City of Emmonak, Alaska

Local Hazards Mitigation Plan

Emmonak, June 4, 2013

October 7, 2014

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City of Emmonak

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Table of Contents

1. Introduction 1-1
1.1 Hazard Mitigation Planning 1-1
1.2 Grant Programs with Mitigation Plan Requirements 1-1
1.2.1 Hazard Mitigation Assistance (HMA) Unified Programs 1-2
2. Community Description 2-1
2.1 Location, Geography, and History 2-1
2.2 Demographics 2-2
2.3 Economy 2-3
3. Planning Process 3-1
3.1 Overview of Planning Process 3-2
3.2 Hazard Mitigation Planning Team 3-3
3.3 Public Involvement & Opportunity for Interested Parties to participate 3-3
3.4 Incorporation of Existing Plans and Other Relevant Information 3-3
3.5 Plan Maintenance 3-5
3.5.1 Incorporating Existing Planning Mechanisms 3-5
3.5.2 Continued Public Involvement 3-5
3.5.3 Monitoring, Reviewing, Evaluating, and Updating the HMP 3-6
4. Plan Adoption 4-1
4.1 Adoption by Local Governing Bodies and Supporting Documentation 4-1
5. Hazard Profiles 5-1
5.1 Overview of a Hazard Analysis 5-1
5.2 Hazard Identification and Screening 5-1
5.3 Hazard Profile 5-3
5.3.1 Earthquake 5-5
5.3.2 Erosion 5-10
5.3.3 Flood 5-13
5.3.4 Severe Weather 5-16
5.3.5 Ground Failure 5-19
5.3.6 Wildfires 5-21
6. Vulnerability Analysis 6-1
6.1 Vulnerability Analysis Overview 6-1
6.2 Asset Analysis 6-2
6.2.1 Asset Inventory 6-2
6.2.2 Facility Replacement Values 6-4
6.3 Vulnerability Analysis Methodology 6-6
6.4 Data Limitations 6-6
6.5 Vulnerability Exposure Analysis 6-6
6.6 Repetitive Loss Properties 6-8
6.7 Land Use and Development Trends 6-11
6.7.1 Emmonak Land Use 6-11
6.7.2 Emmonak Development Trends 6-11

7. Mitigation Strategy 7-1
7.1 City of Emmonak Capability Assessment 7-2
7.2 Developing Mitigation Goals 7-4
7.3 Identifying Mitigation Actions 7-6
7.4 Evaluating and Prioritizing Mitigation Actions 7-11
7.5 Implementing a Mitigation Action Plan 7-13
7.6 Implementation Through Existing Planning Mechanisms 7-15

8. References 8-1

Appendices .....
FEMA Local Mitigation Plan Review Tool ..... A
City of Emmonak Adoption Resolution ..... B
Public Outreach C
Benefit Cost Analysis Fact Sheet ..... D
Annual Review Tables ..... E
FIRM for Emmonak ..... F

Tables

Table 1-1 HMA Eligible Activities 1-2
Table 2-1 2012 Labor Industry Classification 2-4
Table 2-2 2012 Top Occupations, Gender, and Age Group 2-5
Table 3-1 Hazard Mitigation Planning Team 3-3
Table 3-2 Incorporated Planning Documents 3-4
Table 5-1 Identification and Screening of Hazards 5-2
Table 5-2 Hazard Probability Criteria 5-4
Table 5-3 Hazard Magnitude/Severity Criteria 5-4
Table 5-4 Calculated Priority Risk Index 5-5
Table 5-5 Calculated Priority Risk Index by Hazard 5-5
Table 5-6 Magnitude/Intensity/Ground –Shaking Comparisons 5-7
Table 5-7 Wildland Fires Near Emmonak 5-22
Table 6-1 Vulnerability Overview 6-2
Table 6-2 Estimated Population and Building Inventory 6-3
Table 6-3 Emmonak Loss estimates by Occupancy Class 6-4
Table 6-4 Emmonak Loss Estimates 6-4
Table 6-5 Emmonak Critical Facility Loss Estimates 6-5
Table 6-6 Firm Zones 6-9
Table 6-7 Emmonak NFIP Statistics 6-10
Table 7-1 Regulatory Tools 7-2
Table 7-2 Technical Specialists for Hazard Mitigation 7-3
Table 7-3 Financial Resources Available for Hazard Mitigation 7-4
Table 7-4A 2008 Mitigation Goals 7-5
Table 7-4B Revised Mitigation Goals 7-5
Table 7-5A 2008 Mitigation Goals and Related Actions 7-6
Table 7-5B Revised Mitigation Goals and Related Actions 7-9
Table 7-6 Evaluation Criteria for Mitigation Actions 7-12
Table 7-7 Mitigation Action Priority Matrix 7-13
Table 7-8 Mitigation Action Plan Matrix 7-14

Figures

Figure 2-1 Emmonak Location Map....2-1
Figure 2-2 Emmonak Population Estimates....2-2
Figure 2-3 Worker Demographics 2011....2-3
Figure 2-4 Resident Workers by Industry....2-4
Figure 5-1 Emmonak Earthquake Probability....5-8
Figure 5-2 DGGS Neotechtonic Map of Alaska....5-9
Figure 5-3 Permafrost....5-20
Figure 5-4 Emmonak Fire History Map....5-24
Figure 6-1 Emmonak Area Land Use Map....6-12

List of Acronyms and Abbreviations

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

1 Introduction

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

1.1 HAZARD MITIGATION PLANNING

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

On February 26, 2002, FEMA published an Interim Final Rule in the Federal Register (FEMA 2002a), 44 CFR Part 201 with subsequent updates. The planning requirements for local entities are described in detail in Section 201.6 and are identified in their appropriate sections throughout this HMP. Local hazard mitigation plans now qualify communities for several Federal Hazard Mitigation Assistance (HMA) grant programs. This HMP complies with the current Title 44 CFR and applicable guidance documents.

1.2 GRANT PROGRAMS WITH MITIGATION PLAN REQUIREMENTS

FEMA HMA grant programs provide funding to States, Tribes, and local entities having a FEMA-approved State, Tribal, or Local Mitigation Plan. The Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) are authorized under the Stafford Act and DMA 2000, while Flood Mitigation Assistance (FMA) is authorized under the National Flood Insurance Act and the Biggert-Waters Flood Insurance Reform Act. The Hazard Mitigation Grant Program (HMGP) is a competitive, disaster funded, grant program. Whereas the other Unified Mitigation Assistance Programs: Pre-Disaster Mitigation (PDM), Flood Mitigation Assistance (FMA), although competitive, rely on specific pre-disaster grant funding sources, sharing several common elements.

"Hazard mitigation is any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects. This definition distinguishes actions that have a long-term impact from those that are more closely associated with immediate preparedness, response, and recovery activities. Hazard mitigation is the only phase of emergency management specifically dedicated to breaking the cycle of damage, reconstruction, and repeated damage. As such, States, Territories, Indian Tribal governments, and communities are encouraged to take advantage of funding provided by HMA programs in both the pre- and post-disaster timeframes." (FEMA 2010)

1.2.1 Hazard Mitigation Assistance (HMA) Unified Programs

HMA grant program activities include:

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

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

The PDM grant program provides funds to State, Tribes, and local entities, including universities, for hazard mitigation planning and mitigation project implementation prior to a disaster event. PDM grants are awarded on a nationally competitive basis. Like HMGP funding, a PDM project's potential savings must be more than the cost of implementing the project. Funds may be used to protect or purchase either public or private property. The total amount of PDM funding available is appropriated by Congress on an annual basis. In FY 2008, PDM program funding totaled approximately $114 million, FY 2009 was $90 million, and FY 2013 was $25 million. The cost-share for these grants is 75 percent Federal/25 percent non-Federal.

The Flood Mitigation Assistance Program (FMA) provides pre-disaster grants to State and local governments for planning and flood mitigation projects. Created by the National Flood Insurance Reform Act of 1994, its goal is to reduce or eliminate NFIP claims. It is an annual nationally competitive program. Residential and non-residential properties may apply for FMA grants through their NFIP community and are required to have NFIP insurance to be eligible. FMA grant funds may be used to develop the flood portions of hazard mitigation plans or to do flood mitigation projects. FMA grants are funded 75% Federal and 25% applicant.

The Biggert-Waters Flood Insurance Reform Act of 2012 eliminated the Repetitive Flood Claims (RFC) and Severe Repetitive Loss grant programs (SRL). Elements of these flood programs have been incorporated into FMA. The FMA program now allows for additional cost share flexibility:

- Up to 100-percent Federal cost share for severe repetitive loss properties.
- Up to 90-percent Federal cost share for repetitive loss properties.
- Up to 75-percent Federal cost share for NFIP insured properties.

The FMA program is available only to communities participating in the NFIP. In the State of Alaska, the Department of Commerce, Community, and Economic Development (DCCED) manages this program. The City of Emmonak is a member of the NFIP.

HMP Description

The HMP consists of the following sections and appendices:

Introduction

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

Community Description

Section 2 provides a general history and demography, including current trends and economic forces shaping the community.

Planning Process

Section 3 describes the HMP update's planning process, identifies the Planning Team Members, the meetings held as part of the planning process, and the key stakeholders within the community and the surrounding area. This section documents public outreach activities they will implement to encourage public participation (Appendix C).

This section also describes the Planning Team's formal plan maintenance process, ensuring the HMP remains active throughout its 5-year lifecycle. The process includes monitoring, reviewing, evaluating (Appendix E – Maintenance Documents), updating the HMP; and the incorporation of relevant plans, reports, and other appropriate information.

HMP Adoption

Section 4 is documentation of the community's HMP adoption resolution.

Hazard Analysis

Section 5 describes the process through which the Planning Team reviewed the hazards in their HMP. The hazard analysis includes the nature, history, location, extent, impact, and probability of future events.

Vulnerability Analysis

Section 6 identifies vulnerable assets—people, residential and nonresidential buildings, and critical facilities and infrastructure. The analysis identifies their magnitude of risk for each hazard. Land use and development trends are incorporated into the vulnerability analysis.

Mitigation Strategy

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

The Planning Team developed a list of mitigation goals and potential actions. Mitigation includes preventive actions, property protection techniques, natural resource protection strategies, structural projects, and public awareness activities. Mitigation strategies were developed to reduce seasonal flood damage.

References

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

Appendices

Appendix A is the FEMA Local Mitigation Plan Review Tool, which documents compliance with FEMA criteria.

Appendix B is a copy of Emmonak's formal adoption resolution.

Appendix C provides public outreach documentation.

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

Appendix E provides the plan maintenance documents, such as an annual review sheet and the progress report form.

Appendix F is the current Flood Insurance Rate Map (FIRM) for the Emmonak area.

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

2.1 LOCATION, GEOGRAPHY, AND HISTORY

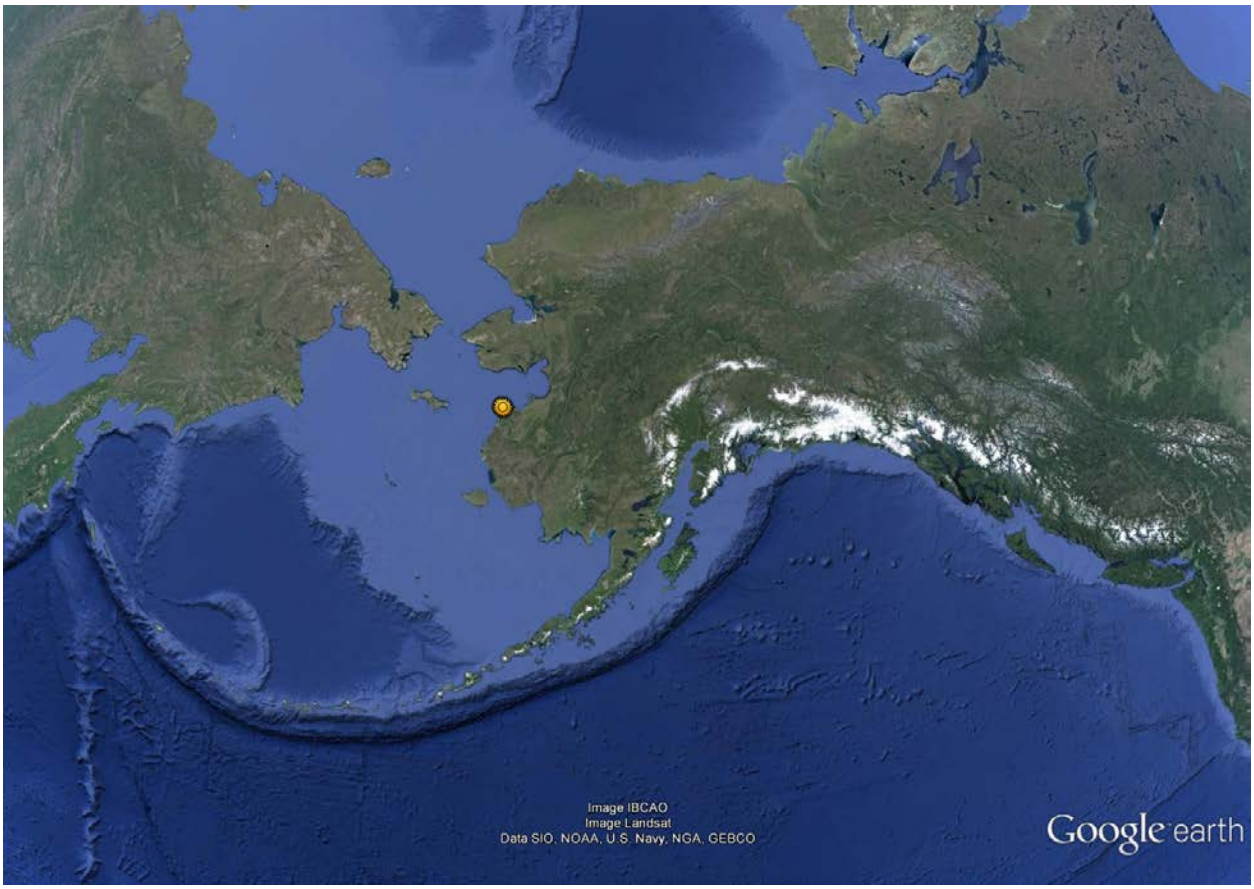


Figure 2-1, Emmonak Location Map

Emmonak is located at the mouth of the Yukon River, 10 miles from the Bering Sea, on the north bank of Kwiguk Pass. It lies 120 air miles northwest of Bethel and 490 air miles from Anchorage, in the Yukon Delta National Wildlife Refuge. It lies at approximately 62.777780° North Latitude and -164.52306° West Longitude. (Sec. 17, T031N, R081W, Seward Meridian.) Emmonak is located in the Bethel Recording District. The area encompasses 7.5 square miles of land and 1.1 square miles of water.

Climate: A maritime climate predominates in Emmonak. Temperatures range from -25 to 79 °F. Precipitation averages 19 inches per year, while snowfall averages 50 to 60 inches per year. Freeze-up occurs during October; break-up occurs in June.

History: The village was originally called "Kwiguk", a Yup'ik word meaning "big stream".

Villagers call themselves "Kuigpagmuit", or "people from the Yukon River". The Census Bureau has also called it "Emanguk". The original settlement was 1.4 miles south of its present location, and was first reported by the U.S. Coast and Geodetic Survey in 1899.

A post office was established there in 1920. Later, commercial fishing became a major industry in the village and the Northern Commercial Company built a cannery. In 1964, floods washed the cannery away. That same year, the City government was incorporated. Due to increasing flooding and erosion, the village was relocated 1.4 miles north of Kwiguk in 1964-65. The new location was renamed Emmonak, which means "blackfish".

Source: (Department of Community, Commerce, and Economic Development [DCCED], Division of Community and Regional Affairs [DCRA] 2013).

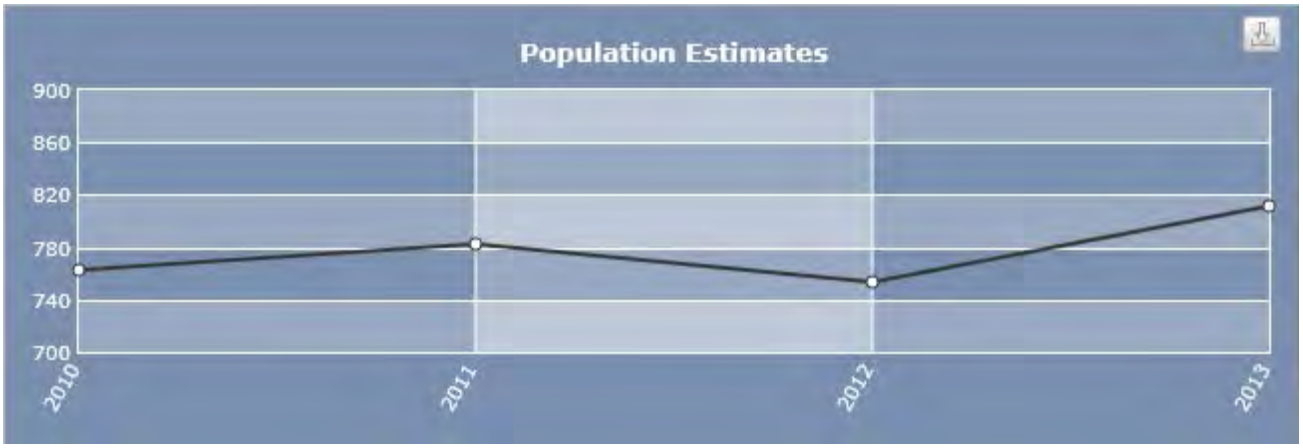
2.2 DEMOGRAPHICS

2.2.1 Population:

- Current Population: 811 (2013 DCCED Estimated Population)
- Incorporation Type: 2nd Class City
- Borough Type: Unorganized
- Census Area Wade Hampton
- School District: Lower Yukon School District
- Regional Native Corp: Calista Corporation

Source: (Department of Community, Commerce, and Economic Development [DCCED], Division of Community and Regional Affairs [DCRA] 2013).

Figure 2-2 2013 Population Estimates for Emmonak



Source: State of Alaska Department of Labor (AKDOL) 2013.

2.2.2 Culture: Emmonak is a Yup'ik Eskimo village involved in commercial fishing, processing, and subsistence activities. Residents of Chuloonawick, a nearby fish camp, also live in Emmonak. The sale, importation, and possession of alcohol are banned in the village *(DCRA)*.

2.3 ECONOMY

Emmonak experiences a seasonal economy as a center for commercial fishing, purchasing and processing on the lower Yukon River. The Yukon Delta Fish Marketing Co-op and the Bering Sea Fisheries process and export Emmonak salmon. 101 residents hold commercial fishing permits. Subsistence activities, trapping and public assistance provide additional income. The majority of the community travels to fish camps during the summer months to dry salmon for winter use. Moose, beluga whale, seal, and waterfowl are also utilized.

In April 2014, Alaska Department of Labor reported a 24% unemployment rate in the Wade Hampton Census Area, which is the highest in the State. In Emmonak, 56% of the 510 adult residents are currently employed and 43% are not in the labor force. The reported unemployment rate is 9.8%.

State of Alaska, Department of Labor Employment Estimates for 2012 are displayed in figures 2-3, 2-4, and table 2-1.

Figure 2-3 Worker Demographics 2012

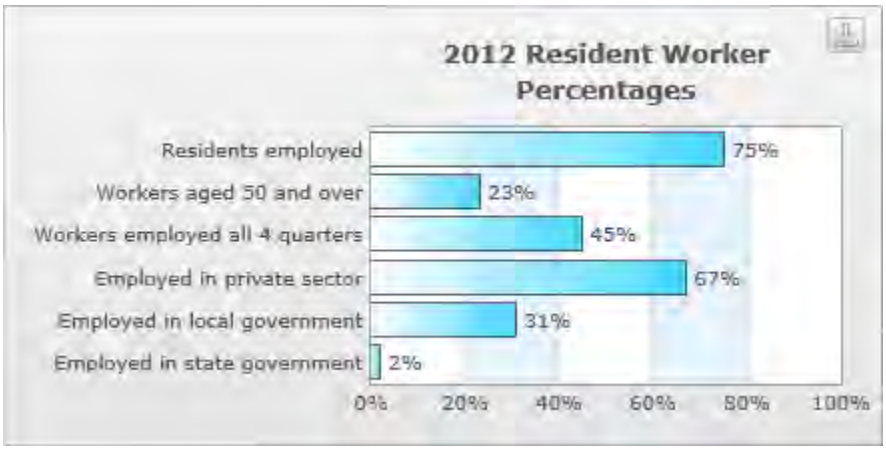


Figure 2-4 2012 Resident Workers by Industry

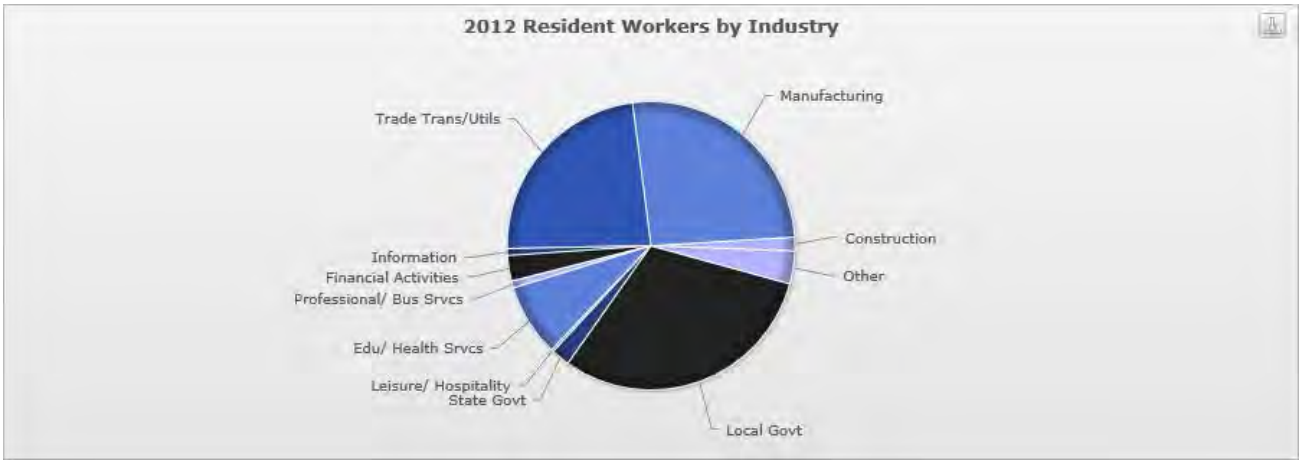


Table 2-1 2012 Labor Industry Classification

Industry	Number of workers	Percent of total employed	Female	Male	Age 45 and over	Age 50 and over
Construction	6	1.6	0	6	2	1
Manufacturing	100	26.1	36	64	16	13
Trade, Transportation, Utilities	89	23.2	32	57	33	16
Information	3	0.8	0	3	2	2
Financial Activities	11	2.9	2	9	6	2
Professional and Business Services	3	.08	0	3	2	0
Educational and Health Services	31	8.1	21	10	10	9
Leisure & Hospitality	1	0.3	1	0	0	0
State Government	8	2.1	2	6	3	2
Local Government	117	30.5	65	52	53	39
Other	14	3.7	10	4	6	4

Table 2-2 2012 Top Occupations, Gender, and Age Group

2012 Top Occupations	Total Workers	Female	Male	Age 45 +	Age 50 +
Meat, Poultry, and Fish Cutters and Trimmers	38	17	21	5	5
Receptionists and Information Clerks	24	7	17	0	0
Teacher Assistants	21	17	4	7	5
Laborers and Freight, Stock, and Material Movers, Hand **OIL AND GAS**	18	1	17	7	4
General and Operations Managers **OIL AND GAS** **TOP JOB**	16	7	9	12	10
Cashiers	13	11	2	1	0
Stock Clerks and Order Fillers	13	3	10	2	1
Construction Laborers **OIL AND GAS** **TOP JOB**	13	1	12	7	3
Elementary School Teachers, Except Special Education **TOP JOB**	11	8	3	9	9
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	9	8	1	1	1
Sailors and Marine Oilers **OIL AND GAS**	9	0	9	0	0
Customer Service Representatives	8	6	2	1	1
Gaming Service Workers, All Other	8	8	0	1	1
Janitors and Cleaners, Except Maids and Housekeeping Cleaners	7	3	4	2	0
Office and Administrative Support Workers, All Other **OIL AND GAS**	7	3	4	1	1
Social and Human Service Assistants	7	7	0	3	3
Captains, Mates, and Pilots of Water Vessels **OIL AND GAS** **TOP JOB**	7	0	7	4	3

2012 Top Occupations	Total Workers	Female	Male	Age 45 +	Age 50 +
Cargo and Freight Agents	6	1	5	1	1
Police and Sheriff's Patrol Officers TOP JOB	6	3	3	0	0
Carpenters OIL AND GAS TOP JOB	6	0	6	2	1
First-Line Supervisors of Office and Administrative Support Workers TOP JOB	5	1	4	2	1
Cooks, Short Order	5	2	3	2	1
Cooks, All Other	5	5	0	5	3
Biological Technicians	5	0	5	1	1
Plant and System Operators, All Other	5	0	5	4	1

OIL AND GAS means the occupation has been identified as an important occupation involved in the oil and gas industry. Read more.
TOP JOB means the occupation is projected to have a high growth rate and numerous openings, and has an above average wage. Read more.
means the occupation has been identified as green. Read more.

Source: State of Alaska Department of Labor

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

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

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

3.1 OVERVIEW OF PLANNING PROCESS

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

1 A review of the local hazards facing the community.

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

3 A revised hazard vulnerability assessment.

4 Revised community demographic, land use, and economic information.

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

The planning team asked participants to review their hazards, reassess risks to residential and critical facilities, and assist the team with reviewing and prioritizing mitigation actions for potential future mitigation project funding.

The following five-step process took place from February through June 2014:

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

3.2 HAZARD MITIGATION PLANNING TEAM

Table 3-1 identifies the hazard mitigation planning team.

Table 3-1 Hazard Mitigation Planning Team

Name	Title	Organization	Key Input
Franklin Murphy	Mayor	City of Emmonak	Planning Team Member, data input and HMP review
Wilbur Hootch, Sr.	Vice Mayor	City of Emmonak	Planning Team Member, data input and HMP review.
Jacob D. Redfox	City Council	City of Emmonak	Planning Team Member, data input and HMP review
Jacob A. Johnson, Sr.	City Council	City of Emmonak	Planning Team Member, Tribal data input and HMP review.
Raymond Waska, Sr.	City Council	City of Emmonak	Planning Team Member, data input and HMP review
Angela Kamkoff	City Council	City of Emmonak	Planning Team Member, Tribal data input and HMP review
Herman Hootch	City Council	City of Emmonak	Planning Team Member, data input and HMP review
Martin B. Moore, Sr.	City Manager	City of Emmonak	Planning Team lead, data input and HMP review
Mary Christie Alexi	Administrative Assistant	City of Emmonak	Planning Team member, data input and HMP review.
Mary Nichols	City Clerk	City of Emmonak	Planning Team Member, data input and HMP review
Scott Nelsen	Mitigation Planner	State of Alaska	HMP development, lead writer, planning coordinator

3.3 PUBLIC INVOLVEMENT PROCESS

Initial Public Meeting On March 26, 2014, the Emmonak planning team held a public meeting announcing the hazard mitigation plan update project. An invitation was extended to the entire community through public meeting notices. A project newsletter describing the plan update process was posted at the City Office and on the State of Alaska Department of Homeland Security and Emergency Management (DHS&EM) website, http://ready.alaska.gov/plans/localhazmitplans, seeking public comment (Appendix C & G). DHS&EM sent an e-mail to the State Hazard Mitigation Advisory Committee (SHMAC) seeking expert comment. SHMAC members are documented in the State of Alaska Hazard Mitigation Plan. A hazard questionnaire was distributed at the public meeting (Appendix C). The public identified five hazards: earthquake, erosion, flood, ground failure, and severe weather which periodically impact the City.

The planning team conducted a vulnerability assessment of assets within their community. They evaluated buildings and City infrastructure for their risk to each identified hazard. The results revealed assets which are exposed and vulnerable to specific hazards.

Second Public Meeting On June 4, 2014, the Emmonak planning team held a second public meeting to review their draft of the mitigation plan. The plan draft was posted at the City Office and on the State of Alaska Department of Homeland Security and Emergency Management (DHS&EM) website, http://ready.alaska.gov/plans/localhazmitplans, seeking public comment (Appendix C & G). DHS&EM sent an e-mail to the State Hazard Mitigation Advisory Committee (SHMAC) seeking expert comment.

Final Planning Meeting On September 5th, 2014, the Emmonak planning team met to complete their review and add additional documentation for FEMA. The meeting was not advertised as the public comments had already been incorporated into the mitigation plan draft. The final approved draft was sent to FEMA for formal review.

3.4 INCORPORATION OF EXISTING PLANS

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

Table 3-2 Incorporated Planning Documents

Existing Plans, Studies, Reports & Ordinances	Contents Summary
Emmonak Community Plan 1984	Defined the city's future development goals.
Emmonak Capital Improvement Projects	Updated Annually, lists the status of projects in the City.
Emmonak Comprehensive Economic Development Strategy Plan, 1997	Addressed methods to develop the City's economy.
Earthquakes in Alaska, USGS Open-File Report 95-624, by Peter Haeussler and George Plafker	Study of the City's earthquake threat potential
DNR/DGGS, Preliminary Volcano-Hazard Assessment for Makushin Volcano, Alaska Report of Investigation 2000-4	Study of the area's volcanic threat

USACE, Emmonak Flood Data, 2011	Documents flood of record, high water marks, and flood history
USACE, Alaska Baseline Erosion Assessment, Emmonak, Alaska, Aug 5, 2007.	Reports on erosion conditions in Emmonak http://66.223.166.160/usace_disclaimer.html
State of Alaska, Department of Commerce Community and Economic Development Profile	Provided historical and demographic information
State of Alaska Hazard Mitigation Plan (SHMP), 2013	Defined statewide hazards and potential risks. Identified risk mitigation projects for Alaska communities.
Emmonak Transportation Plan	Identified potential transportation goals and projects.
Emmonak Ceñaliulriit (Yukon-Kuskokwim) CRSA Coastal Management Plan, 2011	Identified potential mitigation projects within their Coastal Resource Service Area (CRSA).

Refer to Section 8 for a complete list of references.

3.5 PLAN MAINTENANCE

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

The following three process steps are addressed in detail here:

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

3.5.1 Incorporation into Existing Planning Mechanisms

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

DMA 2000 Requirements

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

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

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

3.5.2 Continued Public Involvement

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

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

The City of Emmonak is dedicated to involving the public directly in the continual reshaping and updating of the HMP. A paper copy of the HMP and any proposed changes will be available at the City Office. An address and phone number of the planning team leader to whom people can direct their comments or concerns will also be available at the City Office.

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

3.5.3 Monitoring, Reviewing, Evaluating, and Updating the HMP

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

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

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

The following three activities form the process:

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

3.5.3.1 Monitoring the HMP

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

3.5.3.2 Reviewing the HMP

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

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

3.5.3.3 Evaluating the HMP

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

- ☐ Efforts to involve City authorities, outside agencies, stakeholders, and residents.
- ☐ Changes in risk for each hazard.
- ☐ Any potential new hazards.

- ☐ Impact upon land development activities and related programs.
- ☐ Mitigation Action Plan implementation progress, (identify problems and suggest improvements as necessary).
- ☐ HMP local resource implementation for HMP identified activities.

3.5.3.4 Updating the HMP

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

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

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

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

- ☐ Request grant assistance for DHS&EM to update the HMP (it can take up to one year to obtain and one year to update the plan).
- ☐ Require each authority administering a mitigation project to submit a comprehensive progress report to the planning team.
- ☐ Develop a chart to identify those HMP sections needing improvement.
    - o Determine the current status of the mitigation actions (projects) in progress.
    - o Identify completed, deleted, or delayed projects. For statuses other than "completed", include a reason for the designation.

- Document changes to priorities.
- Assess the impact of completed projects.
- Identify any barriers preventing the implementation of mitigation projects such as financial, legal, or political restrictions and develop strategies to overcome them.
- Thoroughly analyze and update their risks to natural hazards.
- Prepare a "new" Mitigation Action Plan Matrix for the City of Emmonak.

☐ Prepare a draft of the updated HMP.

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

3.5.3.5 State and FEMA HMP Review

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

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

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4. ADOPTION BY LOCAL GOVERNING BODIES AND SUPPORTING DOCUMENTATION

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

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

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

The Emmonak City Council adopted the HMP on , 2014 and submitted the final draft HMP to FEMA for formal approval.

A scanned copy of the vote record and the Borough's formal adoption are included in Appendix B.

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City of Emmonak

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City of Emmonak, Alaska
Local Hazards Mitigation Plan Adoption Resolution
Resolution # 14-05

03-26-14 P03:13 RCVD

Adoption of the City of Emmonak Local Hazards Mitigation Plan

Whereas, the City of Emmonak recognizes the threat that local natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation projects before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

Whereas, an adopted Local Hazards Mitigation Plan is required as a condition of future grant funding for mitigation projects; and

Whereas, the Emmonak Local Hazards Mitigation Plan has been sent to the Alaska Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency for their approval; and

Whereas, the City of Emmonak has obtained from the Department of the Army a permit to proceed with the City of Emmonak Flood Protection Pad the City Council fully supports the plans as submitted with our mitigation plan; and

Whereas, the City of Emmonak has received from the Department of Natural Resources an issuance of land use permit # LAS-26876 and the City of Emmonak is in full of "The establishment and maintenance of a barge landing site to be used for the loading and unloading of cargo per the approved site development/operations plan (Attachment A)." and now part of the mitigation plan; and

Whereas, investment and planning of the future infrastructure is a compliant measure to protect life and well-being and safety of our community from immersing spring and fall floods, establishing a dike within the mitigation plan is in the flood zone area.

Now, therefore be it resolved, that the Emmonak City Council, hereby adopts the City of Emmonak Local Hazards Mitigation Plan as an official plan; and

Be It further resolved, that the City of Emmonak will submit the adopted local Hazards Mitigation Plan to the Alaska Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency officials for review and approval.

PASSED AND APPROVED THIS 14th **DAY OF** November, **2014.** With a vote of 5 in favor, 0 opposed, 0 abstain, 1 excused, 1 vacant.

Franklin Murphy, Mayor
City of Emmonak

ATTEST:

Tabitha A. Lee, City Clerk
City of Emmonak

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

5.1 OVERVIEW OF A HAZARD ANALYSIS

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

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

5.2 HAZARD IDENTIFICATION AND SCREENING

Described below are the DMA 2000 requirements for hazard identification.

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

During March and April 2014, the planning team reviewed the four natural hazards profiled in their hazard mitigation plan: earthquake, erosion, flood, and severe weather. Eight possible hazards were considered even if any particular one had not occurred within the past five years. They evaluated hazards based on a range of factors, including their prior history, relative risk, mitigation potential, and availability of information, (Table 5-1).

Table 5-1 Identification and Screening of Hazards

Hazard Type	Should It Be Profiled?	Explanation
Earthquake	Yes	Periodic, unpredictable occurrences. The City experienced no damage from the 11/2002 Denali EQ, and experienced less than 10% damage throughout the area from the 1964 Good Friday Earthquake.
Erosion	Yes	The City experiences storm surge, coastal ice run-up, and coastal wind erosion along the shoreline and riverine erosion along the area's river, streams, and creek embankments from high water flow, riverine ice flows, wind, surface runoff, and boat traffic wakes.
Flood	Yes	Snowmelt run-off and rainfall flooding occurs during spring thaw and the fall rainy season. Events occur from soil saturation. Several minor flood events cause damage. Severe damages occur from major floods.
Ground Failure (Avalanche, Landslide/Debris Flow, Permafrost, Subsidence)	Yes	The City of Emmonak is located in an area of continuous permafrost and experiences subsidence and heaving.
Tsunami & Seiche	No	This hazard does not exist for this City
Volcano	No	This hazard does not exist for this City.
Weather, Severe	Yes	Annual weather patterns, severe cold, heavy rain, freezing rain, snow accumulations, storm surge, and wind, are the predominate threats. Intense wind and heavy rain are the primary impacts to the community. Severe weather events cause fuel price increases and frozen pipes. Heavy snow loads potentially damage house roofs. Winds potentially remove or damage roofs and moved houses off their foundations. Complex weather systems are the most severe bringing severe cold, wind, freezing rain, storm surge, and flooding.
Wildland/Urban Interface Fire	Yes	Wildland fires have not been documented within the boundaries of Emmonak, however, wildland fires have occurred in the vicinity.

As a result of the hazard review, the planning team decided to add ground failure to their hazard profile.

5.3 HAZARD PROFILE

Described below are the DMA 2000 requirements for profiling hazards.

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

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

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

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

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

Table 5-2 Hazard Probability Criteria

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

Table 5-3 Hazard Magnitude/Severity Criteria

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

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

Table 5-4 Calculated Priority Risk Index

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

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

Table 5-5 Calculated Priority Risk Index by Hazard

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

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

5.3.1 Earthquake

5.3.1.1 Nature

An earthquake is a sudden motion or trembling caused by a release of strain accumulated within or along the edge of tectonic plates and is felt far beyond the epicenter. Earthquakes usually occur without warning and after only a few seconds can cause extensive damage and many casualties. The

immediately perceived effect of earthquakes is ground motion.

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

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

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

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

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

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

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

(MMI 2012)

5.3.1.2 History

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

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

Location

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

Figure 5-1 Emmonak Earthquake Probability.

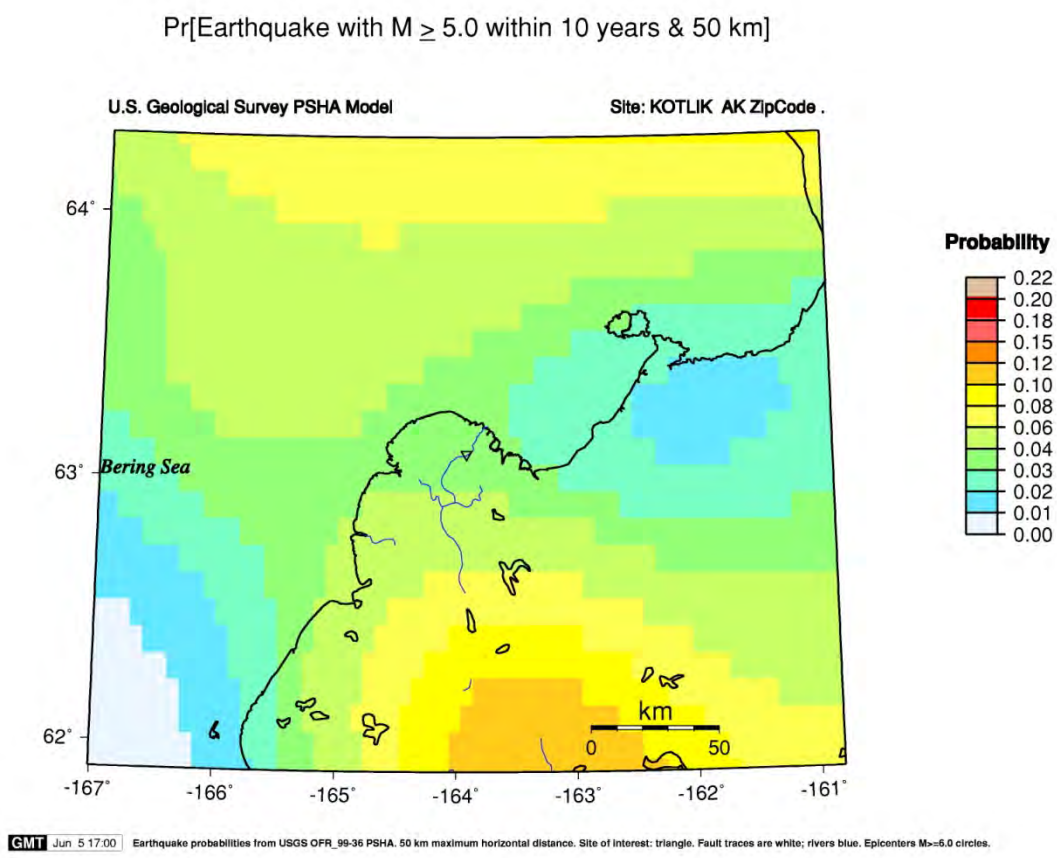

Figure 5-2 Active and Potentially Active Faults in Alaska

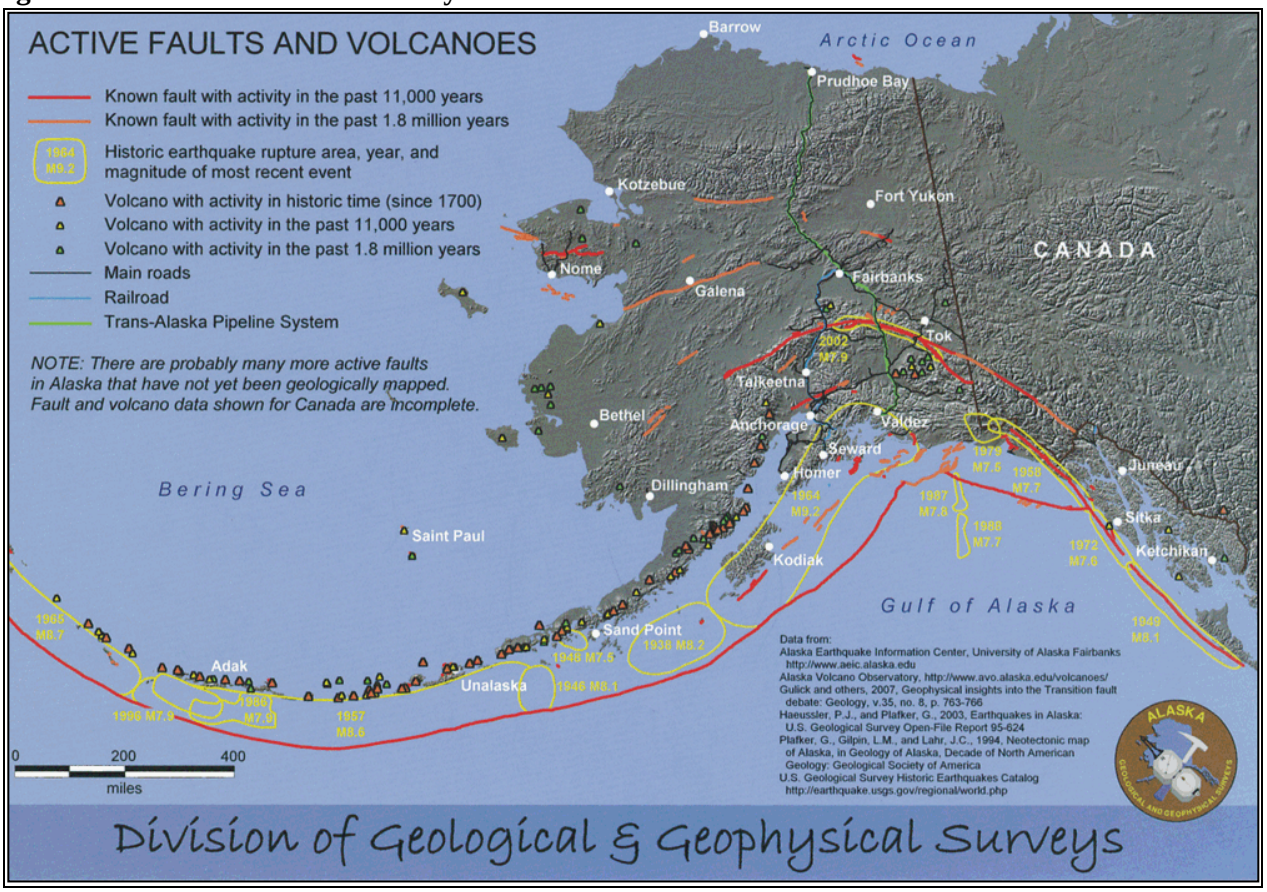

Figure 5-2 Map of Active Faults and Volcanoes from the Alaska Division of Geological and Geophysical Surveys, 2007.

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

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

Extent

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

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

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

Impact

Emmonak is located in an area that is less active than others in the state, although the effects of earthquakes centered elsewhere are expected to be felt in Emmonak. The seismic hazard is not well-documented, but the damage would most likely be negligible with minor injuries, less than 10 percent of property damaged, and little to no permanent damage to transportation, infrastructure, or the economy.

Probability of Future Events

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

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

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

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

5.3.2 Erosion

5.3.2.1 Nature

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

- Coastal erosion
- Riverine erosion
- Wind erosion

Emmonak is primarily vulnerable to riverine erosion, which results from the force of flowing water in and adjacent to river channels. This erosion affects the bed and banks of the channel and can alter or preclude any channel navigation or riverbank development. In less stable braided channel reaches, erosion and deposition of material are a constant issue. In more stable meandering channels, episodes of erosion may only occur occasionally. Riverine erosion in Emmonak threatens both critical and non-critical facilities.

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

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

5.3.2.2 History

According to the U.S. Army Corps of Engineer (USACE) Baseline Erosion Assessment published August 5, 2007, "Spring floods caused major erosion in May 1972, June 1985, May 1989, 1992, 2005, and August 2005."

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

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

Location

Approximately 10 miles upstream from the mouth of the Yukon River, the community of Emmonak is subject to coastal erosion forces such as tides and waves and riverine erosion forces such as ice gouging. A large amount of the community's development is located along the north bank of Kwiguk Pass. All river bank developments are susceptible to erosion.

Extent

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

Erosion along the banks of the Yukon River results from several simultaneous elements. Bank slumping (also known as slab failure) is one of the most obvious elements of erosion on the riverbanks in Emmonak. Bank slumping indicates the degree of riverbank erosion and is a natural and inevitable process that occurs when the riverbank becomes undercut to a degree that the overhanging material falls down. The City of Kotlik, located just five miles downstream from Emmonak, experiences similar riverbank erosion. According to their 2003 Kotlik Bank Protection Feasibility Study, there are six primary factors that have led to bank slumping in the area including:

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

2) *Wave action and currents* contribute to erosion by weakening the river banks. An increase in wave action and current generally exert more pressure on the river banks.

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

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

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

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

Impact

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

Probability

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

- ☐ Event has up to 1 in 1 year chance of occurring (1/1=100 percent).
- ☐ History of events is greater than 33 percent likely per year.
- ☐ Event is "Highly Likely" to occur.

5.3.3 Flood

5.3.3.1 Nature

Emmonak is located on a floodplain along the Yukon River and is situated on flat land slightly above riverbank elevation. In the spring, snow melt from higher elevations form meandering stream channels which flow through City, saturating the ground with water. Underlying permafrost hinders sub-surface drainage, so the water must flow across the surface to the Yukon River. Additionally, Emmonak is subject to ice jam floods from the Yukon River. The U.S. Army Corps of Engineers reported a high frequency of flooding and found Emmonak to be in a high flood hazard area. Four primary types of flooding occur in the City: rainfall-runoff, snowmelt, storm surge, and ice override floods.

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

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

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

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

Ice jams commonly develop in areas where the channel slope decreases, becomes shallow, or at constricted areas such as at bridges, bends in the river, headwaters, and reservoirs. Ice jams frequently impede water along rivers during spring breakup. The water level rises upstream behind the ice jam and floods low lying areas. As the ice jam is breached, there is usually rapid draining of the excess flood water. The water level downstream will rise quickly and behave much like a flash flood, carrying large chunks of ice, trees, bank vegetation, and other debris in it's current. Notable large floods in recent years on the Kenai, Susitna, Kuskokwim, and Yukon rivers were all caused by ice jams in conjunction with water from melting snow.

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

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

Seasonal Occurrences

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

5.3.3.2 History

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

- 1984 – On June 15, the city requested disaster assistance to repair minor flood damage to a road. The State's categorical grant covered the cost of material to repair the road. The village provided manpower and equipment.
- 1985 – On June 11, the Governor declared a Disaster Emergency after flooding caused damage to city roads. A categorical grant provided funds to assist in repairing the roads.
- 1989 – On June 10, Presidential Declaration of Major Disaster, incorporated sixteen local declarations and applied to all communities on Yukon, Kuskokwim and Kobuk rivers and their tributaries. Public and individual assistance was provided to repair the damage.
- 1991 – On May 30, 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 (FEMA-0909-AK) that authorized assistance for repair of public property only. State Disaster Relief Funds were used to implement the Individual and Family Grant Program in all of the communities included in the federal declaration.
- 1995 - On June 5, the Governor declared a Disaster Emergency in the Cities of Akiak, Kwethluk, Napaskiak, Emmonak, and Alakanuk, as a result of inundation. Roads, boardwalks, and other public works essential to vital community services were damaged.
- 2002 – From April 27 through May 29, a federally declared flood event occurred in various interior and western Alaska river drainages, causing widespread damage along the Tanana, Kuskokwim, Nushagak, Susitna and Yukon River systems. This event received a Presidential Disaster Declaration on June 26, FEMA number (DR-1423).
- 2005 – On May 13, a large ice jam blocked the mouth of the Lower Yukon River and caused widespread flooding to the cities of Emmonak and Alakanuk. In both cities, several roads were inundated and eroded by the floodwaters. Floodwaters also inundated city infrastructure to include the above-ground circulating water and vacuum sewage systems which were knocked off their mounting supports. Both cities received State assistance, (AK-05-213). There were no life safety issues during this event. Floodwaters subsequently subsided to normal levels within the river banks on or about May 18, 2005
- 2005 – From September 22 through September 26, a powerful fall sea storm caused severe and widespread coastal flooding and a threat to life and property in the Northwest Arctic Borough, and numerous communities within the Bering Strait (REAA 7), the Kashunamiut (REAA 55), the Lower Yukon (REAA 32) and the Lower Kuskokwim (REAA 31) Rural Education Attendance Areas. This event caused severe damage to homes and infrastructure, and necessitated the evacuation and sheltering of many residents. Refer to FEMA (DR-1618) for further details.

- 2006 - From May 5 through May 30, excessive snowmelt and ice jams flooded communities along the Yukon, Kuskokwim, and Koyukuk river drainages. The communities most seriously impacted were Hughes, Koyukuk, Kwethluk, Alakanuk, and Emmonak. In each community, large portions of city infrastructure were inundated and eroded by floodwaters. Refer to FEMA (DR-1657) or State of Alaska (AK-06-218) for further details.
- 13-242, 2013 Spring Floods declared by Governor Parnell on May 30, 2013 then FEMA declared on June 25, 2013 (DR-4122). Beginning on May 17, through June 10 2013, excessive snow pack and ice thickness, combined with rapid spring warming caused ice jams and severe flooding. The following jurisdictions and communities in Alaska have been impacted: Alaska Gateway Rural Regional Educational Attendance Area (REAA) including the City and Village of Eagle; the Copper River REAA including the Village Communities of Chisotchina and Gulkana; the Yukon Flats REAA including the Community of Circle, and City of Fort Yukon; the Yukon-Koyukuk REAA including the Cities of Galena; the Lower Yukon REAA including the Cities of Emmonak and Alakanuk. The impact of the flooding resulted in severe damage to approximately 194 homes (requiring evacuations and sheltering) to include loss and damage to personal property, multiple businesses (including loss of revenue), and public infrastructure to include: hazardous and non-hazardous debris removal, emergency protective measures (leading to ongoing mass care operations), damage to city and state roads, bridges, water and sewer systems, electrical generation and distribution systems, recreation areas and fuel storage facilities.

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

Location

The entire City of Emmonak is vulnerable to the effects of flooding.

Extent

Since the entire City of Emmonak is vulnerable to flooding, the flood extents would encompass the entire community. Referencing the FIRM map flood depth grid, the area topography is generally flat and low lying. The majority of City infrastructure is located along the Yukon River and is subject to flooding.

Impact

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

Probability

Recorded historical flooding information indicates that Emmonak experiences flooding every 2 to 7 years, and it is expected these intervals of flood events will continue. Therefore the probability of a flooding event impacting Emmonak is highly likely. An event is probable within the calendar year.

- ☐ Event has up to 1 in 1 year chance of occurring (1/1=100 percent).
- ☐ History of events is greater than 33 percent likely per year.
- ☐ Event is "Highly Likely" to occur.

5.3.4 Severe Weather

5.3.4.1 Nature

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

Heavy Snow generally means:

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

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

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

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

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

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

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

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

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

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

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

5.3.4.2 History

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

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

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

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

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

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

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

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

12-236, 2011 West Coast Storm declared by Governor Parnell on December 5,

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

13-S-244, 2013 November Storm Disaster declared by Governor Parnell on November 16, 2013 then FEMA declared January 23, 2014. *On November 5, 2013 the National Weather Service (NWS) issued the first of several coastal flood and winter storm warnings ranging from the central Aleutians to and including the western coastline of Alaska from Bristol Bay to the North Slope. In their published message the NWS warned of very strong low pressure system south of Shemya, moving to the central Bering and Chukchi Sea's bringing a combination of gale, high surf, high wind, freezing spray, coastal flooding and sea surge warnings and watches. The west coast was impacted with hurricane force winds exceeding 85 mph, high tidal ranges, and strong sea surges. The resultant impact culminated to, damage to public facilities including roads, seawalls, bridges, airports, and public buildings; damage to electrical distribution systems and drinking water systems; damages to private residences and the losses of personal and real property; and coastal flooding and power outages which necessitated evacuation and sheltering operations. Overall, the series of storms created a threat to life and property in 23 cities and villages in the Bering Strait Regional Educational Attendance Area (REAA), Lower Yukon REAA, and Lower Kuskokwim REAA, and the Fairbanks North Star Borough.*

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

Location

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

Extent

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

- **Heavy Rain**
- **Heavy Snow**
- **Drifting Snow**

- **Freezing Rain and Ice Storms**
- **Extreme Cold**
- **Winter Storms**

Impact

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

Probability

Severe winter storms occur annually along the western coast of Alaska, therefore the probability of a severe winter storm impacting Emmonak is highly likely. An event is probable within the calendar year.

☐ Event has up to 1 in 1 year chance of occurring (1/1=100 percent).
☐ History of events is greater than 33 percent likely per year.
☐ Event is "Highly Likely" to occur.

5.3.5 Ground Failure

5.3.5.1 Nature

Subsidence is any sinking or settling of the earth's surface. Underground mining, ground water and petroleum extraction or movement, and drainage of organic materials are typical causes of subsidence. However, these are rare in Alaska. More common causes are degassing and changes in hydrothermal systems, sediment compaction, earthquakes, and thawing of ice-rich permafrost.

Seasonally Frozen Ground
Frost action is the seasonal freezing and thawing of ground water interacting with development. Man-made structures like porches, fence posts, and utility poles are gradually forced out of the ground by frost action in the winter, and tilted by uneven thaw action in the summer. Frost jacking is a widespread problem in lower regions of Alaska (Figure 5.3).

Permafrost
Ground failure related to thawing permafrost is a significant problem in Alaska. Permafrost is frozen ground in which a naturally occurring temperature below 32° F has existed for two or more years. Approximately 85% of Alaska is underlain by continuous or discontinuous permafrost. Permafrost is continuous in extent over most of the Arctic but is discontinuous and sporadic or isolated in most areas south of the Brooks Range. Only the southern coastal margins are permafrost-free. Measured

recorded depths extend from 1,330 feet near Pt. Barrow to 350 feet at Nome, 265 feet at Fairbanks, and 100 feet near Tok. Permafrost can form a strong and stable foundation material if it is kept frozen, but if it is allowed to thaw the soil can become weak and fail. Materials most susceptible to thaw settlement are fine-grained soils with high ice content. Permafrost can thaw in response to general climate changes and warming or because of human activity that heats the soil or removes insulating cover.

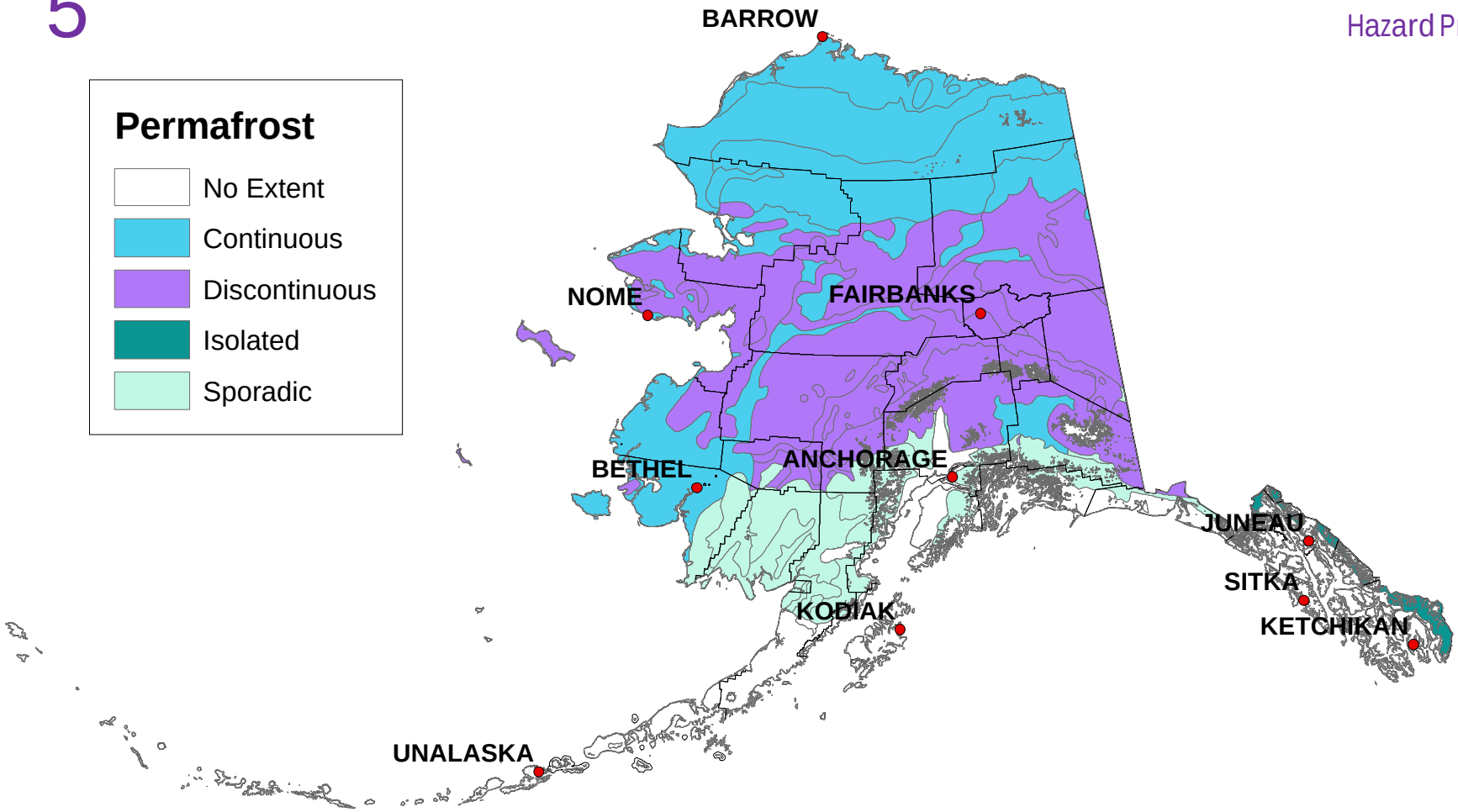

Figure 5.3 Brown, J., O.J. Ferrians Jr., J.A. Heginbottom, and E.S. Melnikov. 1998. revised February 2001. Circum-Arctic map of permafrost and ground-ice conditions. *Boulder, CO: National Snow and Ice Data Center/World Data Center for Glaciology. Digital Media.* http://nsidc.org/data/ggd318.html.

5.3.5.2 History

Ground failure events have not been officially documented in Emmonak. However, the community is located within an area of continuous permafrost and does experience ground subsidence and heaving.

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

Location

Emmonak lies in an area of continuous permafrost.

Extent

The entire community of Emmonak is subject to ground failure.

Impact

Ground failure rarely causes death or injury. However, it occasionally destroys developments. Impacts to the community are considered negligible with little potential for injuries, less that 10 percent of property damaged, minor quality of life lost, and shutdown of critical facilities and services for 24 hours or less. All residents and critical and non-critical facilities are at risk of ground failure, thus Emmonak is highly vulnerable.

Probability

Historical information provided by community elders indicates ground failure events occur often, but have yet to significantly affect their buildings or infrastructure. Thus, the probability is likely within the next three years.

- ☐ Event has up to 1 in 3 years chance of occurring (1/3=33 percent).
- ☐ Occurrence is greater than 20per cent but less than or equal to 33 percent likely per year.
- ☐ Event is "Likely" to occur.

5.3.6 Wildfires

5.3.6.1 Nature

Fires can be divided into the following categories:

Structure Fires – Fires involving man made structures.

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

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

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

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

5.3.6.2 History

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

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

Table 5-7. Wildland Fires near Emmonak

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

Source: Alaska Fire Service, 2013

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

Location

There are no wooded or wildland-urban interface areas within Emmonak. However, secondary effects of wildland fires, such as poor air quality, can be found throughout the community. Over the past 50 years, 14 significant fire events have occurred within 60 miles of Emmonak (Table 5-7, Figure 5-4).

Extent

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

Impact

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

Probability

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

- ☐ Event has up to 1 in 5 years chance of occurring (1/5=20 percent).
- ☐ Occurrence is greater than 10 percent but less than or equal to 20 percent likely per year.
- ☐ Event could "Possibly" occur.

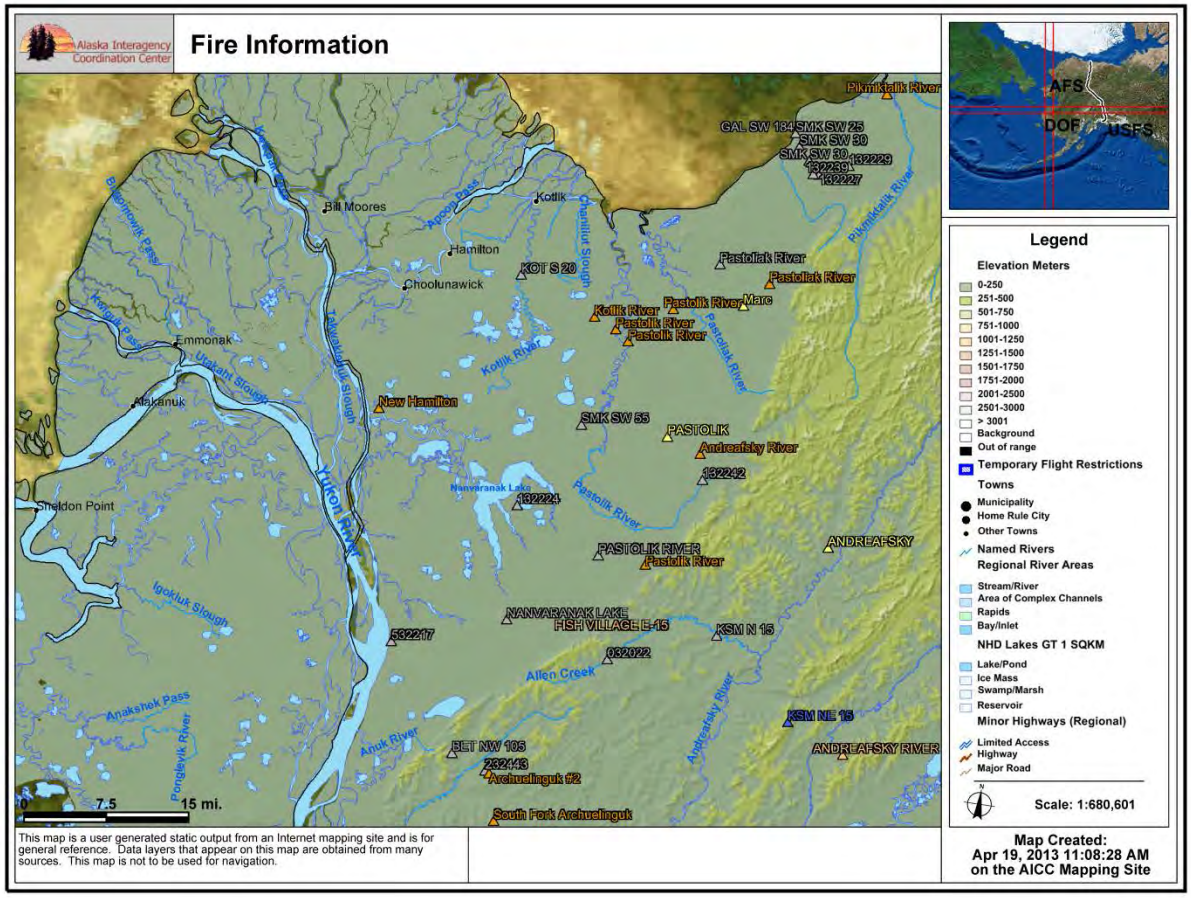

Figure 5-4 Emmonak Fire History Map

Source: Alaska Fire Service, 2013.

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6.1 VULNERABILITY ANALYSIS OVERVIEW

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

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

A vulnerability analysis is divided into eight steps:

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

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

C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements As appropriate? (Requirement §201.6©(3)(ii))
Source: FEMA, October 2011.

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

Table 6-1 Vulnerability Overview

Hazard	Percent of Jurisdiction's Geographic area	Percent of Population	Percent of Building Stock	Percent of Community Facilities and Utilities
Earthquake	**100%**	**100%**	**100%**	**100%**
Erosion	**30%**	**30%**	**30%**	**40%**
Flood	**100%**	**100%**	**100%**	**100%**
Ground Failure	**100%**	**100%**	**100%**	**100%**
Weather	**100%**	**100%**	**100%**	**100%**
Tundra / Wildland Fire	**100%**	**100%**	**100%**	**100%**

6.2 ASSET ANALYSIS

6.2.1 Asset Inventory

Assets possibly affected by hazard events include population for community-wide hazards, residential buildings, where data is available, and critical facilities and infrastructure. The planning team identified and inventoried their valued assets.

6.2.1.1 Population and Building Stock

Population data for the City were obtained from the 2010 U.S. Census and the State of Alaska Division of Community and Regional Affairs (DCRA). The U.S. Census reports the City's total population for 2010 as 762 and 2013 DCRA data reported a population of 811 (Table 6-2).

Table 6-2 Estimated Population and Building Inventory

Population		Residential Buildings	
2010 Census	DCCED 2013 Data	Total Building Count	Total Value of Buildings1
762	811	213	Census: $20,661,000

Sources: U.S. Census 2010, and 2011 DCCED/DCRA Certified population data listed housing value at $97,000.

Estimated replacement values for those structures, as shown in Table 6-2, were obtained from the 2010 U.S. Census, and DCRA. A total of 213 single-family residential buildings were considered in this analysis. The value was determined using the median value provided by the U. S. Census. Table 6-2 does not include estimates for special materials, shipping, or labor.

6.2.1.2 Community Assets

This section outlines the resources, facilities and infrastructure that, if damaged, could significantly impact public safety, economic conditions, and the environmental integrity of Emmonak.

Community Map

The latest land use map is dated 1994. Attached to this plan is a geo-referenced map that used gps readings obtained during the July 18, 2006 site visit.

Critical Facilities: Those facilities and infrastructure necessary for emergency response efforts.

- Emmonak Airport

Essential Facilities: Those facilities and infrastructure that supplement response efforts.

- Designated Shelters
- City Hall Buildings
- Bulk Fuel Storage Tank Farm

Critical Infrastructure: Infrastructure that provides services to Emmonak.

- Telephone lines
- Power lines
- Transportation networks
- Wastewater collection

Vulnerable Populations: Locations serving population that have special needs or require special consideration.

- Schools

Cultural and Historical Assets: Those facilities that augment or help define community character, and, if lost, would represent a significant loss for the community.

- Emmonak Community Center

6.2.2 Facility Replacement Value

Table 6-3 provides an estimated replacement value for residential and critical facilities in Emmonak. Structure values were obtained during the asset data inventory during the winter of 2014. The estimated contents values were calculated after each structure was classified by occupancy class.

Table 6-3 Emmonak Loss Estimates by Occupancy Class

Type of Structure (Occupancy Class)	# in Hazard Area	Estimated Value of Structure	Contents	
			HAZUS Contents Value (%) by Occupancy Class	Estimated Value of Contents
Residential	**213**	$20,661,000	50%	$ 10,330,500
Commercial	**2**	$ 800,000	150%	$ 1,200,000
Industrial	**0**	$ 0	0	$ 0
Religious/Non-Profit	**3**	$ 400,000	100%	$ 800,000
Government	**4**	$ 900,000	150%	$ 1,350,000
Education**	**2**	$ 987,500	150%	$ 1,481,250
Utilities	**4**	$ 3,365,334	NA	$ 3,365,334
Total	**228**	**$36,001,334**	NA	**$ 18,527,084**

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

The functional value is calculated by adding the structure value to the contents value. Displace values were unable to be provided. When these figures become available they will be included in the plan. Table 6-4 provides the loss estimates for critical facilities in Emmonak based on structure value and content value (when available). The functional value is the sum of structure and content value.

Table 6-4 Emmonak Community Facility Loss Estimates

Type of Structure (Occupancy Class)	# in Hazard Area	Estimated Value of Structure		
			Estimated Value of Contents	Functional Value
Residential	**213**	$20,661,000	$ 10,330,500	$ 30,991,500
Commercial	**2**	$ 800,000	$ 1,200,000	$ 2,000,000
Industrial	**0**	$ 0	$ 0	$ 0
Religious/Non-Profit	**3**	$ 400,000	$ 800,000	$ 1,200,000
Government	**4**	$ 900,000	$ 1,350,000	$ 2,250.000
Education**	**2**	$ 987,500	$ 1,481,250	$ 2,468,750
Utilities	**4**	$ 3,365,334	$ 3,365,334	$ 6,730,668
Total	**228**	**$36,001,334**	**$ 18,527,084**	**$ 45,640,918**

Table 6-5 illustrates the vulnerability assessment, which includes the population and the number of residential and critical facility structures affected for each identified hazard.

Table 6-5 Vulnerability Assessment – Population, Residential Structures, and Community Facilities

		Residential Structures				Community Facilities				Total			
Hazard	Pop.	No.	Structure Value	Contents Value	Total Value	No.	Structure Value	Contents Value	Value	No.	Structure Value	Contents Value	Value
Earthquake	811	213	$20,661,000	$10,330,500	$30,991,500	15	$15,340,334	$8,196,584	$23,536,918	228	$58,076,634	$48,450,801	$106,527,435
Erosion	227	64	$6,198,300	$3,657,500	$3,443,500	6	$6,136,134	$3,278,634	$9,414,768	70	$23,230,654	$19,380,320	$42,610,974
Flooding	811	213	$20,661,000	$10,330,500	$30,991,500	15	$15,340,334	$8,196,584	$23,536,918	228	$58,076,634	$48,450,801	$106,527,435
Severe Weather	811	213	$20,661,000	$10,330,500	$30,991,500	15	$15,340,334	$8,196,584	$23,536,918	228	$58,076,634	$48,450,801	$106,527,435
Wildfire	811	213	$20,661,000	$10,330,500	$30,991,500	15	$15,340,334	$8,196,584	$23,536,918	228	$58,076,634	$48,450,801	$106,527,435
Ground Failure	811	213	$20,661,000	$10,330,500	$30,991,500	15	$15,340,334	$8,196,584	$23,536,918	228	$58,076,634	$48,450,801	$106,527,435

6.3 VULNERABILITY ANALYSIS METHODOLOGY

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

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

Replacement structure and contents value estimates were provided by the U. S. Census and the Planning Team. For each physical asset located within a hazard area, exposure was. A similar analysis was used to evaluate the proportion of the population at risk. However, the analysis simply represents the number of people at risk; no estimate of the number of potential injuries or deaths was prepared.

6.4 DATA LIMITATIONS

The vulnerability estimates provided herein use the best data currently available, and is designed to approximate risk. Results are limited to the exposure of the built environment to the identified hazards. It was beyond the scope of this HMP to develop a more detailed or comprehensive assessment of risk, such as scope of injuries, shelter requirements, and economic losses. Such impacts may be addressed with future updates of the HMP.

6.5 Vulnerability Exposure Analysis

Earthquake

The City and surrounding area may experience mild to significant earthquake ground movement resulting in damage to infrastructure. Although all structures are exposed to earthquakes, buildings constructed of wood exhibit more flexibility than those utilizing unreinforced masonry, (URM).

Based on the geographic location of Emmonak, it is unlikely that an earthquake would be centered in an area around Emmonak. However, the entire population of Emmonak, residential structures and critical facilities are vulnerable to an earthquake. This includes 755 people in 213 residences valued at $20,661,000 and all 15 community facilities worth approximately $15,340,334. The total economic loss estimate is $106,527,435.

Erosion

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

A. Population

Approximately 227 people are vulnerable or 30 percent of the community's population.

B. Critical Facilities

(1) Approximately 40 percent of the community's critical facilities are vulnerable.

(2) The specific critical facilities vulnerable are:

- City Women's Shelter
- Two Churches
- LYSD Pre-School
- Health Clinic
- YFDM Co-op Fisheries

C. Non-Critical Facilities

(1) Approximately 30 percent of the community's non-critical facilities are vulnerable.

(2) There are 64 non-critical facilities at risk of damage from erosion, all of which are residential structures.

D. Structure Loss

The economic loss resulting from this hazard is approximately $23,230,654.

Flood

The City of Emmonak participates in the NFIP. The FEMA Flood Insurance Rate Maps (FIRM) are included in the appendix of the LHMP. They are dated 1998 and classify the designated flood areas. Refer to section 6.6 Repetitive Loss for NFIP information.

The entire population of Emmonak, residential structures and community facilities are vulnerable to flooding. This includes 755 people in 213 residences valued at $20,661,000 and all 15 critical facilities worth approximately $15,340,334. The total economic loss estimate is $106,527,435.

- During the 2006 spring flood, the entire village was under water except for the clinic and the tank farm.

The Emmonak Land Use Map, dated 1994, contains the following note:

The U.S. Army Corps of Engineers (USCOE) established flood data for this community. This project located the USCOE flood data on an assumed datum.

The USCOE flood staff #1 is located on the northeast corner of the City Complex Building the USCOE assumed elevations for flood data correlated to surveys made for this map (approximate Mean Sea Level (MSL) from ADOT&PF Airport Plan).

Name	USCOE	Approximate MSL
Flood of Record (1989)	4.2	19.4
Recommended Building Elevation	5.2	20.4

Severe Weather

The entire population of Emmonak, residential structures and critical facilities are vulnerable to severe weather. This includes 755 people in 213 residences valued at $20,661,000 and all 15 critical facilities worth approximately $15,340,334. The total economic loss is estimated to be $106,527,435.

Ground Failure

Impacts associated with ground failure include surface subsidence, heaving, and surface flow. Buildings built using materials and construction techniques designed to accommodate ground movement are much less vulnerable. According to mapping completed by the Department of Geological and Geophysical Survey (DGGS), the entire City is underlain by continuous permafrost. Therefore, the entire population of Emmonak, residential structures and critical facilities are vulnerable to ground failure. This includes 755 people in 213 residences valued at $20,661,000 and all 15 critical facilities worth approximately $15,340,334. The total economic loss is estimated to be $106,527,435.

Wildland Fire

Wildland fires within 60 miles of Emmonak occur approximately every 5 years. Given the history of wildland fires near Emmonak, it is possible future wildland fire events will occur around Emmonak. The entire population of Emmonak is vulnerable to wildland fires. This includes 755 people in 213 residences valued at $19,712,500 and all 15 critical facilities worth approximately $86,514,935. The total economic loss is estimated to be $106,527,435.

6.6 REPETITIVE LOSS PROPERTIES

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

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

B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods?
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate?
Source: FEMA, October 2011.

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

The City of Emmonak participates in the NFIP (Appendices F and G). The National Flood Insurance Program (NFIP) provides flood insurance at a reasonable cost to homes and businesses located in floodplains. In trade, the City of Emmonak agrees to regulate new development and make substantial improvement to existing structures in the floodplain, or to build safely above flood heights to reduce future damage to new construction. The program is based upon mapping areas of flood risk, and requiring local implementation to reduce flood damage primarily through requiring the elevation of structures above the base (100-year) flood elevations.

Table 6-6 below describes the zones used in Flood Insurance Rate Maps (FIRM) in Appendix F.

Table 6-6. FIRM Zones

Firm Zone	Explanation
A	Areas of 100-year flood; base flood elevations and flood hazard not determined.
AO	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet, average depths of inundation are shown but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood.
C	Areas of minimal flooding.
D	Areas of undetermined, but possible, flood hazards.

Development permits for all new building construction, or substantial improvements, are required by the City in all A, AO, AH, and A-numbered flood zones. Flood insurance purchase may be required in flood zones A, AO, AH, A-numbered zones as a condition of loan or grant assistance. An Elevation Certificate is required as part of the development permit. The Elevation Certificate is a form published by FEMA required to be maintained by communities participating in the NFIP. According to the NFIP, local governments maintain records of elevations for all new construction, or substantial improvements, in floodplains and to keep the certificates on file.

Elevation Certificates are used to:

1. Record the elevation of the lowest floor of all newly constructed buildings, or substantial improvement, located in the floodplain.
2. Determine the proper flood insurance rate for floodplain structures.
3. Local governments must insure that elevation certificates are filled out correctly for structures built in floodplains. Certificates must include:
   - The location of the structure (tax parcel number, legal description and latitude and longitude) and use of the building.
   - The Flood Insurance Rate Map panel number and date, community name and source of base flood elevation date.
   - Information on the building's elevation.
   - Signature of a licensed surveyor or engineer.

Table 6-7 describes how the Emmonak Flood Insurance program relates to the state program.

Table 6-7 Emmonak NFIP Statistics Since 1978

Emergency Program Date Identified	Regular Program Entry Date	Map Revision Date	NFIP Community Number	CRS Rating Number	Number Of Policies
5/22/1992	9/21/1998	9/25/2009	020041-A	N/A	9
Total Premiums	**Total Loss Dollars Paid**	**Number of Losses Paid**	**AK State # Current Policies**	**AK State Total Premiums**	**AK Total Paid Claims**
$2,578,900	$23,411.25	2	2,559	$1.6 million	$3.4 million
Emmonak Average Premium	**AK State Average Premium**	**Repetitive Loss Claims**	**Dates of Repetitive Losses**	**Total Repetitive Loss**	**Average Repetitive Loss**
$668	$629	0	0	0	0
Emmonak City Manager			**Martin B. Moore, Sr.**		**907-949-1227**
State of AK Floodplain Coordinator			**Taunnie Boothby**		**907-269-4583**

6.7 LAND USE AND DEVELOPMENT TRENDS

6.7.1 Emmonak Land Use

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

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

Commercial land uses within Emmonak include the YFDM building and the AC Store.

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

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

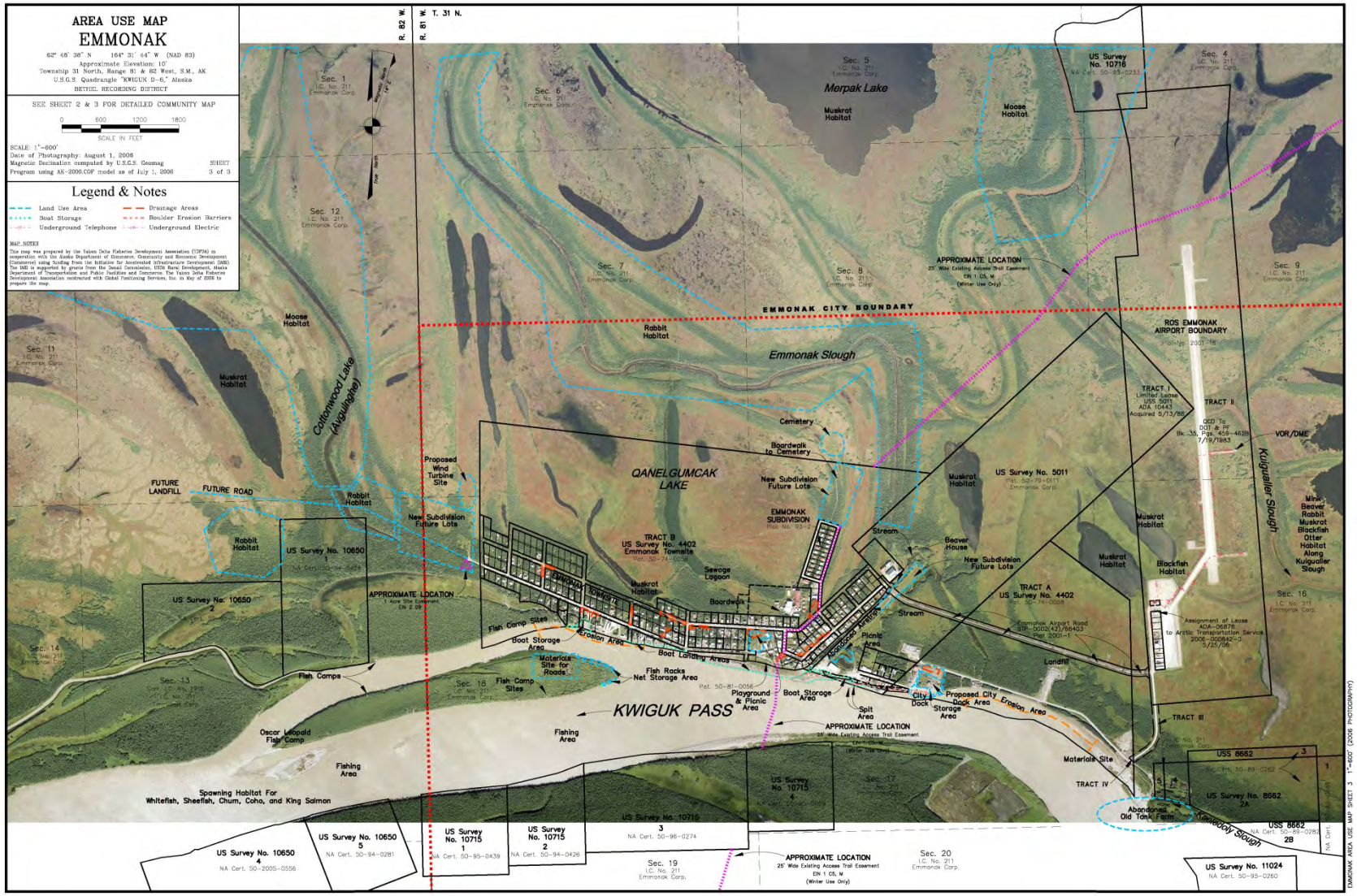
Community facilities are classified under institutional land. They include:

- Church
- Community Center
- Public Safety Building
- Health Clinic
- Armory
- Post Office
- High School
- Elementary School
- Cemetery

6.7.2 Emmonak Development Trends

State of Alaska Division of Community and Regional Affairs estimates the 2013 population of Emmonak at 811, up slightly from the 2010 census count at 762. There are currently 213 total housing units with 185 full time, 5 seasonal use, and 23 vacant houses. Development will likely keep pace with any future population growth.

Figure 6-1 Emmonak Area Land Use Map



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

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

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

C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate?

7.1 CITY OF EMMONAK CAPABILITY ASSESSMENT

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

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

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

Table 7-1 Regulatory Tools

Regulatory Tools (ordinances, codes, plans)	Existing?	Comments (Year of most recent update; problems administering it, etc.)
Comprehensive Plan	Yes	Proposed Initial First Steps Emmonak' s New Sub-Regional Business Plan, 2007. Comprehensive Economic Development Strategy Plan, 1997.
Land Use Plan	No	
Transportation Plan	Yes	Completed in 2002.
Tribal Corporation Land Use Plan	Yes	Ceñaliulriit (Yukon-Kuskokwim) CRSA* Coastal Management Plan, 2011.
Emergency Response Plan	No	Incomplete
Wildland Fire Protection Plan	No	
Building codes	Yes	NFIP regulations

Table 7-1 Regulatory Tools

Regulatory Tools (ordinances, codes, plans)	Existing?	Comments (Year of most recent update; problems administering it, etc.)
Fire Insurance Rating	No	
Zoning ordinances	Yes	NFIP ordinances
Subdivision ordinances or regulations	Yes	NFIP regulations
Special purpose ordinances	Yes	NFIP participating community

Local Resources

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

Table 7-2 Technical Specialists for Hazard Mitigation

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

Table 7-3 Financial Resources Available for Hazard Mitigation

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

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

7.2 DEVELOPING MITIGATION GOALS

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

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

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

visions. As such, eleven goals were revised to reduce or avoid long-term vulnerabilities to the identified hazards (Table 7-4).

Table 7-4A 2008 Mitigation Goals

Haz	Goal Description
Fld Ero	Goal 1. Reduce flood damage. Objective 1.1: Support elevation, flood proofing, buyout or relocation of structures that are in danger of flooding or are located on eroding banks. Goal 2. Prevent future flood damage. Objective 2.1: Continue to enforce the requirements of the National Flood Insurance Program. Goal 3: Increase public awareness Objective 3.1 Increase public knowledgeable about mitigation opportunities, floodplain functions, emergency service procedures, and potential hazards.
SW	Goal 1: Mitigate the effects of extreme weather by instituting programs that provide early warning and preparation. Goal 2: Educate people about the dangers of extreme weather and how to prepare. Goal 3: Develop practical measures to warn in the event of a severe weather event.
Fire	Goal 1: Make buildings safer Goal 2: Conduct outreach activities to encourage the use of Fire Wise landscaping techniques. Goal 3: Encourage the creation of firebreaks. Goal 4: Encourage the evaluation of emergency plans with respect to wildland fire assessment. Goal 5: Information acquisition
EQ	Obtain funding to protect existing critical infrastructure from earthquake damage

Table 7-4B Revised Mitigation Goals

No.	Goal Description
1	Reduce the risk of flood damage.
2	Reduce the risk of erosion damage.
3	Reduce the risk of severe weather damage.
4	Reduce the risk of wildland fire damage.
5	Reduce the risk of earthquake damage.

7.3 IDENTIFYING MITIGATION ACTIONS

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

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

The planning team reviewed their local capabilities and risk assessment, and applied the results to their mitigation action review. Mitigation actions are activities, measures, or projects implemented to achieve the goals of a mitigation plan. Mitigation actions are grouped into three broad categories: property protection, public education and awareness, and structural projects. During the public meeting on June 4, 2014, the planning team reviewed their mitigation actions for the renewal of this HMP. The planning team emphasized projects and programs reducing the vulnerability of future land use, existing buildings and infrastructure, and NFIP requirements. **Since Emmonak chose to extensively modify their goals and actions for 2014, mitigation goals and actions from 2008 are shown in Tables 7-4A and 7-5A for reference only**. Revised goals and actions for 2014 are listed in Tables 7-4B and 7-5B.

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

Table 7-5A 2008 Mitigation Goals and Related Actions

Mitigation Projects	Responsible Agency	Cost	Funding Sources Possible	Priority*
Flood and Erosion Projects				
Project FLD 1. Structure Elevation and/or Relocation	City DCRA, DHS&EM FEMA	To be Determined	PDMG** HMGP*** FMA****	Medium
Project FLD 2. Emmonak Maps	FEMA USCOE	>$10,000	PDMG** HMGP*** FMA****	High
Project FLD 3. Public Education	City DCRA	Staff Time	DCRA	Medium
Project FLD 4. Install new streamflow and rainfall measuring gauges	City DHS&EM	$10,000	PDMG HMGP	Medium
Project FLD 5. Apply for grants/funds to implement riverbank protection methods.	City	Staff Time	PDMG HMGP	Medium
Project FLD 6. Pursue obtaining a CRS ranking to lower flood insurance rates.	City DCRA	Staff Time	City	High
Project FLD 7. Obtain flood insurance for all City structures, and continue compliance with NFIP.	City	$1,500	City	High
Project FLD 8. Culvert Repairs	ADOT/PF	>$100,000	PDMG ADOPT/PF	Medium
Project FLD 9. Airport Road Improvements	City ADOT/PF FEMA	>$100,000	PDMG ADOT/PF	High
Project FLD 10. Revetment Repair and Expansion	USCOE ADOT/PF FEMA	>$100,000	PDMG HMGP	Medium
Project FLD-11. Develop a method to protect the landfill from further flooding	USCOE City	>$100,000	USCOE PDMG	High
Project FLD 12. Research a strategy to deal with beaver dams which cause water flow obstruction and more flood damage	ADF&G	Unknown	ADF&G	Medium
Project FLD 13. Require that all new structures be constructed according to NFIP requirements and set back from the river shoreline to lessen future erosion concerns and costs.	City	Staff Time	City Budget	High
Severe Weather Projects				

Mitigation Projects	Responsible Agency	Cost	Funding Sources Possible	Priority*
Project SW 1: Research and consider instituting the National Weather Service program of *"Storm Ready"*.	City	Staff Time	DCRA	High
Project SW 2: Conduct special awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, etc.	City DCRA DHS&EM	Staff Time	DCRA DHS&EM FEMA	High
Project SW 3: Expand public awareness about NOAA Weather Radio for continuous weather broadcasts and warning tone alert capability.	City	Staff Time	NOAA	High
Project SW 4: Encourage weather resistant building construction materials and practices.	City	Staff Time	City	Medium
Project SW 5: Install a siren to warn people of a severe weather or disaster event.	City DCRA DHS&EM	>$5,000	DCRA DHS&EM FEMA	High
Project SW 6: Installation of automated weather sensors. Automated weather sensors are the chief method by which the National Weather Service detects the occurrence of incoming severe weather.	DHS&EM	>$20,000	PDMG	Medium
Tundra/Wildland Fire Projects				
Project FIRE 1. Acquire additional firefighting equipment and training for personnel.	City DHS&EM	>$20,000	State Grant	High
Project FIRE 2. Promote Fire Wise building design, siting, and materials for construction.	State Div of Forestry	NA	State Grants	High
Project FIRE 3. Establish additional fire regulation and requirements.	City	Staff Time	State Grants	High

Project FIRE 4. Purchase additional fire fighting equipment and vehicles, such as a Fire Truck and fire extinguishers.	City State Div of Forestry	>$150,000	State Grants	High
Earthquake Hazard Projects				
Project EQ 1: Encourage development of earthquake resistance building codes and requirements.	City	Staff Time	State Grants	High
Mitigation Projects	Responsible Agency	Cost	Funding Sources Possible	Priority*
Project EQ 2: Enhance public awareness of potential risk to life and personal property from earthquakes. Encourage mitigation measures in the immediate vicinity of their property.	City DHS&EM DCRA	Staff Time	State Grants	High
Project EQ 3: If funding is available, perform an engineering assessment of the earthquake vulnerability of each identified critical infrastructure owned by the City of Emmonak.	City DHS&EM	Staff Time	PDMG	Medium
Project EQ 4: Identify buildings and facilities that must be able to remain operable during and following an earthquake event.	City DHS&EM	Combine with Project EQ-3	PDMG	Medium
Project EQ 5: Contract a structural engineering firm to assess the identified buildings and facilities to determine their structural integrity and strategy to improve their earthquake resistance.	City DHS&EM	Combine with Project EQ-3	PDMG	Medium

Note: As of October, 2014 none of the actions from 2008 have been implemented or completed. The City of Emmonak was unable to secure any FEMA funding for mitigation projects. Additionally, the above listed flood actions from the 2008 HMP were too vague to implement. For 2014, Emmonak's actions were completely revised (Table 7-5B).

Table 7-5B Revised Mitigation Goals and Related Actions

Goals		Actions	
No.	**Description**	**ID**	**Description**
1	Reduce the risk of flood damage.	1.1	Apply for flood prone structure mitigation projects and grants.
		1.2	Enforce the requirements of the NFIP.
		1.3	Increase public awareness of mitigation opportunities, floodplain functions, and potential flood hazards.
		1.4	Install streamflow measuring gages upriver and downriver of Emmonak.
2	Reduce the risk of erosion damage	2.1	Identify buildings at risk of erosion.
		2.2	Apply for riverbank protection projects and grants.
		2.3	Increase public awareness regarding riverbank erosion problems, prevention, and mitigation opportunities.
3	Reduce the risk of severe weather damage.	3.1	Research becoming a “Storm Ready” community.
		3.2	Institute a communal early warning and preparation system.
		3.3	Apply for projects to protect community infrastructure from storm damage.
4	Reduce the risk of wildland fire damage	4.1	Encourage firebreaks around residential and critical infrastructure.
		4.2	Encourage personal property mitigation measures.
		4.3	Promote “Fire Wise” construction techniques and retrofits.
5	Reduce the risk of earthquake damage	5.1	Teach earthquake & tsunami awareness in the public school.
		5.2	Develop an evacuation and rescue plan for the community.
		5.3	Participate in the annual State wide “Shake Out” earthquake exercise.
		5.4	Encourage use of earthquake resistant construction materials and methods.
		5.5	Ensure all future development meets all requirements for seismic protection.
		5.6	Educate the community about ways to mitigate damages to structures and non-structures, such as book cases.

7.4 EVALUATING AND PRIORITIZING MITIGATION ACTIONS

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

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

The planning team evaluated and prioritized each local hazard and corresponding mitigation action during the public meeting on June 4, 2014. Their final Mitigation Action Plan represents mitigation projects and programs to implement through the cooperation of the community and outside agencies.

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

Table 7-6 Evaluation Criteria for Mitigation Actions

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

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

During the public meeting on June 4, 2014, the planning team prioritized eleven mitigation actions according to the hazard vulnerability assessment. The Team selected a high, medium, and low rating system. Actions receiving a High priority address hazards impacting the community on an annual or near annual basis and damage critical facilities or people. Actions receiving a medium priority address hazards impacting the community less frequently and are typically not a threat to critical facilities or people. Actions receiving a low priority rarely impact the community and have rarely impacted critical facilities or people.

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

7.5 IMPLEMENTING A MITIGATION ACTION PLAN

Table 7-7 Mitigation Action Priority Matrix

(See acronym and abbreviations list for complete titles)

Goals		Rank	Action Number and Action
1	Reduce the risk of flood damage	HIGH	1.1 – Apply for flood prone structure mitigation projects and grants.
			1.2 – Enforce the requirements of the NFIP.
			1.3 – Increase public awareness of mitigation opportunities, floodplain functions, and potential flood hazards.
			1.4 – Install streamflow measuring gauges upriver and downriver of Emmonak.
2	Reduce the risk of erosion damage		2.1 - Identify buildings at risk of erosion.
			2.2 - Apply for riverbank protection projects and grants.
			2.3 – Increase public awareness regarding riverbank erosion problems, prevention, and mitigation opportunities.
3	Reduce the risk of severe weather damage.	HIGH	3.1 - Research becoming a “Storm Ready” community.
			3.2 - Institute a communal early warning and preparation system.
			3.3 - Apply for projects to protect community infrastructure from storm damage
4	Reduce the risk of wildland fire damage.	MEDIUM	4.1 - Encourage firebreaks around residential and critical infrastructure.
			4.2 - Encourage personal property mitigation measures.
			4.3 - Promote “Fire Wise” construction techniques and retrofits.
5	Reduce the risk of earthquake damage.		5.1 - Teach earthquake & tsunami awareness in the public school.
			5.2 - Develop an evacuation and rescue plan for the community.
			5.3 - Participate in the annual State wide “Shake Out” earthquake exercise.
			5.4 - Encourage use of earthquake resistant construction materials and methods
			5.5 - Ensure all future development meets all requirements for seismic protection
			5.6 - Educate the community about ways to mitigate damages to structures and non-structures, such as book cases.

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

Table 7-8 Mitigation Action Plan Matrix

1.1	**Action Item**	**Apply for flood prone structure mitigation projects and grants.**
	Ranking	High
	Department / Agency	Emmonak Mayor, City Administrator, Council; Tribal Council, DCCED, DHS&EM, FEMA, USACE
	Potential Funding Source	DHS Preparedness Technical Assistance Program; HMGP, BIA, PDM Grants
	Implementation Timeline	1 to 5 years
	Benefit-Costs	This mitigation action addresses buildings at risk of flooding.
2.2	**Action Item**	**Apply for riverbank protection projects and grants.**
	Ranking	High
	Department / Agency	Emmonak Mayor, City Administrator, Council; Tribal Council, DCCED, DHS&EM, NRCS, USACE
	Potential Funding Source	DHS Preparedness Technical Assistance Program; NRCS, USACE, HMGP; BIA, PDM Grants
	Implementation Timeline	1 to 5 years
	Benefit-Costs	This mitigation action addresses buildings at risk of erosion.
1.2	**Action Item**	**Enforce the requirements of the NFIP.**
	Ranking	High
	Department / Agency	Emmonak Mayor, City Administrator, Council; Tribal Council, DCRA, FEMA
	Potential Funding Source	BIA, Native Corp, Lindbergh, Rasmussen, DHS Preparedness Technical Assistance Program; HMGP; PDM Grants
	Implementation Timeline	1 to 2 years
	Benefit-Costs	The City of Emmonak needs to update its NFIP insurance policy to remain eligible for FEMA mitigation grants.
3.2	**Action Item**	**Institute a communal early warning and preparation system.**
	Ranking	High
	Department / Agency	Emmonak Mayor, City Administrator, Council; Tribal Council, DCCED, DHS&EM
	Potential Funding Source	Lindbergh Grants Program, NOAA / NWS, DHS&EM SCERP
	Implementation Timeline	1 to 5 years
	Benefit-Costs	Education based on-going mitigation action improving severe storm awareness in the community and developing skills and safety behaviors.
5.1	**Action Item**	**Teach earthquake & tsunami awareness in the public school.**
	Ranking	Medium
	Department / Agency	Emmonak Mayor, City Administrator, Council; Tribal Council, DCCED, DHS&EM, NOAA/NWS
	Potential Funding Source	Lindbergh Grants Program, Rasmussen, School District, NOAA/NWS
	Implementation Timeline	1 to 5 years
	Benefit-Costs	Education based on-going mitigation action improving earthquake and tsunami safety behaviors when traveling to hazard areas.
5.6	**Action Item**	**Educate the community about ways to mitigate damages to structures and non-structures, such as book cases.**
	Ranking	Medium
	Department / Agency	Emmonak Mayor, City Administrator, Council; Tribal Council, DCCED, DHS&EM, FEMA
	Potential Funding Source	Lindbergh Grants Program, BIA, School District
	Implementation Timeline	1 to 5 years
	Benefit-Costs	Education based on-going mitigation action improving earthquake safety in the community and providing skills and safety behaviors for use when traveling to earthquake prone areas.

7.6 IMPLEMENTATION THROUGH EXISTING PLANNING MECHANISMS

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

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

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

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City Of Emmonak
City Staff Meeting
Friday, September 5, 2014
3:00 p.m.
Agenda: FEMA Hazard Mitigation Plan Review

1. Present were City Manager Martin B. Moore, Sr., and City Clerk Mary Nichols. Mr. Scott Nelsen attended by phone.
2. Mr. Nelsen informed Martin that FEMA completed their review and requested some additional information before approving the mitigation plan.
    a. Need to provide meeting minutes where the mitigation plan was discussed.
    b. Solicit and document interested agency participation, (Scott will handle this).
    c. Post an updated flyer soliciting further public comment. Scott sent the updated flyer through e-mail.

CITY OF EMMONAK

Wilbur Hootch. Vice Mayor

Martin B. Moore, City Manager

City of Emmonak

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City Of Emmonak
Council Meeting
Monday, June 4, 2014
1:00 p.m.
Agenda: FEMA Hazard Mitigation Plan

1. Call to Order
2. Roll Call: Present were Mayor Franklin Murphy, Vice Mayor Wilbur Hootch, Sr., Jacob Redfox, Gragory Fratis, Ray Waska, Sr., Angela Kamkoff, City Manager Martin B. Moore, Sr., Assistant City Manager Mary Christie Alexi, and City Clerk Mary Nichols.
3. Agenda Approval
    a. Voice vote, motion passed unanimously
4. Approval of Minutes
    a. Voice vote, motion passed unanimously
5. Record Absences
    a. None
6. Correspondence
    a. None
7. Guest Speakers
    a. By phone, State of Alaska DHS&EM mitigation planner, Scott Nelsen, presented our hazard mitigation plan.
8. Audience Speakers
    a. None

9. New Business
    a. Hazard Mitigation Plan Review
        1 Mr. Nelsen presented the mitigation plan for our review and council approval. Martin changed a few of the names in the Acknowledgements section. No other changes were made.
        2 Approval of Hazard Mitigation Plan
            a) Voice vote, motion passed unanimously
10. Public Comment and Discussion
    a. No public comment. Discussions with Mr. Nelsen regarding FEMA mitigation grant options for Emmonak.
11. Next Meeting Agenda
12. Next public meeting scheduled for July 9, 6:00 pm.
13. Adjournment
    a. Mayor Murphy moved to adjourn at 7:00 pm; Vice Mayor Wilbur Hootch seconded and voice vote passed unanimously.

CITY OF EMMONAK

Wilbur Hootch. Vice Mayor

Martin B. Moore, City Manager

City of Emmonak

P.O. Box 9, Emmonak, Alaska 99581
(907) 949-1227 • (907) 949-1249 • Fax (907) 949-1926
email: emkcity@gmail.com

City Of Emmonak
Council Meeting
Monday, March 26, 2014
1:00 p.m.
Agenda: FEMA Hazard Mitigation Plan and Flood Protection Dike Mitigation Plan

1. Call to Order
2. Roll Call: Present were Mayor Franklin Murphy, Vice Mayor Wilbur Hootch, Sr., Jacob Redfox, Gragory Fratis, Ray Waska, Sr., Angela Kamkoff, City Manager Martin B. Moore, Sr., Assistant City Manager Mary Christie Alexi, and City Clerk Mary Nichols. There was no audience.
3. Agenda Approval
    a. Voice vote, motion passed unanimously
4. Approval of Minutes
    a. Voice vote, motion passed unanimously
5. Record Absences
    a. None
6. Correspondence
    a. The Council received two letters from the State of Alaska Department of Homeland Security and Emergency Management; dated November 27, 2013 and May 18, 2014. The letters stated the City of Emmonak needed to update their FEMA Hazard Mitigation Plan for FEMA mitigation grant eligibility. Copies of the letters are attached.
7. Guest Speakers
    a. None
8. Audience Speakers
    a. None

9. New Business
    a. Hazard Mitigation Plan
        1 Martin suggested requesting DHS&EM assist Emmonak with updating their plan, rather than apply for a grant, which could take up to a year to approve.
        2 Approval of Request
            a) Voice vote, motion passed unanimously
    b. Flood Protection Dike Mitigation Plan
        1 Due to lack of congressional appropriations, Martin suggested submitting the Flood Protection Mitigation Dike plan portion of the proposed port project to State DHS&EM for possible grant eligibility.
        2 Approval of submitting Flood Protection Mitigation Dike plan to State DHS&EM.
            a) Voice vote, motion passed unanimously
10. Public Comment and Discussion
    a. No public comment. Internal discussion was regarding FEMA requirements for updating a mitigation plan and which FEMA grants Emmonak can use.
11. Next Meeting Agenda
12. Next public meeting scheduled for April 28, 6:00 pm.
13. Adjournment
    a. Mayor Murphy moved to adjourn at 7:00 pm; Vice Mayor Wilbur Hootch seconded and voice vote passed unanimously.

CITY OF EMMONAK

Wilbur Hootch. Vice Mayor

Martin B. Moore, City Manager

Community Hazard Awareness and Mitigation Survey

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

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

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

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

Flooding, Erosion, Power Loss

3. What could be done to limit damage from these hazards? Write your ideas here:

Add a Backup Generator, Reinforce River Bank
Home Elevations. Replace Barge Landing

Community Hazard Awareness and Mitigation Survey

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

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

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

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

Yes flooding

3. What could be done to limit damage from these hazards? Write your ideas here:

Rebuild Port of Emmonak & Arthur Rivers Bank

Community Hazard Awareness and Mitigation Survey

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

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Earthquake		X			
Flood	X				
Ash fall from volcanic activity				X	
Wildfire			X		
Severe weather	X				
Erosion	X				
Wind		X			
Natural gas line rupture or explosion					X
Hazardous material spill				X	
Extended power outage	X				
Tsunami					X
Other?					
Other?					

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

Floods + Erosion

3. What could be done to limit damage from these hazards? Write your ideas here:

Community Hazard Awareness and Mitigation Survey

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

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

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Earthquake	✓				
Flood	✓				
Ash fall from volcanic activity				✓	
Wildfire				✓	
Severe weather	✓				
Erosion	✓				
Wind		✓			
Natural gas line rupture or explosion					✓
Hazardous material spill				✓	
Extended power outage	✓				
Tsunami					✓
Other?					
Other?					

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

Flooding, Erosion

3. What could be done to limit damage from these hazards? Write your ideas here:

Construct the Port Pad and barge landing. Elevate houses. Buy a backup generator.

Community Hazard Awareness and Mitigation Survey

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

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

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

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

Flood, erosion Storms

3. What could be done to limit damage from these hazards? Write your ideas here:

Flood PAD mitigation Dike

Community Hazard Awareness and Mitigation Survey

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

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

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

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

Yes, Flooding

3. What could be done to limit damage from these hazards? Write your ideas here:

Build A Dike Along The River.

Community Hazard Awareness and Mitigation Survey

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

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

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

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

Storms - Wind
Flooding

3. What could be done to limit damage from these hazards? Write your ideas here:

Backup Power Generators - Wind Resistant
Build the Flood Pad mitigation ~~Dike~~ Along the River Dike

Community Hazard Awareness and Mitigation Survey

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

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

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

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

Floods & Storms

3. What could be done to limit damage from these hazards? Write your ideas here:

Build a Flood Mitigation Protection Pad Along the River That Could Also be used as a Barge Landing. Purchase Backup Power Generator(s) Resistant to Storm Damage.

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

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

Additional suggestions

_____

_____

_____

_____

5. How long have you lived in Emmonak? 35 years

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

Thank you for helping create a disaster resistant Community!

Please return your completed Survey to the Assistant City Manager

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

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

Additional suggestions Flood protection dike / pad, New barge landing.

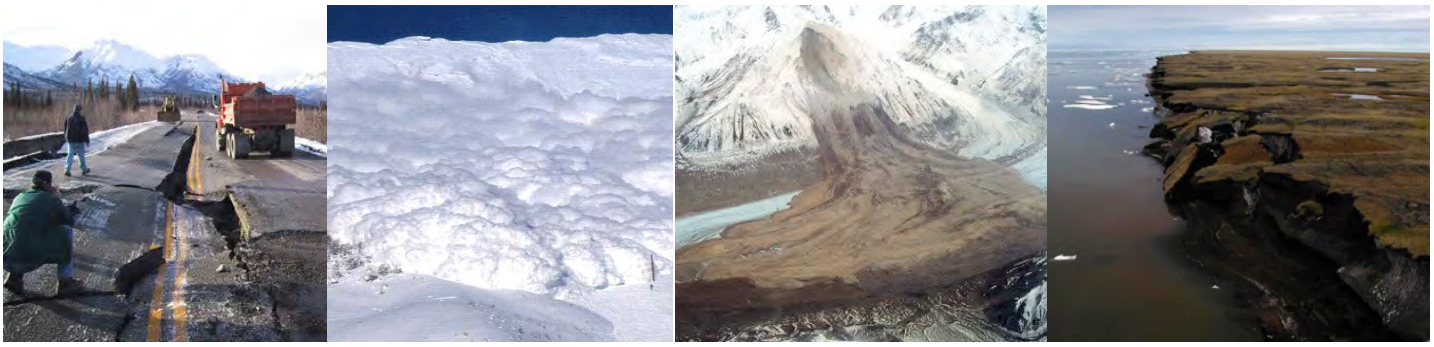
5. How long have you lived in Emmonak? 70+ years

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

Thank you for helping create a disaster resistant Community!

Please return your completed Survey to the Assistant City Manager

City of Emmonak
Multi-Hazard Mitigation Plan



Fall 2014

The Planning Process

The Disaster Mitigation Act of 2000 requires the plan to follow and record the following elements:

1. Planning process
2. Hazard Identification
3. Risk Assessment
4. Mitigation Strategy with Goals, Objectives and Actions
5. Plan Maintenance
6. Adoption by local government
7. Approval from FEMA

For more information on mitigation planning, visit FEMA's website at http://www.fema.gov/plan/mitplanning/index.sht

Multi-Hazards Mitigation Planning

Local mitigation planning reduces risk to disasters, such as avalanches, coastal erosion, earthquakes, floods, high winds, landslides, tsunamis, wildfires, and severe weather.

The Federal Emergency Management Agency (FEMA) awards mitigation grants to communities who participate in their mitigation program.

Preparing a Multi-Hazards Mitigation Plan (MHMP) is the first step in this process. Through the planning process risks

The City of Emmonak planning team will develop a mitigation strategy with goals and actions to reduce or avoid long-term risk to natural hazards.

Once the mitigation plan is approved by the City of Emmonak and FEMA, the community will be eligible to apply for FEMA mitigation project grants.

State DHS&EM sponsors mitigation planning effort

The Alaska Division of Homeland Security and Emergency Services is updating the City of Emmonak local multi-hazards mitigation plan .

The MHMP will include critical facilities, potential threats from natural hazards, and strategies to minimize the risk to people and property.

Strategies may be for immediate implementation or long term activities, and can range from educating residents about what to do in the event of a natural disaster to relocating structures away from high-risk areas.

Get Involved !

Emmonak's hazard mitigation plan needs public participation. Your ideas will guide the planning team throughout plan development. We will be discussing Emmonak's mitigation plan on March and April's city council meeting. We encourage you to attend and tell us which natural hazards are of most concern to you and any ideas on projects to mitigate risk.

Your comments are welcome

We team hope you will take an active role in Emmonak's hazard mitigation plan. If you would like more information or have questions or comments, you can reach the planning team by phone or email:

Martin B. Moore
Emmonak City Manager
907-949-1227
emkcity@gmail.com

Scott Nelsen
Mitigation Plan Writer
State of Alaska
DHS&EM
907-428-7010
scott.nelsen@alaska.gov

Further information may also be found on the DHS&EM website at:

http://ready.alaska.gov/plans/mitigation

Planning Goals and Objectives

Mitigation is any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.

Primary goals of hazard mitigation are to:

- Minimize loss of life and injuries
- Minimize damages
- Restore public services
- Promote economic development

To attain these goals the Multi-Hazard Mitigation Plan will include mitigation projects to:

- Save lives and reduce injuries
- Prevent or reduce property damage

Awareness, education and preparedness, together with prediction and warning systems can reduce the disruptive impacts of natural disaster on communities

Further information may also be found on the DHS&EM website at:

http://ready.alaska.gov/plans/mitigation

Mitigation is any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.

From: Nelsen, Scott G (MVA)
To: MVA DHS&EM Planning Section; Alan Wien; Andy Jones; Ann Gravier; Bill Justice; Bill Knight; Bonnie Hanson; Brenda Ahlberg; Brent Goodrum; Brent Nichols; Bud Cassidy; Cam Carlson; Casey Cook; Charles Cobb; Chris Ulmann; Cindi Preller; Clint R Carlson; Dan Monteleone; Dave Squires; David Tyler; Deanne Stevens; Debora Cooper; Dennis Brodigan; Diana Parks; Elizabeth Nudelman; Ervin Petty; Gary Carver; Grady Fisher; Greg Archibald; Jeanne Mungle; Jeff Conaway; Jeffrey Osiensky; John Aho; Ken Eisses; Kristi Bischofberger; Kyle Wright; Lorri Winchester; Lt.Col Meredith; Mark Spafford (mspafford@denali.gov); Martin Maricle; Mike West; Nancy Merriman; Neal, Christina (tneal@usgs.gov); Nelson, Brett - NRCS, Palmer, AK; Paul Whitmore; Randy Bates; Ray Crowe; Rick Forkel; Sally Cox; Sam Albanese; Sarah Geary; Scott Crockett; Scott Maclean; Scott Nelsen; Taunnie Boothby; Timothy Fisher
Cc: emkcity@gmail.com; Meyers, Kristen (Kristen.Meyers@fema.dhs.gov)
Subject: Community Hazard Mitigation Plans
Date: Thursday, September 18, 2014 10:24:54 AM

Good morning,

For your awareness, the City of Emmonak and the Louden Tribal Council (Galena) have completed a draft of their hazard mitigation plans. The plans and accompanying newsletters may be viewed at, http://ready.alaska.gov/plans/localhazmitplans.

The Disaster Mitigation Act of 2000 mandates State and community hazard mitigation plans for most federal disaster mitigation grants. The plans are updated every five years and often cite work from local, state, and federal agencies. Therefore, I encourage you to offer corrections and suggestions leading to a better plan.

Thank you

Scott Nelsen
Emergency Management Specialist
State of Alaska Homeland Security and Emergency Management
Office: 907-428-7010
Mobile: 907-343-9915
Fax: 907-428-7009

Benefit-Cost Analysis Fact Sheet

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

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

All Benefit-Costs must be:

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

General Data Requirements:

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

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

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

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

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

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

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

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Alaska State Plane 8 zone (FIPSZONE 5008). The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection, or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the National Geodetic Vertical Datum of 1929. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC- 3, #9202
1315 East- West Highway
Silver Spring, MD 20910- 3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by AK DNR and BLM. This information was compiled at various map scales during the time period 2001-2007. Orthoimagery has a 2 ft resolution and was produced from 2006 aerial photos.

This map reflects more detailed and up- to- date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data*) may reflect stream channel distances that differ from what is shown on this map.

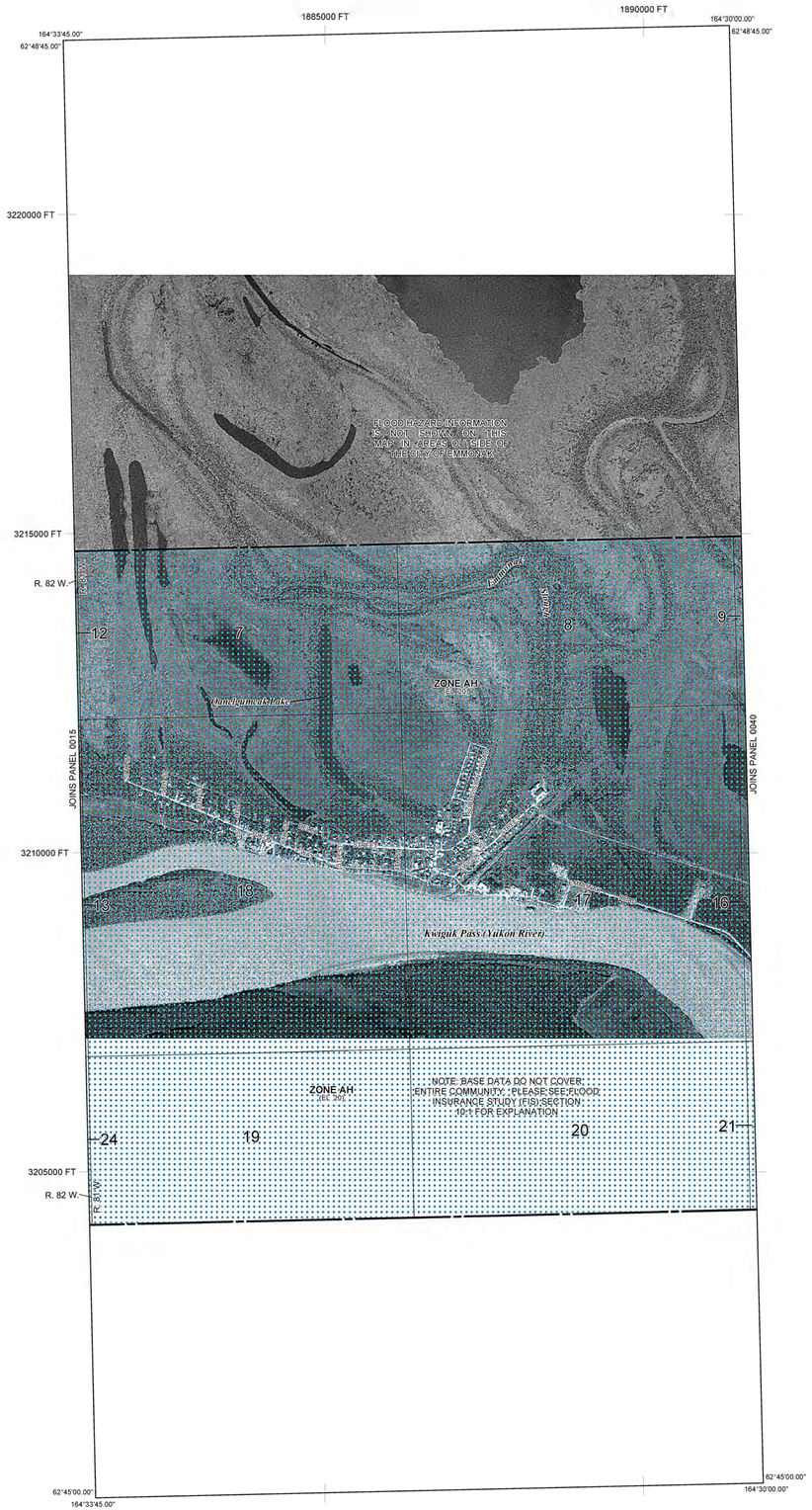
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de- annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map showing the layout of map panels for this jurisdiction.

Contact the **FEMA Map Service Center** at 1- 800- 358- 9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a *Flood Insurance Study report*, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1- 800- 358- 9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1- 877- FEMA MAP** (1- 877-336-2627) or visit the FEMA website at http://www.fema.gov/.

Appendix F



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without subtantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29)

A — A	Cross section line
23 - - - - - - 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid ticks, zone 3
6000000 FT	5000-foot grid ticks: Alaska State Plane coordinate system, 8 zone (FIPSZONE 5008), Transverse Mercator
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
City Office Bldg, Kwiguk Street, Emmonak, Alaska 99581 (Maps available for reference only, not for distribution.)

INITIAL NFIP MAP DATE
September 21, 1998
FLOOD HAZARD BOUNDARY MAP REVISIONS

FLOOD INSURANCE RATE MAP EFFECTIVE
September 21, 1998
FLOOD INSURANCE RATE MAP REVISIONS
September 25, 2009 - to update map format.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1- 800- 638- 6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0020B

FIRM
FLOOD INSURANCE RATE MAP

CITY OF

EMMONAK,
ALASKA
WADE HAMPTON CENSUS AREA

PANEL 20 OF 40
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EMMONAK, CITY OF	020125	0020	B

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
0201250020B

MAP REVISED
SEPTEMBER 25, 2009

Federal Emergency Management Agency

Community Information System

Appendix F

Release 4.06.02.00, 10/25/2013 -- Build 001, Skip Navigation

Home
Search
Previous Search
Community
CRS
CAC/CAV
Maps
SOS
Insurance
CAP-SSSE
CAV Selection

CIS Reports
Links
Request/Feedback

FAMS

Log Out

Community Overview

Community:	EMMONAK, CITY OF	State:	ALASKA
County:	WADE HAMPTON CENSUS AREA	CID:	020125

Program:	Regular	Emergency Entry:	05/22/1992	Regular Entry:	09/21/1998
Status:	PARTICIPATING			Status Effective:	05/22/1992
Current Map:	09/25/2009	Study Underway:	YES	Level of Regs:	C
FIRM Status:	REVISED			Initial FIRM:	09/21/1998
FHBM Status:	NEVER MAPPED			Initial FHBM:	

Probation Status:	
Probation Effective:	Probation Ended:
Suspension Effective:	Reinstated Effective:
Withdrawal Effective:	Reinstated Effective:

CRS Class / Discount:			
Effective Date:			
CAV Date:	12/09/2008	Workshop Date:	09/19/2011
CAC Date:	07/21/2009	GTA Date:	12/06/2013
Tribal Community		Community Website:	
Upton Jones Claims		HMGP Projects	
ICC Claims		FMA Projects	

Policies in Force:	9
Insurance in Force:	$2,578,900.00
No. of Paid Losses:	2
Total Losses Paid:	$23,411.25
Sub. Damage Claims Since 1978:	0