44 CFR § 201.6(c) (2) requires local jurisdictions to provide sufficient hazard and risk information from which to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

Risk assessment is the process of identifying the potential loss of life, personal injury, economic injury, and property damage resulting from hazards. This process is accomplished using four steps:

Step 1: Identify Hazards

Step 2: Profile Hazard Events

Step 3: Inventory Assets and Vulnerabilities

Step 4: Estimate Losses

The following sections address the unique hazards faced by Napakiak and describe the community's risk based on the probability of disaster, vulnerability, exposure.

In accordance with 44 CFR §201.6, the Risk Assessment (Section 3) is the basis for the mitigation strategy (Section 4). Information in this chapter is used by the Planning Committee to identify and prioritize mitigation actions. Risk assessment criteria and applicable 44 CFR §78 Flood Mitigation Assistance criteria for profiling hazards and vulnerability assessments are provided in Table 4-1.

Table 4-1 Federal Requirements for Risk Assessment

44 CFR §201.6 Local Mitigation Plans (c) Plan Content (2) Risk Assessment The risk assessment shall include:
(i) 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 (ii) 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. The plan should describe vulnerability in terms of: (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; (B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate; (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. (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.
44 CFR §78.5 Flood Mitigation Plan development
(b) *Description of the existing flood hazard and identification of the flood risk, including estimates of the number and type of structures at risk, repetitive loss properties, and the extent of flood depth and damage potential.*

4.1 Hazard Analysis

Hazard analysis involves identifying and profiling the hazards that could affect the community. A hazard analysis includes the identification, screening, and profiling of each hazard.

Hazard identification is the process of recognizing the natural events that threaten an area. Natural hazards result from unexpected or uncontrollable natural events of sufficient magnitude. Human, Technological, and Terrorism related hazards are beyond the scope of this plan. Even though a

particular hazard may not have occurred in recent history in the study area, all natural hazards that may potentially affect the study area are considered; the hazards that are unlikely to occur or for which the risk of damage is accepted as being very low, are eliminated from consideration – *hazard screening*.

Hazard profiling is accomplished by describing hazards in terms of their nature, history, magnitude, frequency, location, extent, and probability. Hazards are identified through historical and anecdotal information, existing plans, studies, and hazard maps collection and review for the study area. Hazard maps are used to determine the geographic extent of the hazards and define the approximate boundaries of the areas at risk.

4.2 Hazard Identification and Screening

The Planning Team reviewed the hazards profiled for the nearby community of Napakiak. Consideration of these hazards along with other common Alaska hazards facilitated the discussion of hazards impacting Napakiak. In the public meeting we developed a list of potential hazards based on a range of factors, including prior knowledge or perception of the relative risk presented by each hazard, ability to mitigate the hazard, and the known or expected availability of information regarding the hazard, see Table 4-2.

The Planning Team determined that six hazards pose the greatest threat to the community: erosion, permafrost degradation (subsidence), severe weather, fire, climate change impacts, and flood. The remaining hazards were excluded through the screening process because they're considered to pose a lower threat to life and property in the community due to the low likelihood of occurrence or the low probability that life and property would be significantly affected.

Table 4-2 Identification of Hazards

Hazard Screening	Hazard Profiled?	Profile Justification
Erosion	Yes Section 4.3.1	Kuskokwim River bank has erosion is forecast to be 25-50 feet per year (USACE 2009) and has been on-going since 1960s. Relocation of infrastructure several dozen buildings, residences and fish camps has been necessary to mitigate erosion damage since the mid-1990's. The former armory building, community water source well and school tank farm expected to be impacted by the eroding shoreline in next 5 years.
Permafrost Degradation/Ground Failure (Land Subsidence)	Yes Section 4.3.2	Permafrost underlies most of Napakiak. Where permafrost melts, the wet soils are prone to collapse, creating depressions. Buildings and infrastructure built over these locations are suspectible to damage. The depressions are also prone to localized flooding or ponding, either from surface water run-off or the accumulation of groundwater which seeps to the surface.permafrost is present throughout Napakiak

Hazard Screening	Hazard Profiled?	Profile Justification
Severe Weather	Yes Section 4.3.3	High winds, wind-driven tidal flooding, severe cold and severe heat and winter storms can cause damage to buildings and infrastructure and threaten public health and safety are a threat to residents and can halt transportation. Property damage is typically caused from wind damage to roofs, frozen pipes, and flooding from wind-driven tides. Extreme cold and extreme heat cause injuries and health problems for residents.
Flood	Yes Section 4.3.4	Napakiak has had several flood events, four disaster declarations as a result of flooding. Flooding can result from spring snowmelt, ice jam flooding, late-summer and fall storms and wind-driven tides (which are described in severe weather).
Climate Change	Yes (imbedded in other profiles)	Climate changes such as warmer temperatures, less sea ice, permafrost thawing, wildfires, and greater precipitation will pose continued threats to Napakiak in future years. Climate change is incorporated into the profiles for erosion, flooding, severe weather and permafrost degradation as a change climate and weather patterns, particularly warmer temperatures are anticipated and these are likely to exacerbate these hazards.
Drought	No	Drought may effect wildlife migration and access to historic hunting grounds, but this hazard does not warrant mitigation measures.
Earthquake	No	Infrequent, unpredictable occurrences. There are reports of large central-Alaska earthquakes being felt in Napakiak but this hazard does not warrant mitigation measures for Napakiak.
Fire – Structural Fire & Community Conflagration	No	Historic wildfire occurrences during summer dry season (April-October).
Snow Avalanche	No	Community is at low risk for avalanche. The predominately flat terrain is not conducive to avalanche. River bank and bluffs are too steep to facilitate the snow accumulation required for avalanche.
Tsunami and Seiche	No	Community is located more than 60 miles inland of the Kuskokwim Bay and is not at risk of tsunamis. Nearby lakes are small with sloped banks and unlikely to generate a seiche.
Volcano	No	Wind-blown volcanic ash may pose some problems for the community but is not a significant hazard.

4.3 Hazard Profile

The following section profiles each hazard identified in Section 4.3 and assesses the risk associated with each. Each risk assessment considers the following attributes:

- **Hazard Description:** A brief introduction to the mechanisms behind the hazard.
- **Location:** An indication of geographic areas that are most likely to experience the hazard.
- **Past Occurrences/History:** Similar to location, a chronological highlight of recent occurrences of the hazard accompanied by an extent or damage cost, if available.
- **Potential Impacts from Future Climate Conditions:** A brief overview indicating ways in which the hazard profile may change over time due to a changing climate, if applicable.
- **Extent/Probability:** A description of the potential magnitude of the hazard, accompanied by the likelihood of the hazard occurring (or a timeframe of recurrence, if available).
- **Cascading Impacts:** A brief overview of secondary hazards often associated with the hazards.
- **Vulnerability:** A description of the potential magnitude of losses associated with the hazard. Vulnerability may be expressed in quantitative or qualitative values depending upon available data.

To enhance the usability of the HMP, risk assessments have been streamlined to provide only critical information within the body of this section.

Each hazard was assigned a rating based on the following criteria based on historic events for probability (Table 4-3) and magnitude/severity (Table 4-4). Table 4-5 identifies the rating of probability and magnitude/severity for each profiled hazard.

Table 4-3 Hazard Probability Criteria

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

Table 4-4 Hazard Magnitude/Severity Criteria

Magnitude / Severity	Criteria
4 - Catastrophic	Multiple deaths. Complete shutdown of facilities for 30 or more days. More than 50% 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% 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% 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% of property is severely damaged.

Table 4-5 Hazard Probabilty and Magnitude/Severity Rating

Hazard	Hazard Profile Section	Probability	Magnitude / Severity
Erosion	4.3.1	4 - Highly Likely	4 - Catastrophic
Permafrost Degradation/Ground Failure	4.3.2	3 - Likely	3 - Critical
Severe Weather	4.3.3	3 - Likely	2 - Limited
Flood	4.3.4	3 - Likely	2 - Limited

The hazards profiled for Napakiak are presented in the following subsections. The order of presentation of the hazards profiled does not signify the level of importance or risk, which may fluctuate over time and with other changes that take place in the community.

4.3.1 Erosion

Hazard Description

Erosion rarely causes death or injury. However, erosion causes the destruction of property and infrastructure, and reduces the available extent of land available for development. Erosion is a natural process, but its effects can be exacerbated by human activity.

Erosion on the Kuskokwim River bank is an on-going problem in Napakiak and is the community's primary concern. Past erosion control and bank stabilization efforts have been largely unsuccessful. Alaska District U.S Army Corps of Engineers (USACE) has described erosion in Napakiak as follows:

> ***Erosion at Napakiak generally occurs in fall, when storms with high south winds create wave activity on the river. Spring breakup flooding is a second, less severe cause of erosion. Since Napakiak lies downstream of Bethel, wake from frequent barge traffic delivering supplies also causes erosion. Rapid erosion threatens a wide variety of structures and several have had to be relocated.*** *(USACE, 2009).*

Napakiak began community and building relocation projects in 1986 due to erosion of land. These projects have been funded by the State of Alaska and U.S. Department of Agriculture, Natural Resource Conservation Service and FEMA. Between 1990 and 2010, the City has relocated 40 to 50 homes and over 200 people, from the east side of town to the new subdivision west of the airport. The old clinic, community hall and water treatment plant have been demolished or relocated due to their proximity to the eroding river bank. Distances of critical infrastructure and facilities from the Kuskokwim River is listed in Table 4-6.

Erosion at Napakiak generally occurs in fall, when storms with high south winds create wave activity on the river. Spring breakup is a second, less severe cause of erosion. Since Napakiak lies downstream of Bethel, wake from frequent barge traffic delivering supplies also causes erosion. Rapid erosion threatens a wide variety of structures and several have had to be relocated (USACE, 2009)

A detailed description of the nature and causes of riverine erosion is available in the Alaska Hazard Mitigation Plan, available online at http://ready.alaska.gov/plans/Mitigationplan.

Table 4-6 Erosion: Distance of Facilities from Eroding Shoreline

Facility	Distance from Eroding Shoreline
Community Water Supply Well	139 feet
Former National Guard Armory	139 feet
School	~200 feet
School Tank Farm	139 feet
School Tank Farm, Marine Header	65 feet

Community Relocation vs. relocation of within Community: In previous plans, the city and tribal councils identified the relocation of the village to the bluff, north of Johnson's Slough as one of its primary objectives. However, they arecurrently in agreement that while this is a long-term goal and likely a necessity, the short-term objectives are the relocations and homes and facilities within the current village site until the land and funds can be acquired. due to the erosion hazard. This may include the physical transportation of buildings to new sites, or new construction.

Photographs of examples of erosion are included in Appendix 8

"I remember when I was a little boy, in the 1950s and the banks of the Kuskokwim River where very high, 15 feet high. So high, parents had to carry us down to the river's edge. Now the banks are gone, everything is flat."
Alexie Michael, Napakiak resident, describing the erosion on the Kuskokwim, March 8, 2018

Location

Napakiak is located on the western bank of the Kuskokwim River, on an outside bend of the river. The fastest current and deepest part of the river channel is along this outside bend, which can cause significant erosion on the fine sand and silt composing the riverbank. The riverbank soil is undercut by the flow of the Kuskokwim River and collapses into the river.

Figure 4-1 shows the location of erosion and the extent of forecasted impacts.

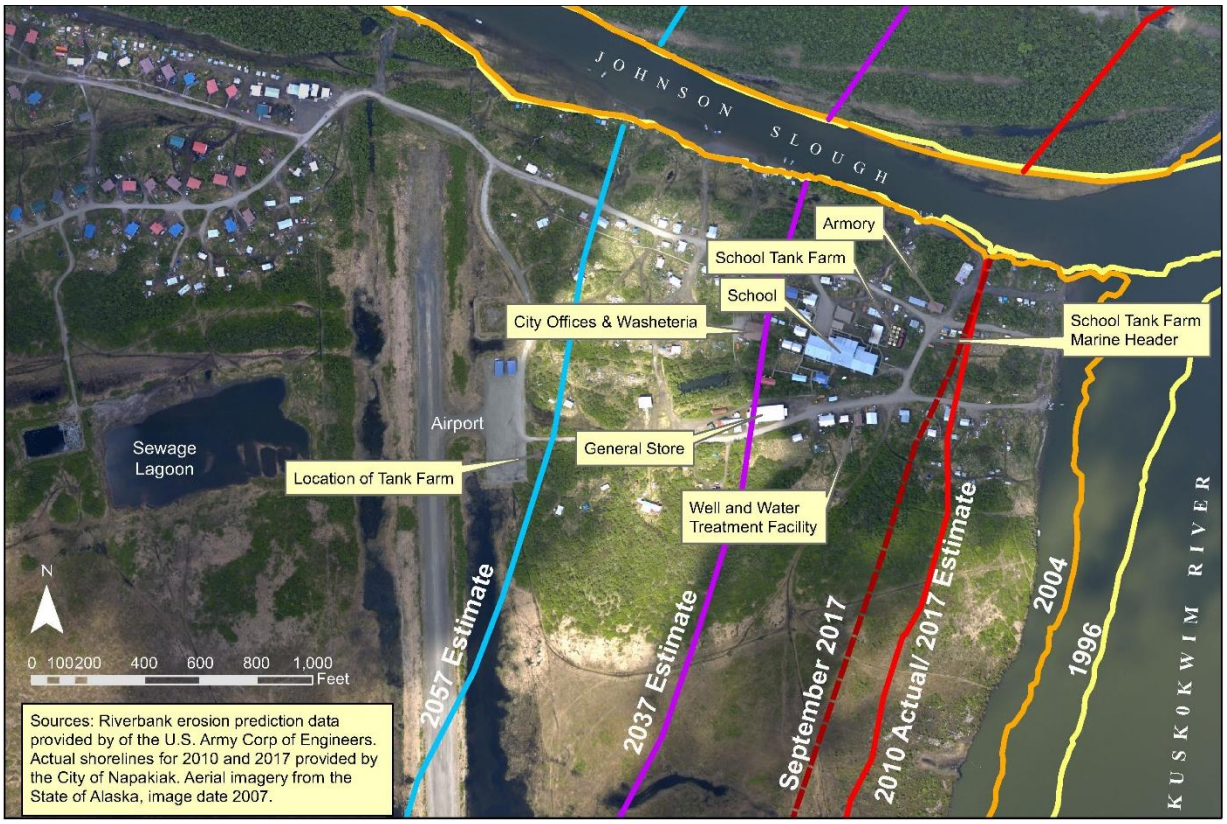


Figure 4-1 Napakiak Erosion Map

Previous Occurrence/History

Erosion along the Kuskokwim River at Napakiak is ongoing. USACE has measured erosion rates of approximately 40 feet per year in the 1960s and 1970s. Since the mid-1990s, erosion loss has varied 7-75 feet per year since the mid-1990s. Table 4-7 provides information on past erosion events, impacts, and estimated losses.

Table 4-7 History of Erosion Events

Date	Location and Extent	Impact	Estimated Loss
May 15, 1986	Severe bank erosion of the Kuskokwim River had reached a point where homes in Napakiak were in danger of falling in the river. The Governor's disaster declaration provided funds to move seven houses to a safe location.		
Sept. 22-26, 2005	**2005 West Coast Storm.** High winds combined with wind-driven tidal surges resulted in severe and widespread coastal flooding and a threat to life and property **Federally-declared disaster DR-1618.**	Loss of 75 feet of riverbank.	

Extent and Probability

USACE estimates continued erosion rates at 25-50 feet per year for the next 50 years (USACE, 2009). Erosion occurs annually, although the severity varies. The most significant erosion events occur during spring break-up and can be expected to occur annually due to the ongoing nature of riverine erosion.

Over the next 40 years, the village east of the airport is expected to be lost to erosion. This includes the school, general store, city building, drinking water facility, corporation tank farm, cemetary, and dozens of residences.

Cascading Impacts

Impact to Permafrost

Erosion of the riverbank bluff can cause melting of permafrost near the river's edge, which can result in localized ground failure inland of the riverbank. As ice rich permafrost melts, water drains from the soil, opening up voids in the soil causing the ground to collapse. On the surface, this appears as potholes or sinkholes, which can be detrimental to building foundations and other infrastructure. Near the river embankment melting permafrost results in a loss of soil shear strength and contributes to mass wasting of the bluff into the river. Riverine erosion increases permafrost vulnerability as insulating material is eroded away. Resulting permafrost melting leads to an acceleration of erosion.

Vulnerability

As the river bank erodes, additional structures, including several homes are threatened. In 2009, the USACE determined that Napakiak can expect to experience significant damage by 2021 (USACE, 2009).

The USACE has identified Napakiak as one of 26 "Priority Action Communities" experiencing erosion problems. The USACE further described these Priority Action Communities as being subject to "serious erosion that is threatening the viability of the community, or, in some cases, significant resources are being expended to minimize those threats. (USACE, 2009)

The detailed assessment of erosion problems in Napakiak demonstrated that the community is experiencing severe and fast-moving erosion. Although the community has moved many structures out of harm's way, a significant number of structures are susceptible to erosion damages within 10 years.

Potential Impacts from Future Climate Conditions
Erosion can increase in the frequency and severity with an increase in Bering Sea storms, increased highwater events on the Kuskokwim River, and a decrease in permafrost. These conditions are expected with a warming temperature and increased precipitation which are forecast in the climate change models for Western Alaska.

4.3.2 Permafrost Degradation/Ground Failure

Hazard Description
In Napakiak, ground failure can be contributed to seasonally frozen ground and permafrost thawing. In permafrost, the frozen soil and water gives structure to the ground. When the permafrost thaws, the formerly frozen water drains resulting in a collapse to the ground structure – often resulting in a depression or sinkhole. The Alaska Village Safe Water Engineer, Lynn Marino, who has worked on projects for the community's sanitation infrastructure for more than 25 years reports that the permafrost underlying Napakiak has approximately 50% ice content.

The ground failure is also linked to riverbank erosion: the sandy soil allows for water to quickly drain into the ground until it reaches the permafrost table. Water may then travel horizontally across the table and drain through the unfrozen, exposed riverbank. As the riverbank erodes, the permafrost table retreats from the exposed bank as the insulating soils are washed away. In addition to affecting the land stability directly above the melting permafrost table, this can increase the rate of water drainage vertically as it is unimpeded by the permafrost, allowing for a more rapid flow and collapse of surface ground layers.

Location
Permafrost mapping indicates Napakiak is in an area of continuous 90-100%, permafrost (Jorgenson et al. 2008).

Permafrost degradation and ground failure can occur anywhere in Napakiak. There are no known patterns to predict area at higher risk than others, except those which are in close proximity to existing sink holes or shoreline erosion areas. Existing sink holes have not been mapped.

Previous Occurrence/History
Ground failure in Napakiak is an ongoing event. Ground failure is expected and occurs annually, although the severity varies. The most significant ground failure events occur during and after periods of rain or snow thaw that result in localized puddles.

Ground failure incidents occur with such frequency that they are not well documented or tracked. Repair of the roads and walkways damaged by the subsidence occurs with such regularity that the repairs have been not been considered separate from maintenance. The Planning Committee reports that periodic, uneven settling within the community has damaged buildings and boardwalks.

Photographs of examples of ground failure are included in Appendix 8.

Extent and Probability
Annual incidents are expected, although the extent and severity of damage is variable.

The community is at equal risk to ground failure.

Cascading Impacts
As erosion advances, permafrost along or near the 'new' shorelines is expected to thaw, expanding the extent of the non-permafrost boundary along the Kuskokwim River and Johnson Slough. Thawing permafrost also can contribute to the suspectiblity of soils to erosion creating a cascade loop between ground failure and loss caused by erostion and permafrost melt.

Vulnerability
Permafrost degradation in Napakiak is expected to result in failure of infrastructure foundations and damages to roads and boardwalks. The newly low lying areas can expect to become inundated with water as the land subsidence increases due to permafrost degradation. The community perceives that subsidence due to permafrost melting is inevitable and likely to be widespread.

Local road maintenance required due to ground failure is costly and persistent. Currently, depressions and sinkholes are filled with local materials, primarily a silty sand that is prone to wear-away by wind, water, and traffic. Gravel is not locally available and must be purchased and delivered by barge at considerable expense.

Potential Impacts from Future Climate Conditions
Annual incidents are expected in frequency and/or severity as permafrost degradation increases. The permafrost degradation is expected to worsen with warmer temperatures and increased frequency of winter rain events.

4.3.3 Severe Weather

Hazard Description
The severe weather concerns of Napakiak include the following conditions:

<u>High Winds</u> In nearby Bethel, the highest wind gust is recorded at 77 mph (WRRC 2018). Records of peak winds and gusts area not available for Napakiak, however, residents report roof damage from high winds to be a common occurance. Many of the buildings are older and/or poorly constructed. Due to the the high cost of materials, repairs are often made with available supplies and make-shift solutions, rather than long-term repairs with durable materials and techniques.
<u>Wind-driven tides</u> High winds, especially from southerly storms during high tides, have historically brought flooding in the form of wind-driven high tides into Napakiak. Due to the low elevation and low topographic profile of the island where Napakiak is located, this flooding can restrict travel in town, particularly between the east and west side of town and can damage property, although most buildings are elevated 2 or more feet off the ground to reduce permafrost melting. These have typically occurred with no notice or warning for potential flooding.

<u>Extreme Cold</u> Napakiak's coldest temperature of record was -67ºF from January 29-31, 1999. Even without the lost of electricity, frozen and burst pipes are a common occurance in Napakiak due to the combination of extreme temperatures and poor quality construction and insulation. Residents have found that newer, flexible, PEX tubing and platics (ABS or PVC) piping are less likely to split and burst than metal pipes and have been using these when available for new construction or

refurbishing properties. The extreme cold can cause illness and injuries to dot cold injuries and poor ventilation.

Extreme Heat Extreme heat in Napakiak is considered temperatures over 80 ºF, although some residents, especially elders have experienced health complications at temperatures over 70 ºF due to the lack of acclimization of their bodies to these warm temperatures. Temperatures over 80 ºF were considered by residents to be an extraordinary and rare occurrence until the mid-1990s and over the last 10 years are reported to be a near annual occurance by the planning committee.

Winter Storm Winter storms often bring high winds, extreme cold and/or heavy snow. Blizzard conditions are a common and restrict travel. Deep or heavy snow can cause structural damage, especially to older or poorly constructed buildings.

Bering Sea Storm Bering Sea Storms often bring high winds, heavy rains and potentially wind-driven high tides. Southerly, storm-driven waves can reach 3-8 feet in height depending on the tide.

Location

The community of Napakiak is subject to a uniform risk of severe weather.

Older and/or poorly constructed homes and facilities are likely to be more likely to sustain damage from high winds, especially to their roofs, or from frozen pipes to poor insulation and more metal pipes that are more vulnerable to freeze damage.

Previous Occurrence/History

Severe weather occurs with such frequency in the Napakiak area that it is not well documented or tracked. Severe weather is an expected event and occurs at minimum annually, although the severity varies.

"During a storm from the south, the wind pushed the tides in and we all woke up to water everywhere. All of Napakiak was flooded. Many homes had an inch of water in them. We had no warning."

Waltern Nelson, Napakiak resident, March 7, 2018

Table 4-8 lists recorded severe weather events recorded by the National Weather Service for the Bethel area. Napakiak is in the National Weather Service (NWS) Weather Zone 155 with Bethel and the Yukon-Kuskokwim Delta. The National Weather Service has continued to modify their system for assigning weather zones to facilitate and more accurately confine weather patterns to relevant geographic areas. Consequently the data in Table 4-8 reflects different zone numbering patterns and should be used to depict weather events that have historically impacted the area; some of which may not have impacted the City of Napakiak as severely as other areas within the same zone.

Table 4-8 Severe Weather Events

Date	Location and Extent	Fatalities/Injuries	Estimated Loss
February 1997	High Wind	0/0	N/A
August 1997	High Wind	0/0	N/A
December 1998	Storm Surge/Tide	0/0	N/A
January 1999	Storm Surge/Tide	0/2	$20K
July 1999	High Wind	0/0	N/A
December 1999	Blizzard	0/0	N/A
January 2000	High Wind	0/0	N/A
January 2000	Winter Storm	0/0	N/A
January 2000	Winter Storm	0/0	N/A
March 2000	Extreme Cold/Wind Chill	1/0	N/A
June 2000	Heat	1/0	N/A
August 2000	High Wind	0/0	$5K
October 2000	Ice Storm	0/0	$5K
January 2002	Ice Storm	0/0	N/A
January 2002	Blizzard	0/0	N/A
October 2002	Ice Storm	0/0	N/A
June 2004	Tornado	0/0	$0K
July 2007	Thunderstorm Wind	0/0	0.00K
July 2008	Thunderstorm Wind	0/0	0.00K
July 2008	Thunderstorm Wind	0/0	0.00K
January 2010	Blizzard	0/0	0.00K
March 2013	Blizzard	0/0	0.00K
March 2016	Ice Storm	0/0	0.00K

Extent and Probability

Severe cold usually occurs during December-January. High winds typically occur from February-March and August-September. August experiences the most rain.

Based on previous occurrences and the criteria identified in Table 4-3, it is highly likely a severe storm event will occur in the next three years (event has up to 1 in 3 years chance of occurring) as the history of events is greater than 20 percent but less than or equal to 33 percent per year

Cascading Impacts

A quick thaw after a heavy snow can also cause substantial flooding.

Extreme cold increases the likelihood of ice jams and flooding.

High summer temperatures are attributed to increased permafrost thawing.

Extreme cold also interferes with the proper functioning of a community's infrastructure by causing fuel to congeal in storage tanks and supply lines, stopping electric generation. Without electricity, heaters and boilers/furnaces do not work, causing water and sewer pipes to freeze or rupture.

Southerly winds and wind-driven tides from Bering Sea storms that occur when the river is not frozen are a major contributor to shoreline erosion

Vulnerability

Based on past severe weather events and the criteria identified in Table 4-34, the extent of severe weather in Napakiak are considered limited where injuries do not result in permanent disability, or complete shutdown of critical facilities occurs for more than one week, or where more than 10 percent of property is severely damaged.

Impacts from extreme cold include hypothermia, halting transportation from fog and ice, congealed fuel, frozen pipes, disruption in utilities, frozen pipes, and carbon monoxide poisoning. Buildings that are older and/or not constructed with materials designed to withstand heavy snow and wind (e.g., hurricane ties on crossbeams) are more vulnerable to the impacts of severe weather.

Impacts associated with high wind and/or high snow events include roof collapse, power lines falling, damage to light aircraft and sinking small boats, injury and death resulting from snow machine or vehicle accidents, water damage, and cold injuries.

Until the snow can be removed, airports and roadways are impacted, even closed completely, stopping the flow of supplies and disrupting emergency and medical services.

Extreme cold can lead to hypothermia and frostbite, which are both serious medical conditions. Cold causes fuel to congeal in storage tanks and supply lines, stopping electric generators. Without electricity, heaters do not work, causing water and sewer pipes to freeze or rupture. Extreme cold can also interfere with air transportation if the ambient temperature is below an aircraft's minimum operating temperature.

The impact from these events can range from inconvenience to life-threatening conditions, particularly if air travel is restricted. Napakiak is not accessible by road, and all goods are brought in by air. Air transportation is particularly critical for emergency medical evacuations.

If extreme cold conditions are combined with low or no snow cover, the ground's frost depth can increase, disturbing buried pipes. The greatest danger from extreme cold is its effect on people. Prolonged exposure to the cold can cause frostbite or hypothermia and become life-threatening. Infants and elderly people are most susceptible. The risk of hypothermia due to exposure greatly increases during episodes of extreme cold, and carbon monoxide poisoning is possible as people use supplemental heating devices (NOAA 2001).

Potential Impacts from Climate Change

Over the past 60 years, the average temperature across Alaska has increased by approximately 3°F. This increase is more than twice the warming seen in the rest of the United States. Warming in the winter has increased by an average of 6°F and has led to changes in ecosystems, such as earlier breakup of river ice in the spring. As the climate continues to warm, average annual temperatures in Alaska are projected to increase an additional 2 to 4°F by the middle of this century. Precipitation in Alaska is projected to increase during all seasons by the end of this century. Despite increased precipitation, the state is likely to become drier due to greater evaporation caused by warming temperatures and longer growing seasons. Higher temperatures can also be attributed to higher winds. (Chapin, et al., 2014) (EPA, 2017). Overall, the planning committee and local residents anticpate more weather extremes to occur with higher frequency and/or intensity, a trend they have observed over that past 20 years. This expectation is based on traditional knowledge and observations.

4.3.4 Flood

Hazard Description

Napakiak is located on a low elevation island between the Kuskokwim River and Johnson's Slough. The average elevation is 6 feet, approximately 3 feet above the waterline of the Kuskokwim River (USACE 2008). Due to the low elevation of the community, flooding effects can occur throughout the community. The entire town, except for the airport runway and a few isolated high points are likely to flood. The U.S. Army Corps of Engineers set the high water mark for the August 1990 flood; the highest flood of memory. The Napakiak High Water Elevation Identification report is in Appendix 6. While there are many different types of flooding, the community of Napakiak primarily experiences floods resulting wind-driven tides, rainfall or snowmelt runoff. and potentially ice jams on the Kuskokwim River.

Impact of Severe Weather on Flooding: Flooding from wind-driven tides most commonly cause flooding in during Bering Sea storms that come in from the south. These flood events can occur with little to warning as winds shift in direction during high tide.

Impact of Erosion on Flooding: Erosion of the Kuskokwim Riverbank eliminated the natural levy that was previously located along the river and that protected the community from some of this flooding disappeared several decades ago (see quote above in Erosion profile from Michael Alexie).

Impact of Permafrost Degradation on Flooding: In addition to high river flow flooding, flood damage in Napakiak is also a result of poor drainage and is exacerbated by subsidence (profiled in Section 4.3.2 Permafrost Degradation/Ground Failure (Land Subsidence)) which is increasing the amount of low-lying property throughout the community.

Timing of events

Ice jam flooding most commonly occurs in the spring in Napakiak. Bering Sea storms with heavy rains and wind-driven tides most often occurs in the late summer and early fall. Snowmelt can typically peaks in April and May.

> *"My fish camp was damaged by the [flooding] from a southwest storm…demolished by smoke house, my fish rack and my fish essentials."*
>
> *Sally Billy, Napakiak resident, March 7, 2018*

Location

All of Napakiak is in low lying delta land and is at risk of flood. Figure 4-2 illustrates the limimted areas above the elevation of the flood of record, which occurred in 1990. The USACE measured the water elevation of 8.54 feet, which inundated most of the village in at least 2 feet of water. The blue line marks this elevation, and the figure indicates the areas above this flood elevation.

New buildings are being constructed and relocated buildings are being elevated to 5 feet or more above ground level to protect the ground from permafrost thawing and to prevent damage from floods and wind-driven high tides. These buildings are typically on the west side of town.

Areas were ground failure due to permafrost degradation has occurred are low-lying areas and prone to local flooding, or ponding, and prolonged flooding.

Figure 4-2 Napakiak Flood Hazard Areas

(Blue line equals 8.54 feet, flood of record water elevation line.)

Previous Occurrence/History

Napakiak has had four disaster declarations as a result of flooding: 1986, 1988, 1990, and 2005.These and additional major flood events are described in Table 4-9.

Table 4-9 History of Major Flood Events

Date	Location and Extent	Impact	Estimated Loss
1965	Community-wide flooding	Entire population was evacuated to bluff north of Johnson's Slough by Army National Guard.	
1973	Community-wide flooding	Entire population was evacuated to Bethel by Army National Guard.	
October 1986	Severe Flooding (State Disaster Declaration #782)	Damage occurred to roads.	

May 24, 1988	Community-wide flooding. State Disaster Declaration	Damage occurred to roads.	State disaster funds of $200,000 were made available for public assistance to Napakiak and Napaskiak.
August 17, 1990	**Flood of Record.** A severe storm compounded by high tides caused extensive flooding in coastal communities of the Kuskokwim and Bristol Bay areas and along the lower Kuskokwim River. The flooding caused damage to both public and private property. Community records indicate flood waters as deep as 4 feet. The flood water elevation was recorded at 8.54 feet – or 2.54 feet above the average ground elevation.	Damage occurred to roads. Loss of fishing gear and boats. Majority of town flooded. 12 homes were flooded. Insulation on ~25 housing units and 5 privately owned homes damaged – housing authority elevated multiple units.	
May 1991	Record snowfalls in the interior combined with sudden Spring melt caused flooding all along the Yukon and Kuskokwim River Systems. Numerous State Declarations were combined into a single Presidential Declaration of Major Disaster. Community records indicate flood waters as deep as 3 feet. (**FEMA-0909-AK**)	12 homes were flooded. Damage occurred to roads.	
Sept. 22- 26, 2005	2005 West Coast Storm. High winds combined with wind-driven tidal surges resulting in severe and widespread coastal flooding and a threat to life and property **Federally-declared disaster DR-1618.**	Damage occurred to roads.	

Extent and Probability
Flooding occurs frequently in the spring due to ice jams and in the late summer and fall due to coastal storms. Although ice jams and coastal storms occur every year, flooding in Napakiak does not occur annually. The recent history (1985-2010) corresponds to a flood, on average, every five years. Therefore, the probability of a future flood disaster event is highly likely.

Cascading Impacts
High, fast water on the Kuskokwim River exacerbates shoreline erosion.

Vulnerability
Most flood events result in damage to the roads and boardwalks. Many of the boardwalks are subject to floating away during floods and most of the baordwalks in Napakiak are gone or damaged due to flooding. Most roads will be inundated in places during floods. The roads are not paved and few are hardened with gravel. The sandy-silty substrate is subject to washing away as flood waters rise and later recede. The building housing the community water source wellhead is at a low elevation and is subject to contamination during flooding, as is shown in the above photograph. Most residences and other occupied buildings are elevated above the average flood elevations; however, some outbuildings and heating oil tanks are not adequately secured to the buildings to prevent loss during flood events. Boats, vehicles, and fishing boats also must be tethered or otherwise secured to the buildings to prevent loss during flood events.

Potential Impacts from Future Climate Conditions
As noted under Severe Weather profile, extreme weather events – including flood events - are occurring with greater frequency or intensity based on local and traditional knowledge and observations, as described by the planning committee. Especially with warming temperatures further degrading the permafrost, isolated or overall ground elevations are anticpated to decrease, thereby increasing the impact of flooding. With increased winter temperatures, mid-winter thaws are more likely to occur. Flooding from snowmelt or even winter rain is likely to be more frequent and potentially more severe.

Warming atsmosphieric and water temperatures contribute to a decrease in Bering Sea ice. It is forming later and retreating earlier. Without the protective barrier of the ice, coastal storm surges are more likely. The intensity of the storms may also increase with increase temperatures (NOAA 2018 and Zador and Siddon 2016).

4.4 Vulnerability Assessment
A vulnerability analysis predicts the extent of exposure that may result from a hazard event of a given intensity in a given area. The analysis provides quantitative data that may be used to identify and prioritize potential mitigation measures by allowing communities to focus attention on areas with the greatest risk of damage. A vulnerability analysis is divided into five steps: including asset inventory, methodology, data limitations, exposure analysis for current assets, and areas of future development.

The requirements for a vulnerability analysis as stipulated in DMA 2000 and its implementing regulations are described here. 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 repetitive loss properties in the identified hazard areas.

- An 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.
- Estimate of potential dollar losses to vulnerable structures and the methodology used to prepare the estimate.

4.4.1 Asset Inventory
Asset inventory is the first step of a vulnerability analysis. 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 Napakiak are identified and discussed in detail in the following sections.

Homes

Population data for the City of Napakiak was obtained from State of Alaska Website of 2010 U.S. Census, and the Department of Labor Division of Research and Analysis (DOL DRA). The City of Napakiak's total population for 2010 was 275 with a 2016 estimate of 326.

The value of residential buildings is presented here as the cost to provide a new home based on the Interior Regional Housing Authority reported average cost of construction for a single-family home in a barge-in community range $325,000 to $375,000[1].

Table 4-10 Estimated Population and Homes Valuation

Population		Residential Buildings	
2010 Census	AKDL&WD 2016 Estimate	Total Residential Building Count	Total Value of Residential Buildings
275	326	105	$36,750,000

Sources: City of Napakiak U.S. Census 2010, and DOL DRA.

The City estimates the cost of relocating a home or similarly sized building to be $25,000 for labor and equipment based on recent relocation expenses. This estimate does not include extensions to existing roads or utility lines.

Existing Critical Facilities and Infrastructure

A critical facility is defined as a facility that provides essential products and services to the general public, such as preserving the quality of life in the City of Napakiak and fulfilling important public safety, emergency response, and disaster recovery functions. The critical facilities profiled in this plan include the following:

- Government facilities, such as city and tribal administrative offices, departments, or agencies;
- Emergency response facilities with firefighting equipment (Napakiak currently lacks local law enforcement or an organized fire department);
- Educational facilities, (Napakiak School, K-12);
- Care facilities, such as the clinic;
- Community gathering places, such as community centers
- Utilities, such as electric generation, communications, water and waste water treatment, sewage lagoons, landfills

Table 4-11 lists the key facilities and criticial infrastructure in Napakiak.

[1] Telephone inquiry with IRHA home builder Donovan Ketzler Sept. 6, 2017

Table 4-11 Infrastructure

Use Type	Facility Description	Const. Type	Estimated Value
EF	Napakiak Community Center (City Offices, Washeteria and washeteria water supply)	Wood Frame, Post & Pad	
EF	Fire Station (not currently in operation)	Wood Frame, Earth & Pad	
EF	Napakiak Clinic	Wood Frame, Steel Pile	$2,051,853
EF	Napakiak School	Wood Frame, Post & Pad	
EF	Former National Guard Armory	Wood Frame, Post & Pad	
EF	Post Office	Wood Frame, Post & Pad	
EF	Public Safety Office	Wood Frame, Post & Pad	$100,000
EF	Tribal Council Building	Wood Frame, Post & Pad	
TI	Napakiak Airport	Gravel	
TI	Airport Maintenance Buildings	Pre-Engineered Metal Bldg.	
U, HM	Old Landfill, Class III	N/A	
U, HM	New Landfill, Class III	N/A	
U	School Water Treatment Plant and Generator	Wood Frame, Post & Pad	$325,900
U	Water Treatment Plant and Pump House	Wood Frame, Post & Pad	
U	Napakiak Water Supply, Central Well (not currently operational)	Wood Frame, Post & Pad	$250,000
U	Village Corporation Power Plant Building	Steel Bldg., Steel Pile	
TI	City Garage	Wood Frame, Post & Pad	
U	Sewage Lagoon, school	Local Soils Berm	
U	Sewage Lagoon	Local Soils Berm	

Table 4-11 Infrastructure

Use Type	Facility Description	Const. Type	Estimated Value
U	United Utilities Building (communications utility)	Wood Frame, Post & Pad	
U	United Utilities Satellite Dish	Steel	
U	GCI Cellular Communications tower	Steel	
U	School Satellite Dish	Steel	
HM	Fuel Storage Tanks, Corporation/ Community Tank Farm and Gas Station	Steel	$1.5M
HM	Fuel Storage Tanks, School	Steel	
EF	Cemetery	N/A	
EF	Moravian Church	Wood Frame, Post & Pad	
EF	Teachers' Quarters 1, 2, 3, 4 , 5 & 6	Wood Frame, Post & Pad	$300,000
EF	Bingo Hall	Wood Frame, Post & Pad	$350,000
EF	Napakiak Corporation Store & Offices (Naparyalruar Store)	Wood Frame, Post & Pad	
EF	Napakiak Corporation Warehouse	Metal Frame	
EF	Coastal Villages Region Fund Building	Wood Frame, Adjustable Pile	$700,000

Future Critical Facilities and Infrastructure

The City plans to relocate the former National Guard Armory buildings to lots west of the airport to use as a community building and a warehouse.

A new school site has been designated, although plams for a new school building have not yet been developed by the LKSD.

An extension of the road west of the current housing subdivision to accommodate a new school site and new or relocated homes is planned.

4.4.2 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.

Critical facilities were identified by the Planning Committee and were compared to locations where hazards are likely to occur. If any portion of the critical facility fell within a hazard area, it was counted as being exposed and vulnerable to the particular hazard.

Replacement structure values were provided by the City of Napakiak, when available . 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 calculated. 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.

4.4.3 Data Limitations

The vulnerability estimates provided herein are simple updates of those provided in the original 2011 Hazard Mitigation Plan which used the best data available at that time. Where available, updated data developed by the local Planning Committee and from public input has been incorporated. The methodologies result in an approximation of risk. These estimates may be used to understand relative risk from hazards and potential losses. 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 facilitate 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 could be developed with future updates of the HMP.

4.4.4 Exposure Analysis

<u>Erosion</u>

Napakiak has had three erosion control projects completed from 1986 through 1997, for a total cost of about $83,000. All three involved community relocation due to erosion at the current community site and were funded by DCCED. An additional residential relocation project is in the construction phase, funded by DCCED at a project cost of approximately $65,000 (USACE, 2009).

The Napakiak School Tank Farm is at risk of erosion which could cause loss of the school fuel supply, critical for facility operations, as well as contamination and navigation hazards as reported by the Alaska Dept. of Environmental Conservation Waste Erosion Assessment and Review (WEAR) 2015. The USACE 2012 CAP Fact Sheet states the Napakiak School could be impacted as early as 2019, with the WEAR report placing an estimate of 2023.

<u>Permafrost Degradation</u>

This hazard potentially impacts all structures and infrastructure throughout the community, including the sanitation facilities. Damages to roads are the most consistently observed impact requiring repair. Damages to either the fuel tank farms or to the water supply infrastructure (well, water treatment and storage) could severely impair the function of the community.

<u>Severe Weather</u>

The entire City of Napakiak is equally vulnerable to the effects of severe weather. Roof damage and frozen and burst pipes are the most likely threat. Damage at one of the community buildings owned or operated by the City, Native Village of Napakiak, Napakiak Corporation or school district could have community-wide implications and reductions in service.

Flood

Flooding is most likely to damage roads and boardwalks and impair transporation in the community. Most buildings are elevated, however, this is done to reduce impacts to the permafrost and not to elevate above high water levels. Many residences are vulnerable to water damage from flooding. Excess water in the sewage lagoons may create a discharge of untreated sewage. High water in the tank farms can result in damages to the tanks and/or containment system resulting in a fuel release. The fuel tanks and waste water holding tanks at individual buildings are also vulnerable to high water events; damage to these may result in a discharge or loss of the tank. Subistance equipment and properties, such as fish camp, drying racks, boats and nets, may be lost or damaged during flood events. This can potentially result in food shortages and impact to cultural identity.

4.5 Development Trends

4.5.1 Land Use and Development

The annual population growth has held at an average of two percent from 1950 through 2017, with continued steady growth expected. New housing is necessary to accommodate a steadily growing population, replace poor condition housing and address erosion losses.

Land use in the City of Napakiak is predominately residential with few areas for commercial services and community (or institutional) facilities. There are areas of commercial land uses within the City of Napakiak that include general store facilities and other Napakiak Corporation facilities. Community facilities are classified under institutional land uses such as schools and government facilities.

The City of Napakiak has no formal zoning or other land use controls, although new developments are coordinated and planned by the City, Native Village of Napakiak, and Napakiak Corporation.

The AVCP and BIA IRR Program are the lead agencies for road maintence and improvments, this includes planned and on-going road elevation, roadway hardening, drainage improvments and the extension of roads to accommodate erosion relocations.

Napakiak has previously sought funding for engineering study of erosion control at bluff embankment. However, a USACE Section 14 Preliminary CAP Fact Sheet was prepared in July 2012 to identify problems and opportunities for providing streambank protection and determine federal interest in implementing emergency streambank or shoreline protection. However, the preliminary study found however that the potential mititation measures would exceed the $1.5 million cap for this program, might have unintended consequences and require expensive maintenance (USACE, 2012). Napakiak expects to continue working with the USACE to monitor changes in the erosion predictions and identify new erosion mitigation measures or technology.

4.5.2 Areas of Future Development

Relocation of homes and community buildings will continue unless erosion control measures are successfully implemented. The community is expanding to the west to accommodate building relocations. Future sites for both residences and community buildings, such as the school, have already been determined via joint planning with the City, Native Village of Napakiak, Napakiak Corporation and the State of Alaska DCRA.

Whole community relocation is anticipated to be to the bluff west and north of the current location. A bridge crossing Johnson Slough would be necessary to facilite relocation and to maintain access to the airport until a new airport can be constructed. Land Use and Development Trends

5 Capability Assessment

The Napakiak capability assessment reviews the existing authorities, policies, programs and resources, and its ability to expand on and improve these existing policies and programs, needed to implement the proposed mitigation strategy.

The capability assessment completed for the 2011 Napakiak HMP has been updated.

The City of Napakiak has a limited number of regulatory and planning tools, staff and financial resources or tools to implement hazard mitigation activities. The resources available in these areas have been assessed by the hazard mitigation Planning Team, and are summarized in Tables 5-1, 5-2 and 5-3.

Table 5-1 City of Napakiak Regulatory Tools

Regulatory Tools (ordinances, codes, plans)	Existing?	Comments (Year of most recent update problems administering it, etc.)
Building code	No	
Zoning ordinances	No	
Subdivision ordinances or regulations	No	
Special purpose ordinances	No	
Community Plan	Yes	2018
Economic Development Plan	No	
Small Community Emergency Response Plan	No	
Land Use Ordinance	Yes	City of Napakiak, Alaska Ordinance No. 2013-02 An Ordinance to the Napakiak City Code to Amend Title 1 to Adopt Chapter 1: The Acquisition, Management, and Disposal of Municipal Land
Land Use Plan	No	

Table 5-2 City of Napakiak Staff Resources

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 GIS and/or HAZUS	No	
Scientists familiar with the hazards of the jurisdiction	No	
Emergency manager	Yes	City of Napakiak and Native Village of Napakiak
Grant writers	No	

Personnel and professional services not available locally are generally provided on a case-specific basis by contracted with the City or Native Village of Napakiak or provided by State or Federal agency.

Table 5-3 City of Napakiak Financial Resources

Financial Resources	Accessible or Eligible to Use
Community Development Block Grants	Yes
Capital Improvement Projects Funding	Unknown
Authority to levy taxes for specific purposes	Unknown
Fees for water, sewer, or electric service	Unknown
Impact fees for homebuyers or developers for new developments/homes	No
Withhold spending in hazard-prone areas	Funding for development or reconstruction in areas at risk for erosion is not applied unless there is a critical need for maintenance.

Resources and potential funding sources from the State orFederal agencies are listed in Appendix 7.

6 Mitigation Goals and Strategies

In accordance with 44 CFR §201.6, the Mitigation Strategy is a plan for reducing damages and losses identified by the Risk Assessment (Chapter 3). Information in this chapter is based on existing resources, programs, polices, and authorities, as well as the City's ability to improve and expand on existing tools.

This section outlines the process for preparing a mitigation strategy including: developing mitigation goals, identifying mitigation actions, evaluating mitigation actions, and implementing mitigation action plans.

Mitigation goals are derived from problem statements and describe the reduction or avoidance of vulnerability to hazards.

Mitigation strategy is the course of mitigation actions taken in order to meet the mitigation goals.

6.1 Developing Mitigation Goals

This section presents goals to reduce or avoid long-term vulnerabilities to the hazards profiled in Section 4.

The hazard profiles and the exposure analysis in were used to develop problem statements. Goals for mitigation that provide long-term solutions to the problem statements are the basis for mitigation actions. The mitigation strategy will be successful when the goals are achieved by completing the mitigation actions.

The exposure analysis results were used as a basis for developing the mitigation goals and actions. Mitigation goals are defined as general guidelines that describe what a community wants to achieve in terms of hazard and loss prevention. Goal statements are typically long-range, policy-oriented statements representing community-wide visions. As such, 10 goals were developed to reduce or avoid long-term vulnerabilities to the identified hazards.

6.1.1 Problem Statements

- Napakiak is losing land and property to erosion.
- Napakiak is subject to severe weather events, especially severe winter weather. Severe weather can damage residential and municipal infrastructure, interrupting essential service including life safety and sanitation systems. Severe weather events in Napakiak have the potential to threaten life and cause permanent injury.
- Fires within the village could spread from building to building and damage critical facilities infrastructure.
- Land subsidence due to permafrost degradation could result in damage to roadway and building foundations. Could require relocation of the Village.
- The impacts of climate change, particularly warming temperatures, could increase the probability and magnitude of natural hazards including erosion, flooding, permafrost degradation, wildland fire, and severe weather events and drought.

6.1.2 Goals and Mitigation Actions

Goals identified that address the problem statements are provided in Table 6-1. Actions identified to meet each of the goals are listed in Table 6-2.

Table 6-1 Mitigation Goals

No.	Goal Description
1.	Losses due to erosion will be reduced or eliminated
2.	Losses due to permafrost degradation will be reduced or eliminated.
3.	Losses due to severe weather will be reduced or eliminated
4.	Losses due to flood will be reduced or eliminated

6.2 Evaluating and Prioritizing Mitigation Actions and De

At both the July 19, 2017 and March 6, 2018 public meetings, the Local Planning Committee, City and Tribal councils assessed the hazard risks, discussed the potential mitigation actions that could be implemented, and prioritized these actions (See Appendix 2 for meeting documentation). Erosion was considered the most severely threatening hazard which will determine the community's long-term survival.

Table 6-2 also includes a priority ranking for each mitigation action: high, medium and low. Some of the high priority are further priorities with a note of "immediate" need because the propery damage and signifant impacts to the community function are expected within 1-2 years. Evaluation and implementation of mitigation actions, as stipulated in DMA 2000 and its implementing regulations is described below.

6.3 Mitigation Action Plan

Table 6-3 shows the Mitigation Action Plan to provide the City with an approach to implementing the HMP. The Mitigation Action Plan organizes the mitigation actions in order of priority. And identifies the agencies that would be responsible for or involved in the implementation of the actions as well as potential funding sources, when applicable or the information is available.

Table 6-2 Mitigation Actions

Goals		Actions to be taken by the Local Planning Committee		
No.	Description	ID	Description	Priority
1	Losses due to erosion will be reduced or eliminated	1.a	Relocate community to higher ground on bluff opposite of Johnson Slough. Associated tasks include: • Land aquistion for new village site. • Construction of a crossing over Johnson Slough, including the preliminary tasks of funding, appropriate geotechnical and engineering studies, and construction of access roads to slough crossing.	Long-term
		1.b	Relocate infrastructure and buildings that are at risk of being affected by erosion. (Note: This in an on-going project, and a continuation of a 2011 Mitigation Action)	High (Immediate Need)
		1.c	Coordinate with LKSD to remove and relocate school tank farm. Immediate step if delay in tank farm relocation is the relocation of marine header closer to the tank farm. The marine header is currently approximately 65 feet from the shoreline, or within the amount of land lost historically lost in a 1-2 year period.Seek funding and apply for grants/funding to construct a fill causeway with culverts in order to relocate to drier ground across Johnson Slough.	High (Immediate Need)High
		1.d	• Conduct geotechnical studies on areas identified by community as new subdivision for relocation of residences and school and other facilities at risk of erosion.	High
		1.e	Coordinate with USACE in identifying potential erosion control measures that are cost effective and likely to succeed.	Medium
		1.f	Coordinate with USACE to obtain revised erosion estimates, including the area at the south end of the runway.	Medium

Goals		Actions to be taken by the Local Planning Committee		
No.	Description	ID	Description	Priority
2	Losses due to permafrost degradation will be reduced or eliminated	2.a	Identify and monitor any areas of land subsidence.	Medium
		2.b	Identify and monitor signs of differential settling of buildings, foundations, or of other infrastructure.	High
		2.c	Avoid construction in areas where land subsidence is expected to occur, such as near existing sink holes or areas with increasing puddle or ponded water formations.	High
3	Losses due to flood will be reduced or eliminated.	3.a	Elevate roads and walkways above anticipated flood levels. Install culverts and ditches as appropriate to facilitate the drainage of water away from or under roadways to reduce damages. (Note: This in an on-going project, and a continuation of a 2011 Mitigation Action)	High
		3.b	Repair or reconstruct boadwalks or similar elevated walkways . Many of these have been damaged or washed away during flood events. (Elevated walkways also reduce permafrost degradation and potential ground failure.).	Medium
		3.c	Identify structures in the community most at risk of flood damage. Coordinate with property owner on flood mitigation options (e.g. building elevation, storage of critical possession above area likely to be flooded, and securing property stored outside.)	Medium
		3.d	Elevation of key facilities at risk of flooding. (Note: Building elevation has historically been to reduce damage to permafrost and not to elevate above high water; new construction and relocated structures are targeted to be 5-8 feet above ground level.)	Medium
		3.e	Assess building & home heating oil tanks for vulnerability to flood damage. Secure heating oil tanks at risk. Use the guidance available from the Alaska Department of Environmental Conservation at http://dec.alaska.gov/spar/ppr/hho.htm	Medium

Goals		Actions to be taken by the Local Planning Committee		
No.	Description	ID	Description	Priority
4	Losses due to severe weather will be reduced or eliminated	4.a	Provide copies of the Napakiak Emergency Response Plan to members of the Local Planning Committee and to local stakeholders; review and update annually and hold an annual training on emergency response actions.	Low
		4.b	Identify structures in the community that are vulnerable to damage due to severe weather: specifically wind damage and frozen pipes from severe cold.	Medium
		4.c	Coordinate with RurAL CAP on their weatherization program and on bringing program to Napakiak to weatherize structures. While the purpose of the RurAL CAP program is to reduce energy costs, the effect is often to reduce vulnerability of buildings to damages from severe cold and high winds. (See weatherization program by RurAL CAP in Appendix 5).	Medium

Table 6-3 Mitigation Action Plan Matrix

Action ID.	Description	Priority	Responsible party	Potential Funding*	Timeframe	Benefit Cost Assessment
1.a	Relocate community to higher ground on bluff opposite of Johnson Slough.	Long-term	City, State	State, USACE	2048	Loss of townsite is inevitable.
1.b	Relocate infrastructure and buildings that are at risk of being affected by erosion.	High (Immediate Need)	City	State: ADEC (well) DMVA (old armory) USACE	2020	Relocation costs are a fraction of new construction.
1.c	Coordinate with LKSD to remove and relocate school tank farm (139 feet from eroding shoreline). Immediate step if delay in tank farm relocation is the relocation of marine header closer to the tank farm. The marine header is currently approximately 65 feet from the shoreline, or within the amount of land lost historically lost in a 1-2 year period.Seek funding and apply for grants/funding to construct a fill causeway with culverts in order to relocate to drier ground across Johnson Slough.	High (Immediate Need)	City LKSD	LKSD State: Department of Education; ADEC	2020	Without tank farm, school building will not have heat.
1.d	Conduct geotechnical studies on areas identified by community as new subdivision for relocation of residences and school and other facilities at risk of erosion.	High	City	State TBD	2023	Geotechnical studies will ensure that homes and faciliites are only constructed on suitable sites.

Action ID.	Description	Priority	Responsible party	Potential Funding*	Timeframe	Benefit Cost Assessment
2.b	Identify and monitor signs of differential settling of buildings, foundations, or of other infrastructure.	High	City	City Native Village of Napakiak Napakiak Corporation	2020 (annual monitoring)	Low cost monitoring to direct and inform mitigation efforts
2.c	Avoid construction in areas where land subsidence is expected to occur, such as near existing sink holes or areas with increasing puddle or ponded water formations.	High	City	City	On-going; implement immediately	Low cost; however will restrict potential area for relocations
3.a	Elevate roads and walkways above anticipated flood levels. Install culverts and ditches as appropriate to facilitate the drainage of water away from or under roadways to reduce damages.	High	City Native Village of Napakiak	AVCP BIA/ IRR Program	2018 (and on-going)	Funding secured by Native Village of Napakiak via AVCP and BIA IRR Program
1.e	Coordinate with USACE in identifying potential erosion control measures that are cost effective and likely to succeed.	Medium	City	USACE	2020 (annual communication)	Coordination is low cost; implementation of mitigation measures TBD
1.f	Coordinate with USACE to obtain revised erosion estimates, including the area at the south end of the runway.	Medium	City	USACE	2021	Loss of the runway will severely restrict village functions and will accelerate need for whole-community relocation

Action ID.	Description	Priority	Responsible party	Potential Funding*	Timeframe	Benefit Cost Assessment
2.a	Identify and monitor any areas of land subsidence.	Medium	City	City Native Village of Napakiak Napakiak Corporation	2020 (annual monitoring)	Low cost monitoring to direct and inform mitigation efforts
3.b	Repair or reconstruct boadwalks or similar elevated walkways . Many of these have been damaged or washed away during flood events. (Elevated walkways also reduce permafrost degradation and potential ground failure.).	Medium	City Native Village of Napakiak	AVCP BIA/ IRR Program	2020	Most boardwalks already lost to flooding. Reconstruction will prevent permafrost degradation and facilitate safe transportation, especially children to/from school during high water events.
3.c	Identify structures in the community most at risk of flood damage. Coordinate with property owner on flood mitigation options (e.g. building elevation, storage of critical possession above area likely to be flooded, and securing property stored outside.)	Medium	City	City Native Village of Napakiak Napakiak Corporation	2020 (annual monitoring)	Low cost monitoring to direct and inform mitigation efforts

Action ID.	Description	Priority	Responsible party	Potential Funding*	Timeframe	Benefit Cost Assessment
3.d	Elevation of key facilities at risk of flooding. Elevation of any relocated buildings.	Medium	City	City Native Village of Napakiak Napakiak Corporation	2025	Use of equipment used for relocations can be implemented for building elevations; reducing the overall cost.
3.e	Assess building & home heating oil tanks for vulnerability to flood damage. Secure heating oil tanks at risk. Use the guidance available from the Alaska Department of Environmental Conservation at http://dec.alaska.gov/spar/ppr/hho.htm	Medium	City Native Village of Napakiak Napakiak Corporation	City Native Village of Napakiak Napakiak Corporation	2023	Low cost assessment; actions to secure tanks are often under $500 to stablize, elevate or reposition tank location.
4.a	Provide copies of the Napakiak Emergency Response Plan to members of the Local Planning Committee and to local stakeholders; review and update annually and hold an annual training on emergency response actions.	Medium	City Native Village of Napakiak Napakiak Corporation	City Native Village of Napakiak Napakiak Corporation	2019 (and annual thereafter)	Low cost; <$2,500 annually for community event
4.b	Identify structures in the community that are vulnerable to damage due to severe weather: specifically wind damage and frozen pipes from severe cold.	Medium	City Native Village of Napakiak Napakiak Corporation	City Native Village of Napakiak Napakiak Corporation	2023	Low cost assessment

Action ID.	Description	Priority	Responsible party	Potential Funding*	Timeframe	Benefit Cost Assessment
4.c	Coordinate with RurAL CAP on their weatherization program and on bringing program to Napakiak to weatherize structures.	Medium	City Native Village of Napakiak	RurAL CAP	2023	Weatherization measures have been documented by RurAL CAP to be cost effective at reducing energy expenses; reduction in damages due to severe weather increase cost effectiveness.

To support the mitigigation goals and actions, Napakiak has identified the following objectives to facilitate the implementation of the actions, their success and broader community awaremess, preparedness and support for hazard preparedness and mitigation.

- Emergency management programs will meet state standards and best practices among Alaska villages.
- Coordinating partners and stakeholders will be familiar with the Napakiak Hazard Mitigation Plan and will be able to provide recommendations for ongoing improvement.
- The local community will be aware of disaster preparedness, emergency response services, and hazard mitigation.
- Community planning for development and infrastructure will acknowledge the Napakiak Hazard Mitigation Planning and incorporate mitigation actions where appropriate.
- The HMP Local Planning Committee will monitor the impacts of climate change on natural hazards and the local environment.

7 Plan Maintenance and Implementation

The HMP, including appendices, will be updated every five years, after a disaster response, or as appropriate in response to community mitigation activities, changes to land use development and changes to critical infrastructure. The HMP will be formally re-promulgated by the Community and sent to the State of Alaska Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency for approval once every five years.

7.1 Adoption by Local Governing Bodies and Supporting Documentation

The requirements for the adoption of this HMP by the local governing body, as stipulated in the DMA 2000 and its implementing regulations are described below:

DMA 2000 REQUIREMENTS: PREREQUISITES Local Plan Adoption Requirement §201.6(c)(5): The local hazard mitigation 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, Commissioner, Tribal Council). Element Has the local governing body adopted the new or updated plan? Is supporting documentation, such as a resolution, included? Source: FEMA, July 2008.

The City of Napakiak is the local jurisdiction represented in this HMP and meets the requirements of Section 409 of the Stafford Act and Section 322 of DMA 2000.

7.2 Monitoring, Evaluating, and Updating the HMP

Table 7-1 shows the previous planned actions and 2017 status.

Table 7-1 Status of 2011 Hazard Mitigation Action Plan

Project	2011 Priority	Funding Sources	Time Frame	Cost	2017 Status

1a. Relocate buildings subject to loss due to erosion within next 50 years.	1	State, Federal, Local	25 Years		Started but Not Complete
1b. Relocate village to bluff north of Johnson's Slough. Construct bridge across Johnson's Slough and road to Bethel to facilitate relocation of village to bluff.	Ultimate Community Goal	State, Federal	25 Years	$100-150 Million (including road to Bethel and bridge across Johnson's Slough)	Study begun by DCCED; This is a long-term objective.
2a. Transfer community water source to "New Well" and relocate or construct new water treatment plant at new well, ensuring that wellhead and building are constructed above record flood line elevations. Decommission "Old Well."	1	State, Federal	2-5 Years	>$250,000	Work initiated with completion expected in 2018.
3b/4a. Install or improve ditches and culverts to facilitate drainage alongside and under roads to slough or river	2	State, Federal	5-10 Years	>$150,000	Beginning 2017, with work planned through 2018. Funding from BIA through AVCP
3a. Elevate roads above flood of record flood line elevation of 8.54 feet. Most roads require an additional 2-4 feet of elevation.	3	State, Federal	1-15 years	>$1,000,000	Beginning 2017, with work planned through 2018. Funding from BIA through AVCP.
3c/4b. Install or improve boardwalks on common walkways to protect ground surface. Boardwalks will further reduce formation of depressions (mud puddles) that inhibit draining of ponded water.	4	State, Federal	1-10 Years	$50,000	Not Complete

2b. Public education and assistance program to elevate and secure heating oil tanks.	5	State, Federal	1-10 Years	$10,000	Not Complete

Relocation of the Community is the top mitigation action priority, with buildings in the 50-Year Erosion Profile being the highest priority for relocation. Other actions are precluded if this completed in a timely manner, however the community recognizes relocation of the entire village may take multiple years and other interim actions will need to be taken to maintain the welfare of the community. The following actions are priorities for mitigation actions prior to village relocation.

The HMP was prepared as a collaborative effort among the Local Panning Committee. To maintain momentum and build upon previous hazard mitigation planning efforts and successes, Napakiak will use the Local Planning Committee to monitor, evaluate, and update the HMP.

The City Administrator of Napakiak is the hazard mitigation Planning Team Leader and is the primary point of contact and will coordinate local efforts to monitor, evaluate, and revise the HMP.

The Planning Team will conduct an annual review during the anniversary week of the plan's official FEMA approval date to monitor the progress in implementing the HMP, particularly the Mitigation Action Plan. The Annual Review Worksheet (provided in Appendix 1) will provide the basis for possible changes in the HMP Mitigation Action Plan by refocusing on new or more threatening hazards, adjusting to changes to or increases in resource allocations, and engaging additional support for the HMP implementation. The Planning Team Leader will initiate the annual review two months prior to the scheduled planning meeting date to ensure that all data is assembled for discussion with the Planning Team. The findings from these reviews 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:

- Participation of authorities and others in the HMP implementation.
- Notable changes in the risk of natural or human-caused hazards.
- Impacts of land development activities and related programs on hazard mitigation.
- Progress made with the Mitigation Action Plan (identify problems and suggest improvements as necessary).
- The adequacy of local resources for implementation of the HMP.

A system of reviewing the progress on achieving the mitigation goals and implementing the Mitigation Action Plan activities and projects will also be accomplished during the annual review process. During each annual review, each authority administering a mitigation project will submit a Progress Report to the Planning Team. The report will include the current status of the mitigation project, including any changes made to the project, the identification of implementation problems and appropriate strategies to overcome them, and whether or not the project has helped achieved the appropriate goals identified in the plan.

In addition to the annual review, the Planning Team will update the HMP every five years. To ensure that this update occurs, in the third year following adoption of the HMP, the Planning Team will undertake the following activities:

- Request grants assistance for DHS&EM to update the HMP (this can take up to one year to obtain funding and one year to update the plan).
- Thoroughly analyze and update the risk of natural and human-made hazards.
- Provide a new annual review (as noted above), plus a review of the three previous annual reviews.
- Provide a detailed review and revision of the mitigation strategy.
- Prepare a new Mitigation Action Plan for the City of Napakiak
- Prepare a new draft HMP.
- Submit an updated HMP to the DH&EM and FEMA for approval.
- Submit the FEMA approved plan for adoption by the City of Napakiak

7.3 Implementation through Existing Planning Mechanisms

The requirements for implementation through existing planning mechanisms, as stipulated in the DMA 2000 and its implementing regulations, are described below.

DMA 2000 Requirements: Plan Maintenance Process - Incorporation into Existing Planning Mechanisms
Incorporation into Existing Planning Mechanisms Requirement §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 Does the new or updated plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan? Does the new or updated plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate? Does the updated plan explain how the local government incorporated the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate? (Not applicable until 2014 update) Source: FEMA, July 2008.

After the adoption of the HMP, the Planning Committee will ensure that HMP information is incorporated into new and existing planning efforts. The Planning Committee will ensure the following activities:

- Conduct a review of the community-specific regulatory tools to assess the integration of the mitigation strategy. These regulatory tools are identified in the following capability assessment section.
- Work with pertinent community departments to increase awareness of the HMP and provide assistance in integrating the mitigation strategy (including the Mitigation Action Plan) into relevant planning mechanisms. Implementation of these requirements may require updating or amending specific planning mechanisms.

7.4 Continued Public Involvement

The means for continued public involvement with this HMP, as required by the DMA 2000 and its implementing regulations, are described below.

The City of Napakiak is dedicated to involving the public directly in the continual reshaping and updating of the HMP. As depicted in the Table 6-3, Mitigation Actions Plan Matrix, five of the implemented Mitigation Actions (1A, 5A, 6D, 9A, and 10A) are outreach activities focused to keeping their population involved and aware of the hazards threatening the community.

A paper copy of the HMP and any proposed changes will be available at 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 City Office.

The Planning Team will also identify opportunities to raise community awareness about the HMP and the hazards that affect the area. This effort 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.

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Appendix 1 – Mitigation Maintenance Forms and Worksheets

Appendix 2 – Documentation of Public Involvement

Appendix 3 – Plan Approval Resolution

Appendix 4 – Alaska Departmetn of Environmental Conservation, Waste Erosion Assessment Reports (WEAR)

Appendix 5 – RurAL CAP Weatherization Program Sheet

Appendix 6 – U.S. Army Corps of Engineers Reports

Appendix 7 – Federal and State Resources and Potential Funding Sources

Appendix 8 – Photographs