Louden Tribal Council, Alaska
Local Hazards Mitigation Plan

Galena Flood, June 4, 2013

September 10, 2014

Prepared by: Louden Tribal Council

Acknowledgements

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Cover Photo

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28 May 2013

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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. Hazard Mitigation Planning

Hazard mitigation is the process of profiling hazards, analyzing risk, and developing preventative actions. When the preventative actions are implemented, risks are reduced or eliminated.

1.1 Purpose

The purpose of the Louden Tribal Hazard Mitigation Plan (THMP) is to identify and coordinate risk mitigation efforts with State, Federal, and local partners and to fulfill the requirements set forth by the Code of Federal Regulations, Title 44 "Emergency Management and Assistance", Part 201 "Mitigation Planning", subsection 6 "Local Mitigation Plans." (44 CFR 201.7).

"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)

Current Federal regulations (44 CFR §201.7) require local Tribes, except under Regional Administrator approved "extraordinary circumstances" (§201.6(a)(3), to have a FEMA approved hazard mitigation plan to be eligible for most of FEMA's grant programs (all but PA Category A, B, and IA). Currently, Federal regulations require local plans to be formally updated and approved by FEMA every five years.

Hazard Mitigation Assistance grant program eligible activities by program:

Specific FEMA programs, such as Public Assistance categories C through G, Pre-Disaster Mitigation (PDM), Flood Mitigation Assistance (FMA), and the Hazard Mitigation Grant Program (HMGP) are detailed in Chapter 6, "Resources."

1.2 Authority

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

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

Alaskan Native Tribes with an approved Tribal Mitigation Plan in accordance with 44 CFR 201.7 may apply for assistance from FEMA as a grantee. If the Tribe coordinates with the State

of Alaska for development and review of their Tribal Mitigation Plan, then the Tribe also has the option to apply through the State as a subgrantee. A grantee is an entity such as a State, territory, or Tribal government to which a grant is awarded and is accountable for use of the funds. A subgrantee is an entity, such as a community, local, or Tribal government; State-recognized tribe; or a private nonprofit (PNP) organization to which a subgrant is awarded and is accountable to the grantee for use of the funds.

1.3 A Guide to this Plan

This plan will provide a focus on mitigation as part of Louden's emergency management efforts. The plan contains seven sections:

1. Introduction
2. Planning Process
3. Hazard Profiles
4. Risk Analysis
5. Mitigation Strategy and Goals
6. Resources (includes links and references to information, graphics and documentation)

Appendices (cited throughout the text)

1.4 Louden Community Profile

This section describes the location, geography, and history; demographics; and land use development trends of the City of Galena. Louden Tribal members reside within the City of Galena and are included as City residents in all State and Federal demographic research.

Location

Galena is situated on the north bank of the Yukon River, 45 miles east of Nulato and 270 air miles west of Fairbanks and covers approximately 17.9 sq. miles of land and 6.1 sq. miles of water. It lies northeast of the Innoko National Wildlife Refuge at approximately 64.733330 North Latitude and -156.927500 West Longitude. (Sec. 06, T009S, R010E, Kateel River Meridian.). The City is located in the Yukon-Koyukuk Census Area. *Source: Division of Community and Regional Affairs [DCRA] 2014*

Figure 1-1 Galena Location Map

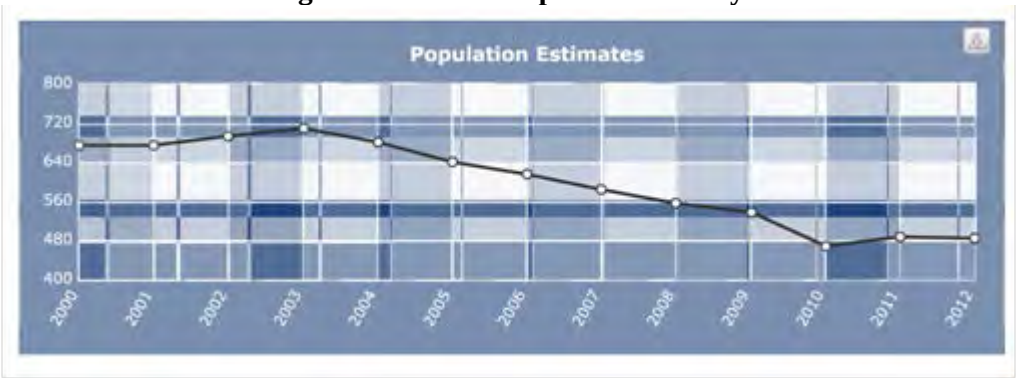
Government

Galena is a first class city within the Unorganized Borough and the Yukon-Koyukuk Census District. The Louden Tribal Council is the Alaska Native Tribal government managing the native assets in the area. Figure 1-2 shows the State Demographer historical population estimates.

- Current Population: 470 (2013 DCCED Estimated Population)
- Incorporation Type: First Class City
- Borough Type: Unorganized
- School District: Galena City Schools
- Regional Native Corp: Doyon Limited Corporation

(Source: State of Alaska, Department of Labor).

Figure 1-2 Galena Population History



Source: DCRA 2013

History and Culture

The Koyukon Athabascans inhabited the area as nomadic tribes living in temporary encampments following game and fish food sources to support their subsistence lifestyle. The population is mixed Athabascan and non-Native, and traditional festivals attract visitors from other river villages. The establishment of the Galena and Campion Air Force Bases in the 1950s brought growth and change to Galena. But in 1997, the airbase was closed and the property was transferred to the City. Many of Galena's residents were originally from Louden or are descendants of Louden inhabitants. Subsistence food sources include salmon, whitefish, moose, and berries.

Several key events occurred throughout the City of Galena developmental history:

- The City was established in 1918 near an old Athabascan fish camp called Henry's Point.
- Galena became a supply and trans-shipment point for nearby lead ore mines.
- Upriver Athabascans began moving to Galena in 1920s to sell wood to steamboats and to work hauling freight for the mines.
- The school was built in the mid-1920s.
- A post office opened in 1932.
- The City Air Field was built during World War II.
- The City suffered major flood damage in 1945.

- Military airport and road development attracted new inhabitants.
- Galena relocated to a new community site near Alexander Lake due to another flood event in 1971.
- City offices, the health clinic, schools, washeteria, store, and more than 150 homes were constructed at the new townsite and a city government was formed.
- The Galena Air Force Station was closed in 1993, and the facilities are now used by the City School District as a Boarding School. The former base facilities are maintained under contract by the Chugach Development Corporation.
- The community is currently recovering from the 2013 Spring Flood Disaster (DR-4122).

Source: (DCRA 2014, FEMA Region X)

Economy

Galena is the unofficial hub for the State's western interior. Major employers are Federal, State, City, and Tribal governments. Additionally, Doyon Native Corporation, the Galena City School District, air transportation, retail businesses, commercial fishing, construction, and BLM firefighting, also provide employment opportunities.

According to the US Census Bureau's 2008 – 2012 American Community Survey 5-Year Estimates, the median household income in Galena was $58,125. Approximately 64 individuals (11.5 percent) were reported to be living below the poverty level. The potential work force (those aged 16 years or older) was estimated to be 377, of which 259 were actively employed. In December 2013 the unemployment rate in the Yukon-Koyukuk Census Area was 15.1 percent; however, this rate included part-time and seasonal jobs, and practical unemployment or underemployment is likely to be significantly higher. Figure 1-3 illustrates employment demographics for the region. Figure 1-4 illustrates industry characteristics within the region. Table 1-1 shows the top occupations for the City of Galena and Louden Tribal Council members.

Figure 1-3 Worker Demographics 2012

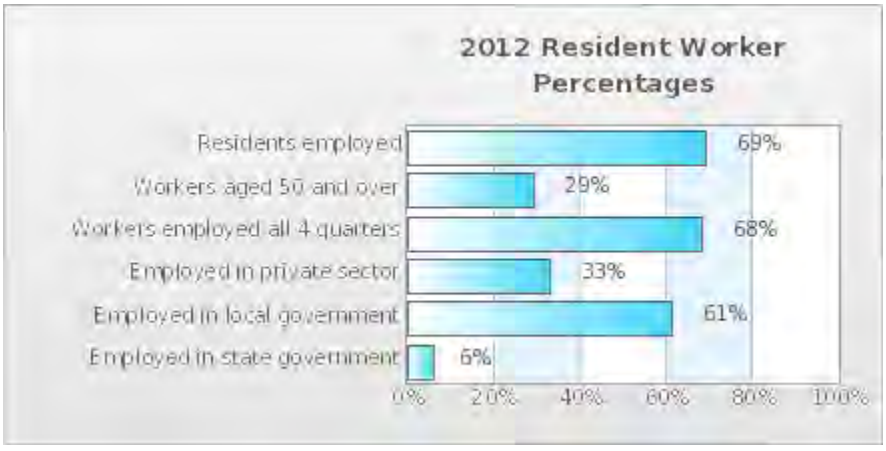
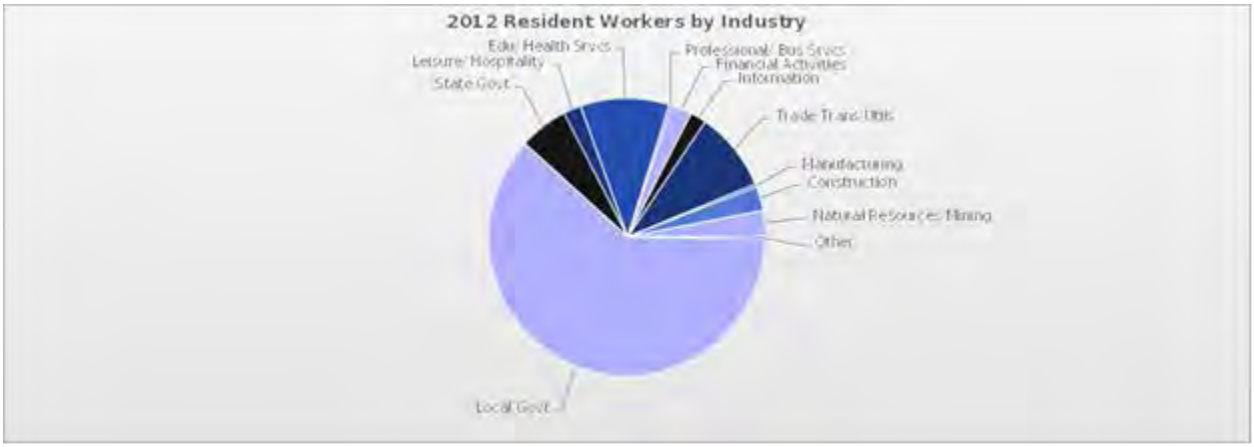


Figure 1-4 2012 Resident Workers by Industry



Source: State of Alaska Department of Labor and Workforce Development 2013

Table 1-1 Top Jobs in Galena	Number of workers	Female	Male	Age 45 and over	Age 50 and over
Laborers and Freight, Stock, and Material Movers, Hand **GASLINE**	18	2	16	3	2
Office and Administrative Support Workers, All Other **GASLINE**	11	6	5	7	6
Cooks, Institution and Cafeteria **GASLINE**	11	6	5	7	6
Secondary School Teachers, Except Special and Career/Technical Education **TOP JOB**	10	6	4	5	4
First-Line Supervisors of Mechanics, Installers, and Repairers **GASLINE TOP JOB**	10	0	10	6	4
Executive Secretaries and Executive Administrative Assistants **GASLINE TOP JOB**	10	10	0	8	5
Maintenance and Repair Workers, General **GASLINE TOP JOB**	9	0	9	4	2
Personal Care Aides	9	9	0	2	2
Teacher Assistants	8	6	2	2	2
Career/Technical Education Teachers, Secondary School	7	3	4	2	0
Residential Advisors	7	5	2	1	1
Janitors and Cleaners, Except Maids and Housekeeping Cleaners **GASLINE**	7	5	2	5	4
Construction Laborers **GASLINE TOP JOB**	7	2	5	1	1
Personal Care and Service Workers, All Other	5	3	2	4	4
Elementary School Teachers, Except Special Education **TOP JOB**	5	4	1	3	2

Table 1-1 Source: State of Alaska Department of Labor, 2012

Facilities

Two central wells and water treatment plants service Galena's residents. Most homes and facilities are completely plumbed and sewage is piped to a stabilization pond. A 4,200 watt diesel generator provides electricity. There is a landfill site south of the community.

Transportation

Galena is dependent on boat and air transportation. A 7,249-foot asphalt runway and a 2,786-foot gravel airstrip are owned and maintained by the State and barge service is available during the summer season. Once the waterways freeze, snow machines and all-terrain vehicles replace the boats.

Climate

Galena's temperatures range from a winter low of -40 degrees Fahrenheit (ºF) to above 70ºF during the summer with an extreme low of -64ºF. The area receives approximately 12.7 inches of rain annually and 60 inches of snow.

Figures 1-5 and 1-6 depict an aerial photograph of the City obtained from the Department of Commerce, Community, and Economic Development (DCCED)/DCRA as part of their community mapping effort. This photos depict the City's proximity to the Yukon River.

Figure 1-5 Aerial Photograph of Galena and the Yukon River (DCRA 2009a)

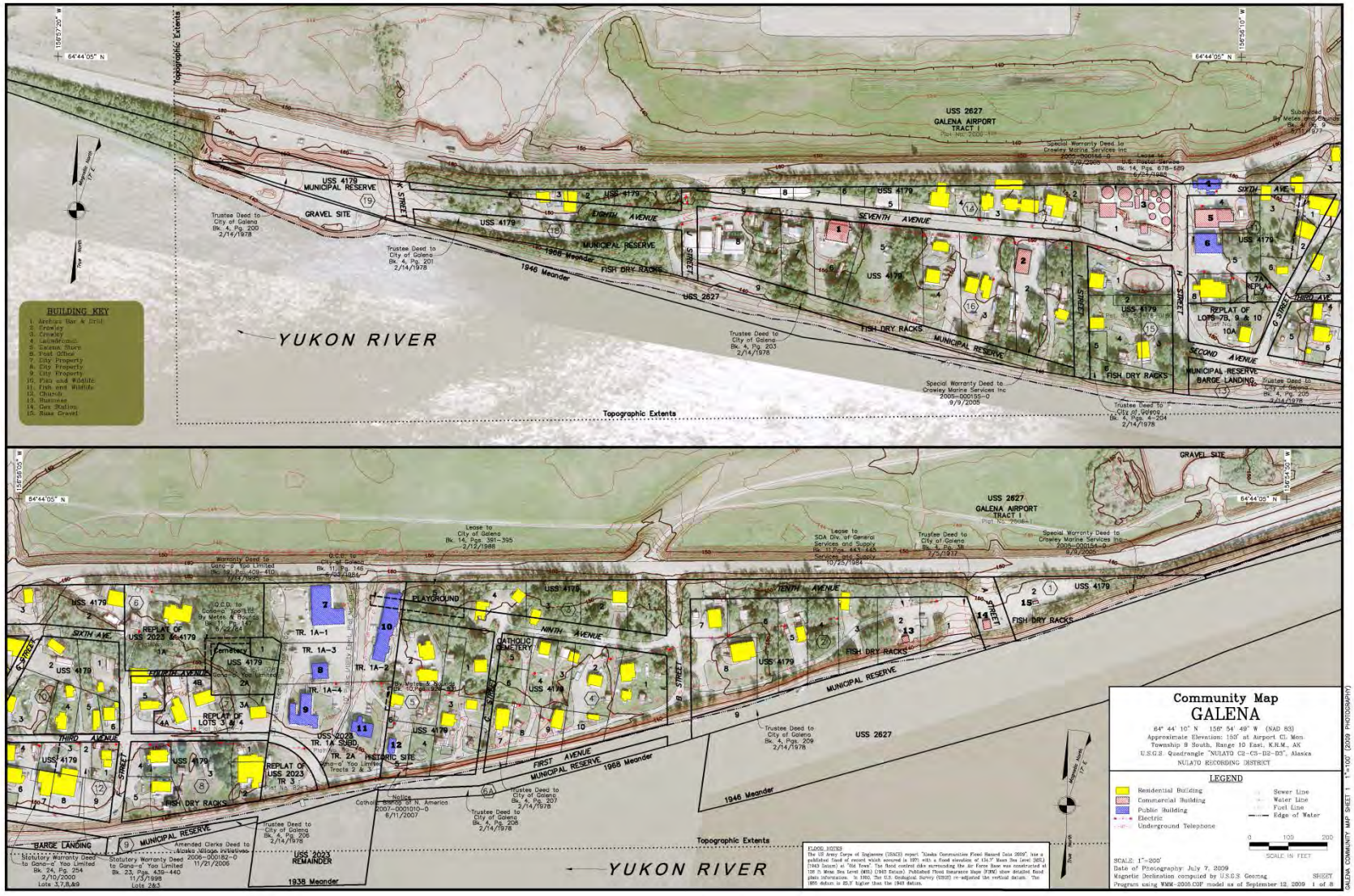


Figure 1-6 Split Map of Galena and the Yukon River (DCRA 2009)

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2. Planning Process

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

2.1 Overview

The Louden Tribal Council developed their plan with assistance from the State of Alaska, Division of Homeland Security and Emergency Management (DHS&EM). This plan includes:

1 Community demographic, land use, and economic information

2 A review of the local hazards facing the community.

3 A hazard vulnerability assessment.

4 A hazard mitigation strategy with attainable goals and actions.

5 A list of incorporated planning documents.

The DHS&EM mitigation officer and planner attended Louden's public mitigation plan kickoff meeting on February 10, 2014. The meeting was advertised on the local radio station and posted newsletters (Appendix F). During the public meeting, the Louden Council chose a planning team, identified hazards, resources, capabilities, and set the date for their next public meeting (Appendix G). The role of the Planning team agreed to assist with gathering information and public input. There was also a brief discussion about hazards affecting the community such as erosion, floods, and wildland fire. They selected March Runner, Louden's Administrator, to be the Local Planning team Leader.

The following five-step process took place from January through October 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.
2. Assess risks: The planning team reviewed their hazards and risk assessments.
3. Assess capabilities: The planning team assessed their community's current administrative, technical, regulatory, and fiscal capabilities.
4. Develop the mitigation strategy: The planning team identified and prioritized their mitigation goals and actions.
5. Monitor, evaluate, and update the plan: The planning team evaluated their goals and actions for compatibility with community priorities.

2.2 Hazard Mitigation Planning Team

Table 2-1 identifies the local planning team members led by Louden Tribal Council Administrator, March Runner:

Table 2-1 Hazard Mitigation Planning Team

Name	Title	Organization	Key Input
March Runner	Administrator	Louden	Planning Team Lead, HMP review.
Christopher Sommer	Chief	Louden	Planning Team Member, data input and HMP review.
Theresa Burley	Tribal Principle	Louden	Planning Team Member, data input and HMP review.
Susie Sam	Acting Tribal Principle	Louden	Planning Team Member, data input and HMP review.
Scott Nelsen	Mitigation Planner	Alaska DHS&EM	Plan Writer, research and HMP review.
Ann Gravier	Mitigation Officer	Alaska DHS&EM	Technical Assistance, data input and HMP review
Brent Nichols	HMGP Manager	Alaska DHS&EM	Technical Assistance, data input
Kristen Meyers	Mitigation Planner	FEMA Region X	Technical Assistance
Brett Holt	Mitigation Planner	FEMA Region X	HMP Reviewer, Technical Assistance

2.3 Public Involvement

Initial Public Meeting: On February 10, 2014, the Louden Administrator held a public meeting announcing the hazard mitigation plan update project. An invitation was extended to the entire community through public announcements over the local radio station and posted newsletters (Appendix F). The planning team posted a project newsletter describing the plan update process at the Tribal Office. The newsletter was also placed on the DSH&EM website for SHMAC and DPC review. During the meeting they promptly identified five hazards known to impact Louden and the City of Galena:

1. Earthquake
2. Erosion
3. Flood
4. Subsidence
5. Severe Weather
6. Wildland Fire
7. Climate Change

Assisted by elder members of the community, the planning team conducted a vulnerability assessment of Louden's assets. They evaluated buildings and infrastructure for their risk to each

hazard. The results revealed the extent of damage each hazard could inflict in a worst case scenario.

Second Public Meeting: On September 9, 2014, the Louden planning team held a second public meeting to review their final plan draft. An invitation was extended to the entire community through public meeting notices, (Appendix F). The nine member planning team reviewed the plan draft and approved it's submission to FEMA for final review.

2.4 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 Louden's HMP(Table 2-2).

Table 2-2 Incorporated Planning Documents

Existing Plans, Studies, Reports & Ordinances	Contents Summary
12/5/2007- US Army Corps of Engineers, Alaska Baseline Erosion Assessment, Erosion Information Paper	Defined the region's risk of erosion.
2010, City of Galena Hazard Mitigation Plan	Assessed the region's risk to various hazards.
2014, State of Alaska, Department of Commerce, Community and Economic Development Community Profile	Referenced for current demographic and historical information.
1998, Galena Comprehensive Plan	Defined City governance and land use policy.
Galena USAF Base Reuse Plan	Repurposed the abandoned military buildings and infrastructure.
Galena Electric Power, A Situational Analysis Draft Final Report	Researched current and future electrical infrastructure demand and growth.
State of Alaska Hazard Mitigation Plan (SHMP), 2013	Defined statewide hazards and potential risks.

Existing Plans, Studies, Reports & Ordinances	Contents Summary
Wildfire Protection Plan	Established community wildfire protection methods.
Emergency Response Plan	Referenced for natural hazard information
2014, Galena HMGP structure elevation, relocation, and buyout application DR 4122	Identified city structures to be elevated, relocated, or bought out
1983, Galena Flood Study (FEMA)	Flood insurance rate study for the region.
2014, Louden HMGP structure elevation application DR 4122	Identified tribal structures to be elevated.

Section 6 documents all references used in this HMP.

2.5 Plan Maintenance

The Louden Hazard Mitigation Plan will be maintained using the following three step process:

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

2.5.1 Incorporation into Existing Planning Mechanisms

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

- ☐ Research the community's regulatory tools when implementing mitigation planning initiatives.
- ☐ Involve pertinent agencies when integrating hazard mitigation concepts.
- ☐ Update or amend existing planning mechanisms as necessary.

2.5.2 Continued Public Involvement

Louden will continue involving the public when updating their HMP. A paper copy of the HMP and any proposed changes will be available at the Tribal Office. The planning team's contact information for questions, comments or concerns will also be available at the Tribal Office.

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

2.5.3 Monitoring, Reviewing, Evaluating, and Updating the HMP

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

Monitoring the HMP

The HMP was prepared as a collaborative effort. To maintain momentum and build upon previous hazard mitigation planning efforts, the Louden planning team will continue monitoring, evaluating, and updating the HMP. Each authority identified in Table 2-1 will be responsible for implementing the mitigation action plan. The planning team leader or designee will be the primary point of contact and will coordinate local efforts to monitor, evaluate, and revise the HMP.

Reviewing the HMP

The Louden planning team will review their goals and actions annually. During each annual review, each agency or authority administering a mitigation project will submit a progress report (Appendix C) to the planning team. The report will include the current status of the mitigation project and its relevancy to the corresponding goal identified in the plan.

Evaluating the HMP

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

- ☐ Involvement of community authorities, outside agencies, stakeholders, and residents
- ☐ Changes in risk for each natural or human- caused hazard
- ☐ Impact upon land development activities and related programs
- ☐ Mitigation Action Plan implementation progress, (identify problems and solutions)
- ☐ HMP local resource implementation for HMP identified activities

Updating the HMP

The Louden planning team will review their HMP annually and update it every five years, or when hazards, actions, or priorities are changed. 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 assistance from DHS&EM to update the HMP.
- ☐ Require each authority administering a mitigation project to submit a comprehensive progress report to the planning team.
- ☐ Identify the HMP sections needing improvement.
    - o Determine the current status of the mitigation actions (projects) in progress.
    - o Identify completed, deleted, or delayed projects. For statuses other than "completed", include a reason for the designation.
    - o Document changes to priorities.
    - o Assess the impact of completed projects.
    - o Identify any barriers preventing the implementation of mitigation projects such as financial, legal, or political restrictions and develop strategies to overcome them.
    - o Thoroughly analyze and update their risks to natural hazards.
    - o Update the Mitigation Action Plan.
- ☐ Prepare a draft of the updated HMP.
- ☐ Submit the updated draft HMP to the DHS&EM and FEMA for review and approval.

2.5.4 State and FEMA Review

Draft local hazard mitigation plans are submitted to the State Hazard Mitigation Officer (SHMO) for review. The SHMO reviews the plan for consistency with the State HMP and the Disaster Mitigation Act of 2000 (DMA 2000) regulations. The primary guidance is the FEMA Local Mitigation Plan Review Guide and Tool, October 2011, and the FEMA Local Mitigation Planning Hand Book, March 2013. The State assists the community with any necessary revisions and then forwards the plan to FEMA Region 10 for final review. If no further revisions are necessary, FEMA issues an "approval pending adoption" (APA) letter to the community council. The local community council will formally adopt the plan by a resolution. Once the plan is adopted, the SHMO forwards a copy of the adoption resolution to FEMA Region 10 for final approval. FEMA sends the final approval letter to the community and the State for their records. Finally, the SHMO places copy of the FEMA approved Local HMP in DHS&EM files and on the State web site for reference.

2.5.5 Formal Plan Adoption and Assurances

The Louden Tribal Council Supports 44 CFR 201 and assures compliance with all applicable federal statutes and regulations. Louden, with assistance from the State Hazard Mitigation Officer (SHMO), the State Hazard Mitigation Advisory Committee (SHMAC), and FEMA, is responsible for monitoring, evaluating, and updating the Louden Tribal Hazard Mitigation Plan in accordance with 44 CFR §201.7.

The Louden Tribal Council formally adopted their Hazard Mitigation Plan on , 2014 and submitted the final draft to FEMA for formal approval. A scanned copy of Louden's formal adoption is attached (Appendix B).

3. Hazard Profiles

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 (Table 3-1).

Table 3-1 Identification and Screening of Hazards

Hazard Type	Should It Be Profiled?	Explanation
Earthquake	Yes	Periodic, unpredictable occurrences. Galena experienced no damage from the 11/2003 Denali EQ, and experienced less than 10% damage throughout the area from the 1964 Good Friday Earthquake.
Erosion	Yes	Galena experiences 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	Ice Jams, 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.
Subsidence	Yes	The City is located in an area of discontinuous permafrost, and experiences thawing and sinkholes.
Tsunami & Seiche	No	This hazard does not exist for this City
Volcano	No	This hazard does not exist for this City.
Severe Weather	Yes	Annual weather patterns, severe cold, heavy rain, freezing rain, snow accumulations, 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 Galena, however, wildland fires have occurred in the vicinity.
Climate Change	Yes	The community is experiencing an increase in severity and frequency of severe weather, flood, and subsidence.

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.

During the kickoff meeting, the Louden planning team identified six natural hazards for their hazard mitigation plan: earthquake, erosion, flood, subsidence, wildland fire, and severe

weather. All six 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.

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

- ☐ Nature (Type)
- ☐ History (Previous Occurrences)
- ☐ Location
- ☐ Extent (to include magnitude and severity)
- ☐ Impact (Chapter 3 provides general risk associated with each hazard. Chapter 4 provides a detailed risk assessment for each hazard)
- ☐ Probability of future events

NFIP insured Repetitive Loss Structures (RLS) are addressed in Section 4.0, Risk Analysis.

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

Table 3-2 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 3-3 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 from the historical record and studies. 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" are multiplied by each rating then combined (added) to generate the overall Calculated Priority Risk Index value.

Table 3-4 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

Example: Highly Likely (4x.45) + Negligible Severity (1x.30) + Low Warning Time (4x.15) + Short Duration (1x.10) = 2.8

Table 3-5 reveals the Calculated Priority Risk Index for each hazard facing the community:

Table 3-5 Calculated Priority Risk Index by Hazard

Hazard	Probability	Magnitude / Severity	Warning Time	Duration	Priority Risk Index
Earthquake	4 Highly Likely	1 Negligible	4 < 6 Hours	1 < 6 Hours	2.8
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
Subsidence	3 Likely	2 Limited	1 24+ Hours	1 < 6 Hours	2.2
Severe Winter Storm	3 Likely	1 Negligible	1 24+ Hours	3 < One Week	2.1
Wildfires	2 Possible	1 Negligible	4 < 6 Hours	- Not Specified -	1.8
Climate Change	4 Highly Likely	4 Catastrophic	1 24+ Hours	4 > One Week	3.55

Table 3-6 documents the event history and damage extents for Louden and the City of Galena.

Table 3-6 Hazard History and Extent

Hazard History and Extent – City of Galena					
Flood	**Wildland Fire**	**Earthquake**	**Severe Weather**	**Erosion**	**Climate Change**
13 - L	0	2 - L	5 - L	2 - L	0

Extent

L - Limited – Minimal through maximum impact to part of community

Falls short of the definition for total extent

T - Total – Impact encompasses the entire community

Number: Number of occurrences

(Source: State of Alaska Hazard Mitigation Plan, 2013, Bethel Census Area)

The hazards profiled for Louden and the City of Galena are presented throughout the remainder of Chapter 3. The presentation order does not signify their importance or risk level.

3.1 Earthquake

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 3-7, 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 (Table 3-7).

Table 3-7 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		

Source: (MMI 2012)

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 earthquake damage has occurred in Galena.

Table 3-8 lists historical earthquakes from 1971 to present which exceeded M 5.0 located within 100 miles of the City. These earthquakes did not induce any damage.

Table 3-8 Historical Earthquakes for the Region

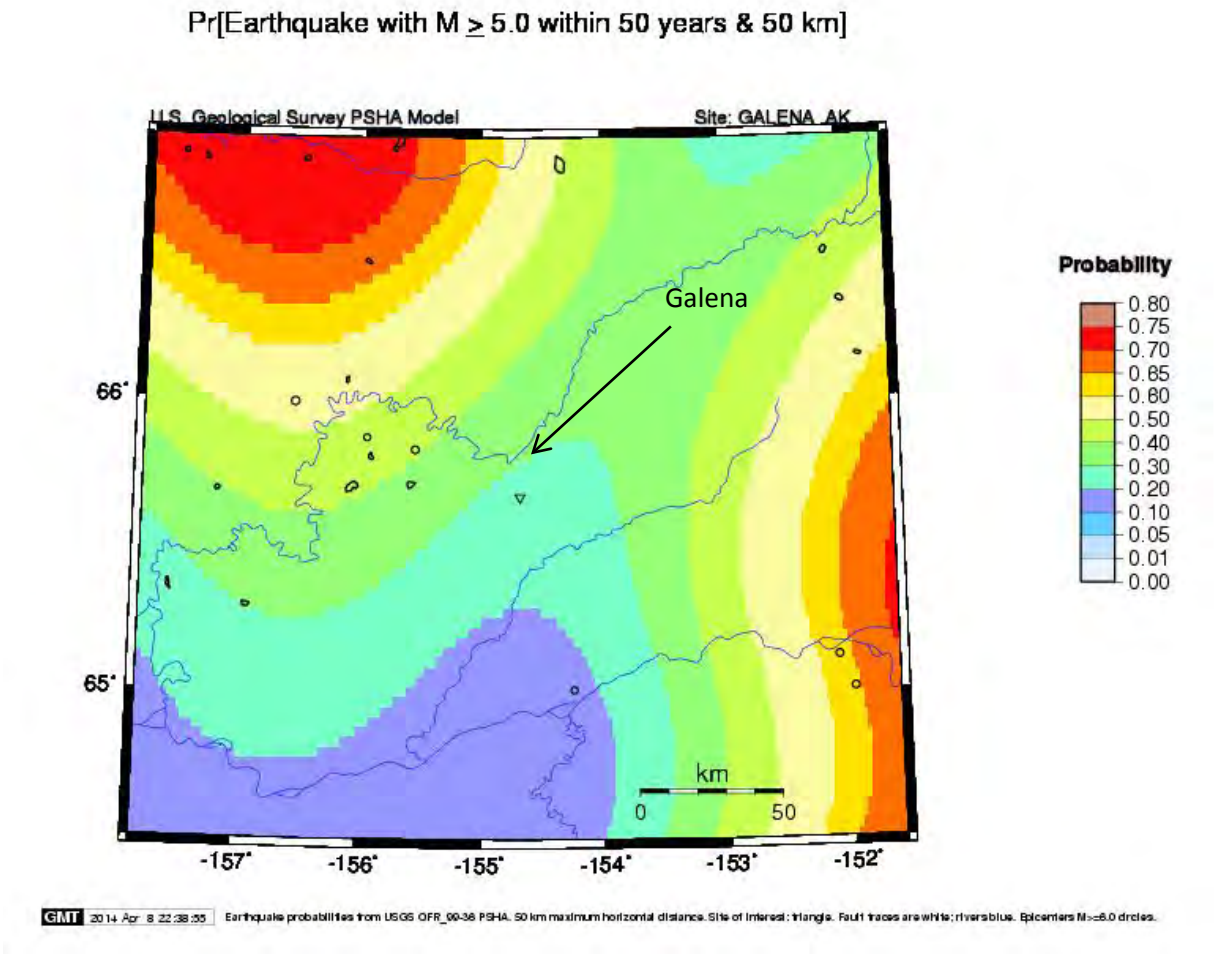
Cat	Year	Mo	Day	Origin Time	Lat	Long	Depth (Miles)	Magnitude	Distance (Miles)
PDE	1978	12	24	131308.10	63.56	-154.59	20.5	M 5.3	87.0
PDE	2000	02	03	102459.03	65.01	-154.24	4.4	M 5.7	81.4

Since 1977, 149 earthquakes have been recorded within 100 miles of the City. The average magnitude of these earthquakes is 3.0. Two exceeded M 5.0 (U.S. Geological Survey [USGS] 2009). The record event occurred on February 3, 2000, measuring M 5.7 at a depth of 4.4 miles) and caused no damage. The epicenter was located approximately 81.4 miles from the City.

Location

The entire geographic area of Alaska is prone to the effects of an earthquake. Figure 3-1 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 Galena.

Figure 3-1 Galena Earthquake Probability



The Department of Geological and Geophysical Survey (DGGS) Neotectonic Map of Alaska (Figure 3-2) depicts Alaska's known earthquake fault locations.

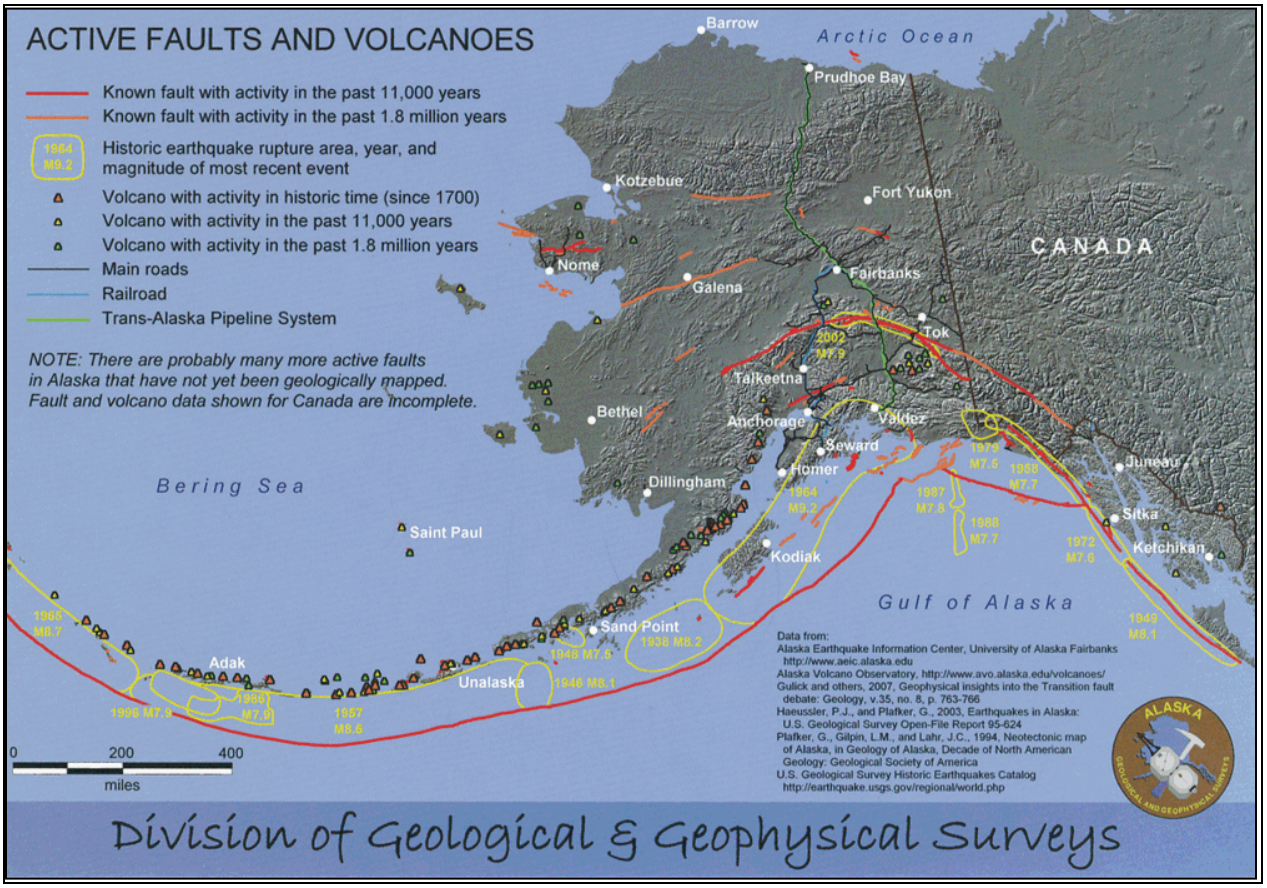


Figure 3-2 DGGS Neotechtonic Map of Alaska

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

Alaskans experience approximately 5,000 earthquakes annually, including 1,000 that measure above 3.5 on the Richter scale. Alaska is vulnerable to three types of earthquakes. One type is 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

Galena is located in a seismically less active area than other areas in the State. Although the effects of distant earthquakes could be felt in the City, extensive damage and significant ground movement are not expected. Impacts to future populations, residences, critical facilities, and infrastructure are anticipated to remain negligible.

Probability

Based on the geographic location of Galena, Figure 3-1 and Table 3-2, it is unlikely that an earthquake would be centered in an area near Galena. Figure 3-1 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 50 years near Galena.

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 3-1, 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 greater than 33 percent likely per year.

3.2 Erosion

Nature

Erosion is the wearing and transportation of land. Occasionally flash floods, human activity, or severe weather events greatly increase normal erosion rates. In populated areas, erosion often threatens development and infrastructure. Three main types of erosion affect communities in Alaska:

- Coastal erosion
- Riverine erosion
- Wind erosion

Located along the Yukon River, Galena is primarily vulnerable to riverine erosion. The water scours away the riverbed and deposits the material (silt) elsewhere. Silt deposits often alter the direction of flow and preclude channel navigation. In less stable braided channel reaches, erosion and deposition are a constant issue. Along the Yukon River itself, episodes of erosion may only occur occasionally. Riverine erosion in Galena threatens both critical and non-critical facilities.

History

The City has received several erosion prevention and bank stabilization projects since the 1950's. The USACE Alaska Baseline Erosion Assessment Study indicates:

> *"Galena has been the recipient of a number of erosion protection and bank stabilization projects, starting in the late 1950's. These projects have been constructed by various agencies, including the U.S. Air Force, the State of Alaska, the Corps of Engineers, and the City. Projects have included*
>
> *a) thermal sheet pile (sheet pile backed soil freezing probes), approximately 75 feet long, installed off the end of the runway at the edge of the riverbank;*
>
> *b) bank stabilization installations funded with State legislative grants in 1983, 1984 and 1987, totaling about $4.4 million;*
>
> *c) placement of 1,590 feet of armor rock erosion protection in 1988, authorized by Section 116 of Public Law (PL) 99-190;*
>
> *d) emergency bank stabilization measures since 2001, provided under Title I of the Energy and Water Appropriations Act (PL 106-377), totaling about $6 million;*
>
> *e) an additional 2,275 feet of armor rock to protect new town. According to the community survey the city had received State grant funds they used to place recycled concrete along the shore in old town, but the rebar in the concrete caused problems and the concrete was removed.*
>
> *Additional bank stabilization using existing stockpiled rock was proposed in a 2006 Corps assessment."*
>
> (USACE 2009)

Location

The Yukon River is known to cause erosion damage impacting "old town" and the embankment is migrating northward to "new town." The factors influencing erosion are flooding, spring break-up ice scour, and thawing permafrost.

Erosion is occurring all along the Yukon riverbank. During the spring thaw (break-up) the riverbank becomes water saturated and unstable allowing the swollen river to wash it away. The City is concerned with a six mile stretch of river migrating northward towards "new town." Sections of Campion road were completely washed away during the 2013 Spring Flood (DR4122). The State Department of Transportation decided to relocate the road further away from the river.

Figure 3-3 is an aerial photograph provided by USACE from their 2009 Alaska Baseline Erosion Assessment of the Old Town and airfield portion of the City. The photo partially depicts the Yukon River erosion and flood threat locations.

Figure 3-3 Aerial View, City of Galena, 2009

Extent

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

Ice jam floods are some of the most destructive forces of erosion in Galena. Ice jams re-direct flowing water and large blocks of ice through the community, scouring away the land and destroying structures. Additional erosion forces are:

1) *Fine bank material and silty soil* act as sandpaper against the riverbank.

2) *Wave action and currents* soften the river banks.

3) *High water.* Increases pressure on the riverbank. As high water recedes, the saturated soil may also slump.

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 attributed to preventing or controlling erosion sites. Possible impacts to the community are injury, illness, and death, complete shutdown of critical facilities for at least two weeks, and more than 25 percent of property severely damaged.

Based on past events, the 2009 USACE Alaska Erosion Assessment, and the criteria identified in Table 3-3, the magnitude and severity of erosion impacts upon the Louden Tribe and the City are negligible with injuries treatable by basic first aid, critical facilities shutdown 24 hours or less, and less than 10 percent severely damaged property and critical infrastructure.

The USACE Alaska Baseline Erosion Assessment states:

> *"Campion Road continues to be at risk from advancing river erosion. This road provides an important link to major infrastructure such as:*
>
> *a) the Very High Frequency Omni-directional Radio (VOR) station, a short-range air navigation aid used for landing, terminal, and en route guidance;*
>
> *b) a U.S. Air Force Loran station;*
>
> *c) the city and military landfills;*
>
> *d) silt pits used for road construction;*
>
> *e) a cemetery; and*
>
> *f) several cabins (currently unoccupied)"*
>
> (USACE 2009b)

Probability

Based on previous occurrences and applying the criteria identified in Table 3-2, it is likely that erosion will occur in the next three years (event has up to one in three years chance of occurring) as the history of events is greater than 20 percent but less than or equal to 33 percent likely per year.

3.3 Flood

Nature

Galena is located on a floodplain along the Yukon River and is situated on flat land slightly above riverbank elevation. The many meander channels in the surrounding area can cause surface drainage problems. Galena is subject to ice jams and stream overflow flooding from the Yukon River. The U.S. Army Corps of Engineers reported a high frequency of flooding and found Galena to be in a high flood hazard area.

Four primary types of flooding threaten the Galena area: rainfall-runoff, snowmelt, 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.

Ice Overflow (Aufeis) Flood is glaciation or bottom fast icing of streams and rivers. Aufeis form during the winter when emerging ground water freezes upward and forces water out of the stream channel. In winter 2013, an Aufeis event along the Campbell Creek in Anchorage forced water into a few homes.

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

History

The US Army Corp of Engineers reported "There is a river gauge in the community. Significant floods have been reported since 1925. Most floods are ice-jam floods. The 1945 ice-jam flood destroyed most of the community. The previous flood of record is 1971 ice-jam flood, which reached an elevation of 134.7 ft (mean sea level (MSL) at 'Old Town.' Floodwaters were approximately 8 ft deep." (USACE 2009). The new flood of record refers to (DR-4122) below.

Several disaster declarations have been awarded for Galena flood damages such as the June 10, 1989 food that affected 16 local communities, the May 30, 1991 spring thaw flood, and the May 26-29, 1992 spring ice jam flood located several miles downstream of Galena. The 1992 flood is the fourth worst in Galena's recorded history. All roads and the majority of homes and infrastructure sustained extensive damage in the downtown area. The May 10, 1994 spring ice jam flood event threatened life and property. Roads and river bank revetments suffered significant damage as did the sewage lagoon.

The 2013 Spring Ice Jam Flood (DR4122) established a new flood of record and was the worst flood in Galena's history. Most of the community voluntarily evacuated to avoid serious injury. The Old Town section was completely destroyed by flood water and ice impacts. The New Town section was extensively damaged in similar manner. Approximately 194 homes were seriously damaged, uninhabitable, and must be completely rebuilt. Long term recovery efforts continue as of Spring 2014.

Table 3-8 lists the previous flood disasters in Galena.

Table 3-9 Historical Floods in Galena

Zone(s)	Location(s)	Date(s)	Event	Description
AK216	Galena	1945	Ice Jam Flood	Flood destroyed most of the community
AK216	Galena	1971	Ice Jam Flood	Flood of record, reached an elevation of 134.7 ft MSL at "Old Town." Floodwaters were approximately 8 ft deep
AK216	Galena	6/10/89	Federal: Spring Floods (FEMA DR-0832) Ice Jam Flood	Incorporated sixteen local declarations and applied to all communities on Yukon rivers and their tributaries.
AK216	Galena	5/30/91	Federal: (FEMA-0909-AK) Flood Ice Jam Flood	Record snowfalls with sudden spring melt caused flooding all along the Yukon River systems
AK216	Galena	5/26-29/92	State: Galena Break-up Flood Disaster	Both downtown and uptown Galena were flooded as a result of an ice jam at Bishop Rock several miles down stream of Galena. This was the third worst flood in recorded history for the community. Extensive damage to State road systems, City streets, electrical distribution system, sewage lagoon and the majority of homes in the downtown area.
AK216	Galena	5/10/94	State: Galena Break-up Flood Disaster	Losses and threats to life and property resulting from flooding due to break-up. As a result of this disaster, roads and revetments suffered significant damage, and the sewer lagoon was breached.
AK216	Galena	6/25/13	Federal: (FEMA DR-4122) Ice Jam Flood	New flood of record established. Extensive damage to New Town. Old Town destroyed. DOT road abandoned and new road built away from the river on higher ground.

(Source: HMGP, DHS&EM, 2014)

Location

The USACE reported the Base Flood Elevation (BFE) for ice-jam floods is approximately 134 feet MSL at "Old Town" and approximately 134.5 feet MSL in "New Town," about one mile upstream. The flood control dike surrounding the Air Force Base was constructed at 136 feet MSL and was not overtopped during the 2013 Spring Flood. Unfortunately, the community is outside the dike. Therefore, the entire City of Galena and Louden Tribe are vulnerable to flooding. Two vertical datums exist: the 1943 datum (used here) and the 1955 U.S. Coast and Geodetic Survey readjustment, which is 23.3 feet higher. Published Flood Insurance Maps (FIRM) show detailed floodplain information. FIRMs are available by contacting FEMA at: FEMA Map Service Center, P.O. Box 1038, Jessup, Maryland 20794-1038.

Extent

The entire City of Galena and Louden Tribe are vulnerable to flooding.

Impact

Impacts to the community are 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 severely damaged. Specific impacts resulting from floods include water damage to infrastructure, buildings (both critical and non-critical facilities) and structural damage caused by floating debris such as ice.

Climate Influence upon Ice Jam Flooding

The following is from the Special Supplement to the Bulletin of the American Meteorological Society published in August 2013:

"The climate of the Arctic in 2012 was dominated by continued significant changes in the cryosphere. There were new records for minimum sea ice extent and permafrost warming in northernmost Alaska. And, a negative North Atlantic Oscillation (NAO) in spring and summer, which promoted southerly airflow into the Arctic, had a major impact on lake ice break-up, snow cover extent, Greenland Ice Sheet melt extent and albedo, and mass loss from the ice sheet and from Canadian Arctic glaciers and ice caps. Lake ice break-up was up to three weeks earlier in Arctic Canada and up to one month earlier in Eurasia, consistent with changes in spring snow cover extent."

In 2013, Alaska's riverine communities experienced one of the quickest spring thaws on record. Many watersheds were inundated with melt-water. Rivers tend to meander in large river deltas, such as the lower Yukon and lower Kuskokwim, during flood events.

Probability

Recorded historical flooding information indicates Galena experiences flooding every two to 20 years, and that trend is expected to continue (Table 3-9). Therefore the probability of a flood impacting Galena is highly likely (Table 3-2).

3.4 Subsidence

Nature

Permafrost is soil, sand, gravel, or bedrock remaining below 32°F for two years or more. Permafrost may form massive ice wedges and lenses in poorly drained soils a relatively dry matrix in well-drained gravel or bedrock. During the summer, the surficial soil material thaws to a depth of a few feet, but the underlying frozen materials prevent drainage. The surficial material subject to annual freezing and thawing is referred to as the "active layer".

Permafrost degradation (Thermokarst) occurs naturally as a result of climate change and is usually a very gradual process. As a result of thermokarst, the ground subsides, creating depressions filled with melt water, known as thermokarst lakes or thaw lakes.

Human induced ground warming will degrade permafrost much faster than natural degradation from a warming climate. Warm structures on the ground surface allow heat to transfer to the underlying permafrost. Under this scenario, ill-conceived structures will sink unevenly into the thawing permafrost, resulting in complete loss or expensive repairs. Permafrost is also degraded by damaging the insulating vegetative ground cover, allowing the summer thaw to extend deeper into the soil. Evidence of this type of thermokarst is evident along unevenly settled old trails, roads, and railroads.

History

There is no written record addressing permafrost impacts within Galena. However, the planning team noted periodic and uneven settling of infrastructure in the area.

Location

According to mapping completed by the Alaska Division of Geological and Geophysical Survey (DGGS), the entire Galena area is underlain by discontinuous permafrost (Figure 3-4).

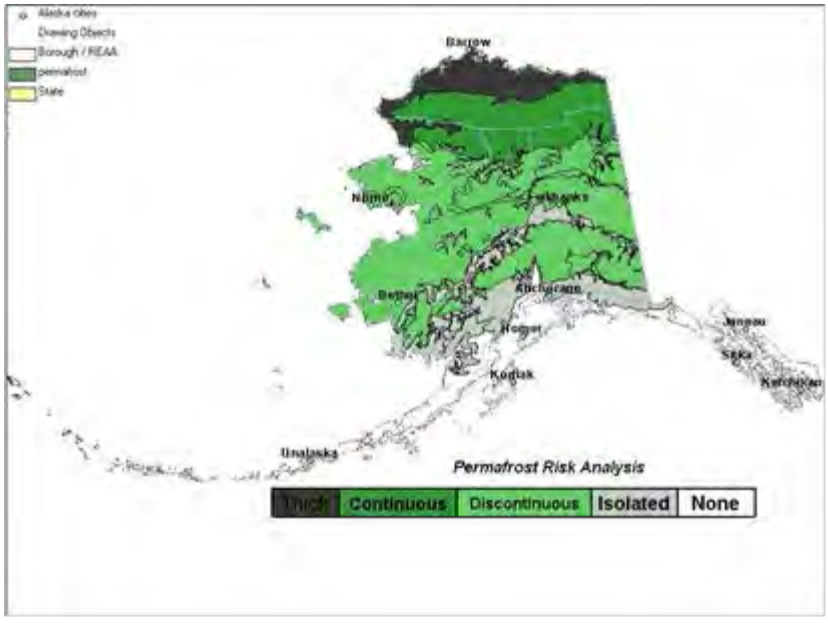


Figure 3-4 DGGS Permafrost Map of Alaska (DHS&EM 2013)

Extent

Based on past permafrost degradation events and the criteria identified in Table 3-3, the extent of permafrost degradation impacts in Galena are considered negligible where injuries are treatable with first aid, minor quality of life is lost, shutdown of critical facilities and services occurs for 24 hours or less, and less than 10 percent of property is severely damaged.

Impact

Impacts associated with thermokarst are uneven settling of infrastructure and buildings. This hazard warrants careful planning and design of all structures to eliminate risk.

Probability

Historical permafrost damage data is non-existent for Galena. However, the planning team noted that permafrost damage occurs annually to structures and roads adjacent to the City's wetlands. The planning team stated that the probability of future damage from thermokarst is possible in the next five years as the history of events is greater than 10 percent but less than or equal to 20 percent likely per year (Louden 2014).

3.5 Severe Weather

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 are excessive accumulations of ice during a freezing rain or sleet event. Freezing rain and sleet commonly occur within a narrow band of a storm which may deposit heavy amounts of snow in other locations.

High Winds often accompany winter low-pressure systems from the North Pacific Ocean and the Gulf of Alaska. Alaska's high wind can equal typhoon force but fall under a different classification because they are neither cyclonic nor exhibit other characteristics of typhoons. In Alaska, high winds (winds in excess of 60 miles per hour [mph]) occur rather frequently over the interior due to strong pressure differences, especially where influenced by mountainous terrain. Galena's highest wind speed reached 64 mph.

History

Table 3-10 lists the National Weather Service's major storm events for Galena's Weather Zone. The events are named by location within the identified zone.

Table 3-10 Severe Weather Events

Zone(s)	Location(s)	Date(s)	Event	Description
AK004, AK008,	Various	24-25 Feb 89	Winter Storm	Wind and heavy snow in many areas, probably affected all villages
AK008	East of Galena	10 Nov 85	Heavy Snow	10 inches (") (1-day)
AK008	Galena	27-28 Dec 90	Heavy Snow	11-13" (1-day)
AK008	Galena	22 Mar 91	Heavy Snow	6" (1-day)
AK004 & AK008	Galena	26-29 Feb 96	Heavy Snow	Snowfall totals for the one-to-two day event. Galena 4"
AK004 & AK008	Galena, Nulato Kaltag, Ruby	22-24 Jan 99	Heavy Snow	Blizzard Conditions, precipitation, strong winds Nulato 7", Ruby 10.2", Kaltag 12"
AK004 & AK008	Galena	29-31 Jan 99	Extreme Cold	Cold air mass -50 degrees Fahrenheit (ºF) to during the period and reached the -60ºF. The lowest recorded temperature for Galena: -64ºF
AK004 & AK008	Galena, Kaltag, Ruby,	01-12 Feb 99	Extreme Cold	Cold air mass -50ºF to during the period and reached the -60ºF. The lowest recorded temperature for Galena: -64ºF
AK004 & AK008	Koyukuk Valley, Galena	20-23 Dec 99	Heavy Snow	Cold, high winds, snow and ice Galena 7", 22nd
AK004 & AK008	Nulato, Kaltag	22-24 Jan 00	Winter Storm	Winter weather, heavy snow (24 hour amounts) occurred at: Wiseman 15", 15.5", Nulato 9.6", Kaltag 7", 23rd, 7" 24th

Table 3-10 Severe Weather Events

Zone(s)	Location(s)	Date(s)	Event	Description
AK004 & AK008	Galena, Kaltag	1-3 Feb 00	Blizzard	Winter weather, strong winds, blizzard conditions, high winds, and heavy snow: Galena 8.3", Kaltag 8"
AK004 & AK008	Nulato, Galena, Kaltag	9-11 Nov 00	Winter Storm	Winter Weather, strong winds, blizzard conditions. Nulato and Galena reported freezing rain, Kaltag reported freezing rain. Nulato reported 9 inches of snow
AK008	Nulato, Kaltag	12-13 Nov 00	Heavy Snow	Blizzard conditions, heavy snow. Kaltag and Nulato strong winds Nulato 9"; Kaltag, 8"
AK216	Galena, Nulato, Kaltag	2-3 Apr 01	Heavy Snow	Blizzard conditions, heavy snow, high winds Galena 7-10"; Nulato 10-12"; Kaltag 6"
AK216	Kaltag	14-15 Jan 02	Heavy Snow	Heavy snow. Kaltag reported 6" of new snow over a 12 hour period
AK216-AK218	Kaltag	16-17 Apr 02	Heavy Snow	Heavy snow, strong winds, blizzard conditions Kaltag reported 6" of new snow
AK216	Kaltag	3-4 Feb 03	Heavy Snow	Heavy snow Kaltag where 6" snow
AK216 & AK219	Bettles, Galena	1-3 Mar 03	Heavy Snow	Heaviest snow fell near Bettles (Zone 219) where 11" of new snow; Galena (Zone 216) measured 8" and reported near white out conditions
AK216	Galena	3-5 Feb 04	Heavy Snow	Snowfall. Zone 216- Galena reported: 9"
AK216	Galena	15 Feb 04	Heavy Snow	Cold air mass produced heavy snow. Zone 216: Galena reported 6"
AK216	Galena	10 Nov 04	Heavy Snow	Heavy snow Galena reported 9.0"
AK216	Galena	1 Dec 04	Heavy Snow	6" of snow reported by Galena
AK216	Galena	22 Dec 04	Heavy Snow	Winter Storm Conditions reported at: Zone 219- Heavy snow reported at Zone 216- Galena reported 8"
AK216-AK219	Galena, Bettles	2-5 Jan 05	Heavy Snow	Arctic cold front, heavy snow reported: Zone 216- Galena 8". Zone 219: Bettles Airport 10.4"
AK216	Galena	13 Feb 05	Heavy Snow	Heavy snow reported at Galena 6"
AK216	Galena, Kaltag	20-22 Mar 05	High Wind	Zone 216- Kaltag Peak Wind 45 mph and Galena highest gust 39 mph
AK216	Kaltag	26 Nov 06	Heavy Snow	Zone 216- Kaltag reported 12" snow
AK216	Galena	9-10 Oct 07	Heavy Snow	Galena reported 8" of snow
AK216	Kaltag	4-5 Nov 07	Heavy	Heavy snow over the Nulato Hills including

Table 3-10 Severe Weather Events

Zone(s)	Location(s)	Date(s)	Event	Description
			Snow	Kaltag. Kaltag reported 8" of snow
AK215 & AK216	Galena, Kaltag,	3-5 Apr 08	Winter Storm	Zone 216- Kaltag heavy snow with rain and/or freezing rain, snowfall amounts of 7 to 9". Galena reported only 1-2" of snow.
AK216	Galena	3-4 Dec 08	Heavy Snow	Galena reported 7" of snow.
AK216 &	Galena,	1-12 Jan 09	Extreme Cold/Wind Chill	Cold snap did not produce any record low temperatures, It was the most prolonged cold snap across interior Alaska since 1999 Zone 216- Galena: -51ºF on the 2nd
AK216 & AK219	Galena &	2 Jan 09	Temperat ures	Zone 216- Galena: -51 ºF, Cold snap did not produce any record low temperatures; it was the most prolonged cold snap across interior Alaska since 1999
AK215, AK216 & AK219	Galena, Kaltag, Ruby	13-16 Jan 09	Winter Storm	Estimated 8 to 12" of snow fell along the eastern slopes of the Nulato Hills. Above freezing temperatures at Kaltag, the Galena and Ruby, it is likely that the snow changed to freezing rain in spots
AK216	Galena	16-17 Jan 09	Winter Storm	High winds, heavy snow, blizzard conditions and freezing rain. Zone 216- Galena reported trees and power lines down during the early morning hours of the 17th. Sustained winds of 50 mph were observed, with a peak wind gust of 64 mph
AK216 & AK215	Galena	17 Jan 09	High Wind	Galena reported trees and power lines down. Sustained winds of 50 mph were observed, with a peak wind gust of 64 mph

Source: DHS&EM 2014

Location

The National Weather Service continues to mold their weather zones to relevant geographic areas. Consequently the data in Table 3-9 depicts different zone numbers representing the same area.

Extent

Galena experiences the following severe weather events:

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

The entire Galena area is vulnerable to the effects of severe weather. Winter snows average eight inches per storm; wind speed varies based on weather patterns but reach as high as 64 mph, while record low temperatures have reached -64ºF.

Impact

In Galena, the impact of a severe winter storm is negligible. Structures and infrastructure have 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. The Galena area is most vulnerable to high winds during the winter season. Winds may sweep up loose snow and produce blinding blizzards and dangerous wind chills. Additionally, high winds may damage community facilities and infrastructure.

Extreme cold may bring transportation to a halt. Aircraft are often grounded during extreme cold and ice fog conditions, disrupting access as well as the flow of supplies to communities.

Extreme cold may also interfere with a community's infrastructure. Occasionally old, overtasked, or ill maintained power generators will fail during extremely cold weather. For communities relying upon electrical heat, loss of power will freeze water and sewer pipes. If prolonged extreme cold conditions are combined with low or no snow cover, buried pipes may freeze or heave. However, the greatest danger from extreme cold is exposure. Frostbite and hypothermia are life-threatening medical conditions associated with prolonged exposure. To alleviate the risk of exposure, people often use supplemental heating devices not approved for indoor use, thus increasing their risk to carbon monoxide or carbon dioxide poisoning.

Probability

Based on the event history and the criteria identified in Table 3-2, it is likely a severe storm will occur in the next three years (event has up to one in three years chance of occurring) as the history of events is greater than 20 percent but less than or equal to 33 percent likely per year.

3-6 Wildland Fire

Nature

Fire is a natural wildland management force in the Alaskan Interior. It is a key environmental factor in cold-dominated ecosystems. Without fire, organic matter accumulates, the permafrost table rises, and ecosystem productivity declines. Fire rejuvenates an ecosystem by removing decaying matter and returning their nutrients to the soil, preserving vegetative diversity and wildlife habitat unique to Alaska. In the absence of wildland fires, many plant and animal species would no longer thrive.

While fire is critical for maintaining the viability of Alaska’s ecosystems, it must be tempered with the need to protect human life and property. This is particularly true of fires burning in “wildland urban interface” areas, where structures and other human development meet or intermingle with undeveloped wildland. Wildland urban interface (WUI) has gained importance throughout Alaska with increased development adjacent to wild lands (Figure 3.2.1).

Firefighter and public safety is the primary concern of the land and wildland management agencies. Galena resides in the Alaska Fire Service Protection Area. In Alaska, thousands of

acres burn every year in 600 to 800 fires primarily between the months of March and October.

History

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

Over 215 wildland fires occurred within 50 miles of Galena. Table 3-11 lists the 62 wildfires that exceeded 3000 acres burned for the historical period of 69 years (i.e., from 1939 to 2014).

Table 3-11 Wildfire Locations Since 1938 Within 50 Miles of the City

Fire Name	Fire Year	Estimated Acres	Specific Cause
Head Long Creek	1940	10000	Unknown
Poorman	1940	10000	Unknown
East Ruby	1940	5000	Unknown
Galena	1941	10000	Unknown
Kaltag	1941	10000	Trapper
Ruby	1941	100000	Unknown
Nulato	1941	10000	Trapper
Galena	1946	15360	Lightning
Yuko	1946	128000	Lightning
Nowitna	1946	4100	Lightning
South Kotol Mt.	1953	9700	Lightning
Kotol River	1953	11000	Lightning
20 Mile	1954	17920	Lightning
Galena N-35	1956	23000	Lightning
Dubli #2	1956	112492	Lightning
Nulato S-10	1956	129840	Lightning
South Fork Nulato River	1957	40000	Lightning
Hill 1224	1957	151800	Lightning
Kayiuh Mtn	1959	5100	Lightning
Kokrines Nw-19	1959	6400	Lightning
Nulato	1960	16500	Lightning
Khotol Mt	1968	15300	Lightning
Base Line	1968	8000	Lightning
Sheets Creek	1968	7000	Lightning
Holt Creek	1968	8000	Lightning
Yuki River	1968	3000	Lightning
Cottonwood	1968	6000	Lightning
Mueller	1969	90000	Lightning

Table 3-11 Wildfire Locations Since 1938 Within 50 Miles of the City			
Fire Name	**Fire Year**	**Estimated Acres**	**Specific Cause**
Cottonwood	1969	140000	Lightning
Bear	1969	422000	Lightning
Dulbi	1969	12000	Lightning
England	1971	28000	Lightning
Little Mud River	1972	10000	Lightning
Koyukuk	1973	10240	Lightning
Gal Ne 57	1985	37000	Lightning
831024	1988	52600	Lightning
Gal N 38	1990	60000	Lightning
Gal Ne 30	1991	11040	Lightning
Gal Ne 50	1991	4740	Lightning
331662	1993	3300	Lightning
331653	1993	4800	Lightning
331639	1993	3410	Lightning
Gal Ne 38	1994	3680	Lightning
631588 Antelope Cr.	1996	9300	Lightning
Soonkakat River	1997	3070	Lightning
Yukon Creek	2000	61291	Lightning
Natlaratlen River	2000	8541	Lightning
Moose Creek	2002	5275	Lightning
Holtnaka	2002	23033	N/A
Long Creek	2002	74931	Lightning
Bonanza Creek	2004	265916	N/A
Louis Lake	2004	22193	Lightning
Gisasa River	2005	52606.4	Lightning
Nulato #3	2005	14404.6	Lightning
East Fork Yuki River	2005	32774.5	Lightning
Dulbi South	2005	3432.6	Lightning
Kalyuh Hill	2005	8958.8	Lightning
Little Mud River #2	2005	30170.7	Lightning
Camp Creek	2005	13755	Lightning
Holtnakatna Creek	2005	194015.2	Lightning
Big Creek	2007	3416.9	Lightning
Coffee Can Lake	2007	39795	Lightning

Location

Since fuels data is not readily available, for the purposes of this plan, all areas outside Galena are considered to be vulnerable to wildland fire impacts. Since 1939, 215 wildland fire events have occurred within 50 miles of the City (Figure 3-5).

Figure 3-5 Galena Fire History Map

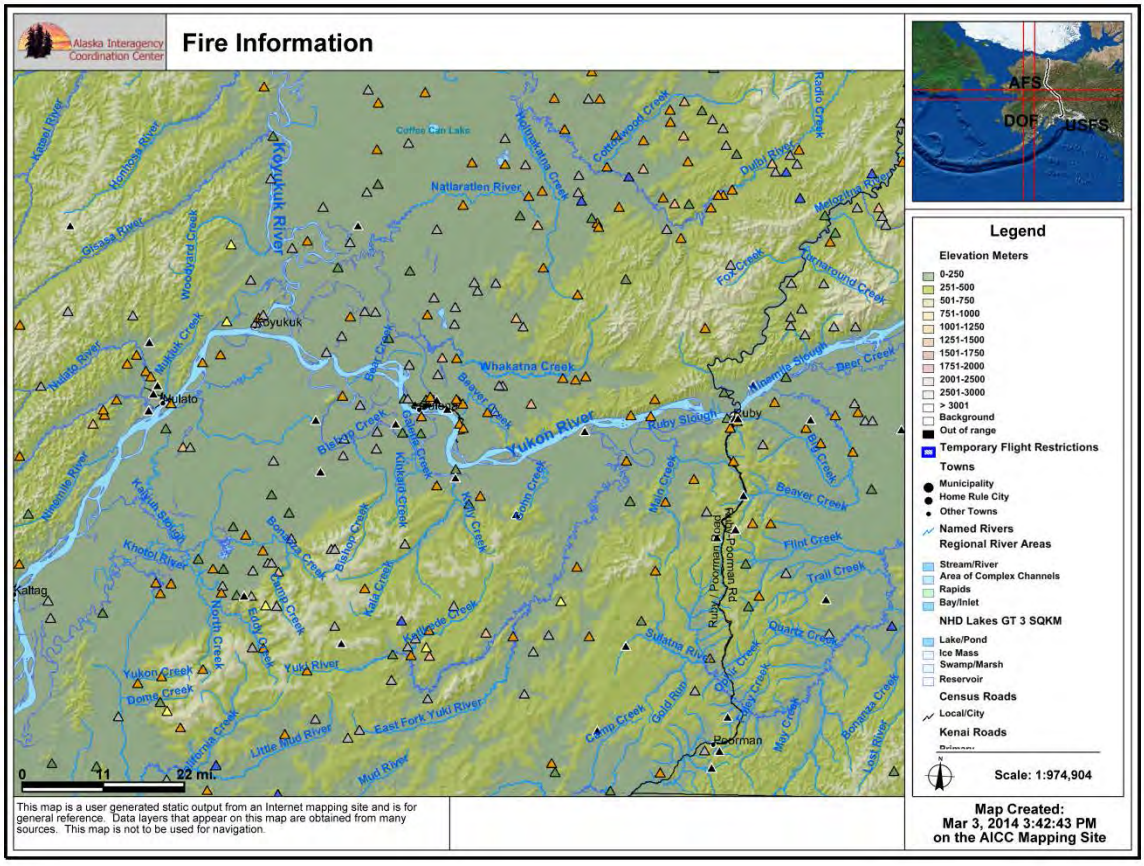


Figure 3-5 Source: Alaska Interagency Coordination Center Mapping Site, 2014

Extent

During the past 69 years an average of 42,471 acres burned during each of the 62 wildland fire events from Table 5-8. Based on past wildland fire events and the criteria identified in Table 5-3, the magnitude and severity of impacts within Galena are considered negligible with minor injuries, the potential for critical facilities to be shut down for less than 24 hours, less than 10 percent of property or critical infrastructure being severely damaged, and little to no permanent damage to transportation or infrastructure or the economy.

Impact

Impacts of a wildland fire that interfaces with the population center of Galena could grow into an emergency or disaster if not properly controlled. A small fire can threaten lives and resources and destroy property. In addition to impacting people, wildland fires may severely impact

livestock and pets. Such events may require emergency watering and feeding, evacuation, and alternative shelter.

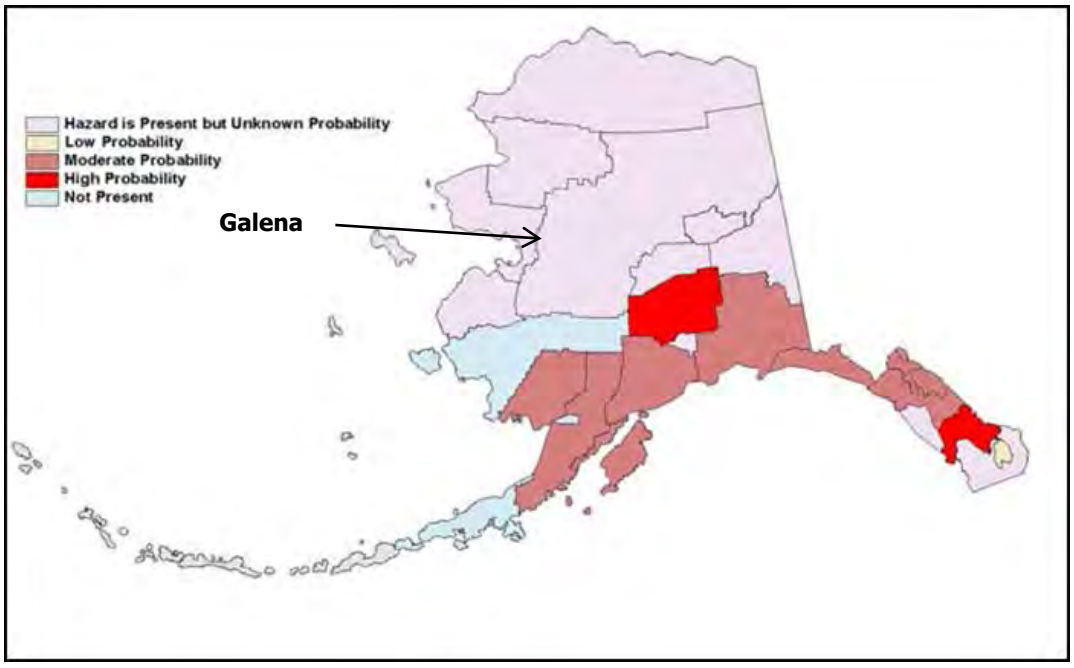
Indirect impacts of wildland fires can be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways, and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life. Exposed soils erode quickly and enhance siltation of rivers and streams, thus increasing flood potential, harming aquatic life, and degrading water quality.

Probability

Recorded wildland fires within 50 miles of Galena have an average recurrence rate of approximately 2.5 to 3 years (Table 3-10). Therefore a wildland fire has up to one in three years chance of occurring within 50 miles of Galena and the history of events is greater than 20 percent but less than or equal to 33 percent likely each year.

The following map from the Alaska State Hazard Mitigation Plan depicts Galena as being in a present but unknown probability area of the state.

Figure 3-6 Wildland Fire Risk in Alaska



Source: State of Alaska Hazard Mitigation Plan 2013

Galena is located in a Modified Management Option area of the state. Modified Management Option is a management level between "Full" and "Limited". Unlike Full management areas, the intent is not to minimize burned acres, but to balance acres burned with suppression costs and, similar to Limited, support land and resource management objectives when conditions are favorable.

3-7 Climate Change

Nature

For this HMP, climate change refers to the long term variation in atmospheric composition and weather patterns on a global scale. Global climate change may occur gradually due to small variations or rapidly due to large catastrophic forces. Greenhouse gasses, especially carbon dioxide (CO2) and methane (CH4) are commonly regarded as the most significant factors influencing the Earth's current climate.

Significant atmospheric variations may also be influenced by more than one event, for instance, an asteroid impact and a major eruption over a longer time period. For scientists studying climate change, both hazards imply different time periods. Therefore the time period estimates for previous climate change events tend to vary and cannot be accurately applied to current predictive climate change models, which now must account for human activity. This is significant because hazard mitigation planning relies greatly upon the historical record.

History

Previous rapid changes in the earth's climate appear in the fossil record as global mass extinctions. According to National Geographic, more than 90 percent of all organisms that have ever lived on Earth are extinct. Not all of them were subject to mass extinction events from climatic forces. However, fossilized remains of species known to be alive during periods of mass extinction are under scrutiny for evidence of root causes.

During Earth's history, there have been many mass extinction events, five of which are regarded as the most thorough:

1. End Ordovician (~443Ma): The second largest know mass extinction on record. 12% of all families and 65% of all species ceased to exist.
2. Late Devonian (~370 Ma): Sharks appeared in this mass extinction, some of which still exist today and mostly unchanged. 14% of all families and 72% of all species became extinct.
3. End Permian (~250Ma): known as the Great Dying, this is the most thorough known mass extinction in history. 52% of all families and greater than 90% of all species perished.
4. End Triassic (~210Ma): 12% of all families and 65% of all life in the Triassic period perished.
5. End Cretaceous (~65Ma): 11% of all families and 62% of all species became extinct.

Location

Climate change and mass extinctions are global events. Therefore the entire community of Galena and Louden are vulnerable to climate change.

Extent

Through studies of the historical record, we know climate change affects water acidity, atmospheric composition, precipitation, weather patterns, and temperatures.

Local Impact

Climate change has the potential to aggravate natural disasters along the Yukon River, particularly ice jam flooding and permafrost degradation. If the disasters recur often or increase in severity, Yukon River Communities may need to relocate.

Global Impact

The 2013 Spring Flood disaster in Alaska coincided with Ivu disasters in northern Minnesota and Canada. A rapid spring thaw in concert with high winds pushed lake ice into lakeside homes. Worldwide, Ivu is considered a very rare event, yet the North American continent experienced two within a few weeks.

The major effect of climate change and therefore mass extinctions is the abrupt decline of the earth's bio-diversity and population of organisms. However, periods of mass extinction have been followed by periods of new species development. The dinosaurs developed and flourished after one of the most thorough mass extinctions in Earth's history. Today they are the most popular subject of the most studied mass extinction ever, the Cretaceous event. The Cretaceous extinction cleared the path for mammals such as humans to evolve.

Probability

Given the Earth's history of mass extinctions attributed to climate change, the current observed changes in the atmosphere, and the criteria identified in Table 3-2, it is likely a disaster event influenced by climate change will occur in the next three years (event has up to one in three years chance of occurring) as the history of events is greater than 20 percent but less than or equal to 33 percent likely per year.

4. Risk Analysis

This analysis is an assessment of the community's risk to hazards without consideration of probability or level of damage.

A risk analysis is divided into six steps:

4.1. Asset Inventory
4.2. Risk Analysis Methodology
4.3. Data Limitations
4.4. Risk Assessment Summaries
4.5. NFIP and Repetitive Loss Properties
4.6. Land Use and Development Trends

Tables 4-1A and 4-1B list the infrastructure hazard vulnerability for Louden and Galena.

Table 4-1A Vulnerability Overview for Louden

Hazard	Percent of Louden's Geographic area	Percent of Population	Percent of Building Stock	Percent of Community Facilities and Utilities
Earthquake	**100%**	**100%**	**100%**	**100%**
Erosion	**14%**	**0%**	**14%**	**50%**
Flood	**100%**	**100%**	**100%**	**100%**
Subsidence	**100%**	**100%**	**100%**	**100%**
Weather	**100%**	**100%**	**100%**	**100%**
Tundra / Wildland Fire	**100%**	**100%**	**100%**	**100%**
Climate Change	**100%**	**100%**	**100%**	**100%**

Table 4-1B Vulnerability Overview for Galena

Hazard	Percent of Galena's Geographic area	Percent of Population	Percent of Building Stock	Percent of Community Facilities and Utilities
Earthquake	**100%**	**100%**	**100%**	**100%**
Erosion	**12%**	**19%**	**12%**	**20%**
Flood	**100%**	**100%**	**100%**	**100%**
Subsidence	**100%**	**100%**	**100%**	**100%**
Weather	**100%**	**100%**	**100%**	**100%**
Tundra / Wildland Fire	**100%**	**100%**	**100%**	**100%**
Climate Change	**100%**	**100%**	**100%**	**100%**

4.1 Asset Inventory

Population

Population data for Galena were obtained from the 2010 U.S. Census and the State of Alaska Department of Labor (AKDOL) 2013 population estimates. The U.S. Census reports Galena's total population for 2010 as 470 and 2013 AKDOL data reported a population of 483 (Table 4-2).

Table 4-2 Estimated Population and Building Inventory

Population		Residential Buildings	
2010 Census	AKDOL 2013	Total Building Count	Total Value of Buildings
470	483	264	Census: $25,608,000 1: $52,800,000

Sources: U.S. Census 2010, and 2013 DCCED/DCRA Certified population data listed housing value at $97,000.
[1] The Planning team determined the average value of all single-family residential buildings is $200,000 per structure.

Estimated replacement values for residential structures were obtained from the 2010 U.S. Census, and DCRA (Table 4-2). A total of 264 single-family residential buildings were considered in this analysis. The value was determined using the median value provided by the U.S. Census. Table 4-2 does not include estimates for special materials, shipping, or labor.

Community Assets

Critical Facilities: Tables 4-3A and B are an inventory of public facilities owned by Louden and the City of Galena. One notable omission from this inventory is the City of Galena Post Office, which is owned by the Ganaa'yoo Native Corporation and leased to the U.S. Postal Service. There are a few native corporation owned structures considered critical by Louden and the Galena City Council. They are inventoried in Table 4-3C, but not analyzed in HAZUS-MH.

Table 4-3A Louden Critical Facility Inventory

Facility Type	Facility Name	Location	Replacement Value	Occupancy
Government Facilities	Louden Tribal Council Office, two stories	Tiger Street	$250,000	4 People
Residential	Louden Administration Log House	Tiger Street	$200,000	
	Louden Rental Home #1	Crow Creek Rd.	$200,000	
	Louden Rental Home #2	Crow Creek Rd.	$200,000	
Commercial	Admin House Garage	Tiger Street	$50,000	N/A
	Louden Office Storage Shed 10'x7'	Tiger Street	$15,000	N/A
Community Facilities	Community Hall	Tiger Street	$500,000	0 People

Table 4-3B Galena Critical Facility Inventory

Facility Type	Facility Name	Location	Replacement Value	Occupancy
Government Facilities	City Office	Antoski Avenue	$1,200,000	15 People
	Post Office	H Street	$100,000	3 People
	Maintenance Building	Antoski Avenue	$156,000	0 People
	Service/Maintenance Shop City Garage	Antoski Avenue	$200,000	3 People
	Service/Maintenance Shop State Garage	Air Base	$400,000	3 People
	US Fish and Wildlife	Front Street	$200,000	5 People
Transportation Facilities	Edward G Pitka Sr. Airport	Air Base	$5,000,000	0 People
	Boat Launch	H Street	$75,000	N/A
	Old Town Boat Launch	Old Town	$25,000	N/A
	Arctic Circle Air Service	Air Base	$50,000	3 People
	Evert Air Alaska	Air Base	$50,000	3 People
	Frontier Flying Service	Air Base	$50,000	3 People
	Warbelow's Air Ventures	Air Base	$50,000	3 People
	Gana-A'Yoo Limited	Front Street	$150,000	3 People
Emergency Response	Fire Station	Antoski Avenue	$75,000	0 People
	Police Station	Antoski Avenue	$30,000	2 People
	Troopers Post	Air Base	$100,000	4 People
Educational Facilities	GILA School	Air Base	$9,800,000	200 People
	GILA Gym	Air Base	$9,100,000	0 People
	University of Alaska	Antoski Avenue	$50,000	10 People
	Aviation Tech Lab	Edward Pitka Airport	$1,100,000	0 People
	Cosmetology Lab	101 Cosmetology Lane Air Base	$877,500	0 People
	Galena High School	299A Antoski Avenue	$14,201,310	35 People
	Galena Elementary School	299B Antoski Avenue	$4,248,293	35 People
	GM Auto Tech Lab	Bldg. 359C Air Base	$4,000,000	0 People
	Student Dormitory	Bldg. 1874 Air Base	$34,000,000	140 People
	Suzuki Tech Lab	299D Antoski Avenue	$490,000	0 People
	Swimming Pool	299E Antoski Avenue	$1,200,000	0 People
	Dining Hall	Bldg. 1859 Air Base	$6,000,000	4 People
	Iditarod Inn	Bldg. 1876 Air Base	$19,172,790	20 People
	Composite Building	Bldg. 1847	$2,287,600	0 People

Facility Type	Facility Name	Location	Replacement Value	Occupancy
		Air Base		
	Birchwood Adult Dorm	#1 Birchwood Drive	$10,000,000	10 People
Care Facilities	Edgar Nollner Health Clinic	Antoski Avenue		10 People
	Mental Health Clinic	Antoski Avenue		3 People
	Galena Day Care	Tom Cook Loop #2	$325,000	20 People
Community Facilities	Red Shed Storage Building	299C Antoski Ave.	$459,394	0 People
	Cold Storage	Bldg. 1858 Air Base	$2,000,000	0 People
	Head Quarters	Bldg. 1854 Air Base	$7,000,000	20 People
	Old Dining Hall	Bldg. 1873 Air Base	$3,000,000	4 People
	Cemetery 1	No road access	N/A	0 People
	Cemetery 2	No road access	N/A	0 People
	Bible Church	Gabes Drive	$200,000	1 Person
	Catholic Church	Antoski Avenue	$200,000	1 Person
	Community Hall 1	Tiger Street	$10,000	0 People
	Community Mess Hall	Tiger Street	$150,000	0 People
	Public Shower House (Washeteria)	Antoski Avenue	$30,000	0 People
	Elder Housing Center	Tiger Street	$5,600,000	25 People
	Galena Liquor Store	H Street	$200,000	2 People
	Sweetsir's	Tiger Street	$200,000	2 People
Roads	Louden Road (BIA) 4 miles @ $1M/mile	N/A	$4,000,000	N/A
	Louden Loop Rd, 1.5 miles @ $1M/mile	N/A	$1,500,000	N/A
	Campion Rd, 9 miles @ $1M/mile	N/A	$9,000,000	N/A
	Antoski Rd, 4 miles @ $1M/mile	N/A	$4,000,000	N/A
	Gabes Dr., 1.5 miles @ $1M/mile	N/A	$1,500,000	N/A
	Crow Creek Rd, .25 miles @ $1M/mile	N/A	$250,000	N/A
	Ptarmigan Dr., .25 miles @ 1M/mile	N/A	$250,000	N/A
	Bike, Snow Machine, ATV trails, 2 miles @ $10K/mile	N/A	$20,000	N/A
Bridges	None	N/A	N/A	N/A
Utilities	Potable Water Production & Treatment Facility	Antoski Avenue	$1,000,000	1 Person
	Landfill / Incinerator	Seven miles East of Galena	$1,500,000	0 People
	Waste transfer station	New Town	$20,000	0 People

Facility Type	Facility Name	Location	Replacement Value	Occupancy
	Waste transfer station	Old Town	$20,000	0 People
	Waste transfer station	Air Base	$20,000	0 People
	Base Potable Water Production & Treatment Facility	Air Base	$1,500,000	1 Person
	Power Generation Facility, Power Plant	Antoski Avenue	$3,000,000	1 Person
	Base Power Generation Facility, Steam Plant	Air Base	$3,000,000	1 Person
	Radio Transmitter, KIYU 910 AM	Tiger Street	$2,000,000	2 People
	Piped Water Supply		$2,000,000	0 People
	Satellite Dish	Tiger Street	$50,000	0 People
	City Sewage Lagoon	Antoski Avenue	$1,500,000	0 People
	Base Sewage Lagoon	Air Base	$1,500,000	0 People
	Interior Telephone Co & Eyecom Cable Co. Maintenance Bldg	Air Base	$1,250,000	1 Person
Fuel Storage & Distribution Facilities	Tank #44	Air Base	$2,500,000	1.7 million gallons
	City Fuel Storage Tanks	Million Gallon Hill	$1,700,000	1 million gallons
	JBX/Airport fuel storage tanks	Air Base	$170,000	100,000 Gallons
	Warbelow's Air Service Fuel storage tanks	Air Base	$37,000	37,000 Gallons
	Frontier Flying Fuel storage tanks	Air Base	$30,000	30,000 Gallons
	Crowley Fuel Co. Fuel storage tanks	H Street	$10,000,000	1,297,750 Gallons
	City Power Plant Fuel storage tanks	Air Base	$750,000	630,000 Gallons
	City Schools Fuel storage tanks	Air Base	$60,500	60,500 Gallons
	Old Town Fuel Header	Air Base	$750,000	N/A
	City Fuel Header	Air Base	$750,000	N/A

Table 4-3C Ganaa'yoo Native Corporation Critical Facility Inventory

Facility Type	Facility Name	Location	Replacement Value	Occupancy
Government Facilities	Galena Post Office (leased to USPS)	H Street	$100,000	3 People
Residential	Worker Housing (Seven plex facility)	H Street	$1,000,000	Unknown
	Blue Housing Bldg.	N64.7325/W156.934	$200,000	Unknown
Commercial	Administration Office	H Street	$100,000	Unknown

Facility Type	Facility Name	Location	Replacement Value	Occupancy
	(one story facility)			
	Large Steel Work Shop	H Street	$500,000	N/A
	Large Steel Garage/Shop Facility	H Street	$700,000	N/A

Facility Replacement Value

Tables 4-6A and B estimate the total replacement value of dwellings, critical facilities, and infrastructure. Structure values were obtained during the asset data inventory during the winter of 2013. The estimated structure and content values are grouped by HAZUS-MH occupancy classification (Table 4-4). The contents value is a percentage of the structure value.

Table 4-4 HAZUS Building Occupancy Classes

Occupancy Class	Descriptions	Contents Value %
Residential		
Single Family Dwelling	House	50
Mobile Home	Mobile Home	50
Multi Family Dwelling	Apartment / Condominium	50
Temporary Lodging	Hotel / Motel / Hostel	50
Institutional Dormitory	Group Housing (military, college, jails)	50
Nursing Home	Nursing Home	50
Commercial		
Retail Trade	Store	100
Wholesale Trade	Warehouse	100
Personal and Repair Services	Service Station / Shop	100
Professional / Technical Services	Offices	100
Banks	Banks	100
Hospital	Hospitals	150
Medical Office / Clinic	Medical Facilities	150
Entertainment & Recreation	Restaurants / Bars	100
Theaters	Theaters	100
Parking	Garages	50
Industrial		
Heavy	Factory	150

Occupancy Class	Descriptions	Contents Value %
Light	Factory	150
Food / Drugs / Chemicals	Factory	150
Metals / Minerals / Processing	Factory	150
High Technology	Factory	150
Construction	Office	100
Agriculture		
Agriculture	Agriculture	100
Religion / Non-Profit		
Church / Non-Profit	Church / Non-Profit	100
Government		
General Services	Office	100
Emergency Response	Police / Fire Station / EOC	150
Education		
Grade Schools	Grade Schools	100
Colleges / Universities	Does not include group housing	150

Table 4-5A Louden Loss Estimates by Occupancy Class

Type (Occupancy Class)	Total Count	Estimated Value	Contents	
			HAZUS Contents Value (%) by Occupancy Class	Estimated Value of Contents
Residential	**3**	$600,000	50%	$300,000
Commercial	**2**	$65,000	50%	$97,500
Religious/Non-Profit	**1**	$350,000	100%	$350,000
Government	**1**	$250,000	150%	$375,000
Total	**7**	**$1,265,000**	NA	**$1,122,500**

Table 4-5B Galena Loss Estimates by Occupancy Class

Type (Occupancy Class)	Total Count	Estimated Value	Contents	
			HAZUS Contents Value (%) by Occupancy Class	Estimated Value of Contents
Residential	**264**	$52,800,000	50%	$26,400,000
Commercial	**19**	$32,376,994	150%	$48,565,491
Industrial	**0**	$0	150%	$0
Religious/Non-Profit	**5**	$410,000	100%	$410,000
Government	**10**	$23,045,000	150%	$34,567,500
Educational	**9**	$43,867,103	150%	$65,800,655
Utilities	**25**	$35,557,500	NA	$0
Total	**332**	**$188,056,597**	NA	**$175,743,646**

Note: Estimated value of contents does not include values for the utilities category (not available in HAZUS-MH). Therefore, the Utility structure value represents the total insured value of the structures and their contents.

The functional value is calculated by adding the structure value to the contents value. Table 4-6A and B provide the facility functional value by occupancy class. The functional value is the sum of structure and content value.

Table 4-6A Louden Facility Functional Value Estimates

Type of Structure (Occupancy Class)	Total Count	Estimated Value of Structure	Contents	
			Estimated Value of Contents	Functional Value
Residential	3	$600,000	$300,000	$900,000
Commercial	2	$65,000	$97,500	$162,500
Religious/Non-Profit	1	$350,000	$350,000	$700,000
Government	1	$250,000	$375,000	$625,000
Total	**7**	**$1,265,000**	**$1,122,500**	**$2,387,500**

Table 4-6B Galena Facility Functional Value Estimates

Type of Structure (Occupancy Class)	Total Count	Estimated Value of Structure	Contents	
			Estimated Value of Contents	Functional Value
Residential	264	$52,800,000	$26,400,000	$79,200,000
Commercial	19	$32,376,994	$48,565,491	$80,942,485
Industrial	0	$0	$0	$0
Religious/Non-Profit	5	$410,000	$410,000	$820,000
Government	10	$23,045,000	$34,567,500	$57,612,500
Educational	9	$43,867,103	$65,800,655	$109,667,758
Utilities	25	$35,557,500	$0	$35,557,500
Total	**332**	**$188,056,597**	**$175,743,646**	**$363,800,243**

Table 4-7A and B list estimated damage values from the vulnerability assessment, and the population affected by each identified hazard (Tables 4-1A and B).

Table 4-7A Louden Facilities Risk Assessment

	Residential Structures				Community Facilities				Total			
Hazard	No.	Structure Value	Contents Value	Functional Value	No.	Structure Value	Contents Value	Functional Value	No.	Structure Value	Contents Value	Functional Value
Earthquake	3	$600,000	$300,000	$900,000	4	$665,000	$822,500	$1,487,500	7	$1,265,000	$1,122,500	$2,387,500
Erosion	0	0	0	0	1	$250,000	$375,000	$625,000	1	$250,000	$375,000	$625,000
Flooding	3	$600,000	$300,000	$900,000	4	$665,000	$822,500	$1,487,500	7	$1,265,000	$1,122,500	$2,387,500
Subsidence	3	$600,000	$300,000	$900,000	4	$665,000	$822,500	$1,487,500	7	$1,265,000	$1,122,500	$2,387,500
Severe Weather	3	$600,000	$300,000	$900,000	4	$665,000	$822,500	$1,487,500	7	$1,265,000	$1,122,500	$2,387,500
Wildfire	3	$600,000	$300,000	$900,000	4	$665,000	$822,500	$1,487,500	7	$1,265,000	$1,122,500	$2,387,500
Climate Change	3	$600,000	$300,000	$900,000	4	$665,000	$822,500	$1,487,500	7	$1,265,000	$1,122,500	$2,387,500

Table 4-7B Galena Facilities Risk Assessment

		Residential Structures				Community Facilities				Total			
Hazard	Pop.	No.	Structure Value	Contents Value	Functional Value	No.	Structure Value	Contents Value	Functional Value	No.	Structure Value	Contents Value	Functional Value
Earthquake	483	261	$52,200,000	$26,100,000	$78,300,000	63	$134,341,597	$148,146,146	$283,112,743	332	$186,541,597	$172,246,146	$361,412,743
Erosion	90	30	$6,000,000	$3,000,000	$9,000,000	12	$25,779,351	$25,779,351	$51,558,702	42	$31,779,351	$28,779,351	$60,558,702
Flooding	483	261	$52,200,000	$26,100,000	$78,300,000	63	$135,341,597	$148,146,146	$283,112,743	332	$186,541,597	$172,246,146	$361,412,743
Subsidence	483	261	$52,200,000	$26,100,000	$78,300,000	63	$135,341,597	$148,146,146	$283,112,743	332	$186,541,597	$172,246,146	$361,412,743
Severe Weather	483	261	$52,200,000	$26,100,000	$78,300,000	63	$135,341,597	$148,146,146	$283,112,743	332	$186,541,597	$172,246,146	$361,412,743
Wildfire	483	261	$52,200,000	$26,100,000	$78,300,000	63	$135,341,597	$148,146,146	$283,112,743	332	$186,541,597	$172,246,146	$361,412,743
Climate Change	483	261	$52,200,000	$26,100,000	$78,300,000	63	$135,341,597	$148,146,146	$283,112,743	332	$186,541,597	$172,246,146	$361,412,743

4.2 Risk Analysis Methodology

The planning 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 (Table 4-8). The data was used to model an exposure assessment for each hazard where applicable.

Table 4-8 Critical Infrastructure in Alaska

Fire Stations	Airports	Community Cemeteries
Police Stations	Schools	Community Stores
Emergency Operations Centers	Telecommunications Structures & Facilities	Service Maintenance Facilities
Hospitals, Clinics, & Assisted Living Facilities	Satellite Facilities	Critical Bridges
Water & Waste Water Treatment Facilities	Community Washeterias	Radio Transmission Facilities
Fuel Storage Facilities	Harbors / Docks / Ports	Reservoirs & Water Supply Lines
Community Halls & Civic Centers	Landfills & Incinerators	National Guard Facilities
	Power Generation Facilities	Community Freezer Facilities
	Oil & Gas Pipeline Structures & Facilities	
	Any Designated Emergency Shelter	

Table 4-8 Source: State of Alaska Hazard Mitigation Plan, 2013

Replacement structure and contents value estimates were provided by the U.S. Census and the planning team. An exposure analysis was conducted for each physical asset located within a hazard area. 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 casualty estimates were prepared.

4.3 Data Limitations

The vulnerability estimates provided herein use the best data currently available, and are designed to approximate risk. Results are limited to the exposure of the built environment. It is beyond the scope of this HMP to estimate the range of injuries.

4.4 Risk Assessment Summaries

Earthquake

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

Given its location, it is unlikely that an earthquake would be centered in an area around Galena. However, the entire population, residential structures and critical facilities are vulnerable to an

earthquake. For Galena and Louden, all 483 people in 264 residences worth $79,200,000 and all 68 critical community facilities worth $284,600,243 are vulnerable. The total economic loss is approximately $363,800,243.

Erosion

Based on local knowledge (see Section 5.3.2.3), the City has 41 people in 12 critical facilities located in erosion prone areas which include: the U.S. Fish and Wildlife Service's Office, Gana A'Yoo Limited Offices, the Elder Housing Center, Sweetsir's Store, Louden Road, approximately two miles of trails, the new and old town boat launches, sections of the piped water supply system, and the old town fuel header (worth approximately $13,105,000). There are approximately 90 people in 30 residences (worth approximately $6,000,000), located in areas historically prone to erosion. The Louden Tribal Council Office is also in this area, and is valued at $625,000 (Table 4-7A).

Based on estimates of potential erosion in 50 years, any structures within 300 feet of the riverbank would likely be vulnerable to erosion.

A. Population

Approximately 90 people are vulnerable or 20 percent of the community's population.

B. Critical Facilities

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

C. Non Critical Facilities

(1) Approximately 12 percent of the community's dwellings are vulnerable.

(2) There are 30 non-critical facilities at risk of damage from erosion, all of which are residential structures.

D. Loss Estimate

The economic loss resulting from this hazard is approximately $61,183,702 (Table 4-7A&B).

Subsidence

The entire population of Galena, residential structures and community facilities are vulnerable to subsidence. This includes 483 people in 264 residences valued at $79,200,000 and all 68 critical facilities worth approximately $284,600,243. The total economic loss estimate is $363,800,243.

Flood

The total elevation gain in the Galena vicinity is no more than 14 feet above the riverbank. Therefore, the entire population of Galena, residential structures and community facilities are vulnerable to floods. This includes 483 people in 264 residences valued at $79,200,000 and all 68 critical facilities worth approximately $284,600,243. The total economic loss estimate is $363,800,243.

Severe Weather

The entire population of Galena, residential structures and community facilities are vulnerable to severe weather. This includes 483 people in 264 residences valued at $79,200,000 and all 68 critical facilities worth approximately $284,600,243. The total economic loss estimate is $363,800,243.

Wildland Fire

Although the probability is low, the entire population of Galena, residential structures and community facilities are vulnerable to wildland fires. This includes 483 people in 264 residences valued at $79,200,000 and all 68 critical facilities worth approximately $284,600,243. The total economic loss estimate is $363,800,243.

Climate Change

The entire population of Galena, residential structures and community facilities are vulnerable to climate change. This includes 483 people in 264 residences valued at $79,200,000 and all 68 critical facilities worth approximately $284,600,243. The total economic loss estimate is $363,800,243.

4.5 NFIP and Repetitive Loss Properties

Through The City of Galena, Louden has participated in the NFIP since 1984. The City and Louden have not developed an inventory of properties that meet the RL or SRL criteria. This has been identified as a low priority. However, the NFIP Insurance Report states the City of Galena has a total of 73 insured properties 32 of which are located in the City's "A" zone. The remaining property locations are not known as of this report date (Appendix I). The City's total NFIP coverage is $10,234,800. The City's FIRM numbers 020124IND0, Index; 020124005b, March 1984; and 0201240010b, March 1984 delineates the City's floodplain.

Repetitive loss 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 Galena lists the total repetitive property losses in Table 4-9.

Table 4-9 Repetitive Loss Properties

Type (RL/SRL) Year(s)	Town	Occupancy	No. of Claims	Flood Insurance (Yes/No)	Average Claim Value ($)[1]	Total Paid ($)[2]
RL since 1978	City of Galena	Unknown	11	Y	$68,264	$3,140,125

Type includes: RL or SRL

[1]Insured structural value n/a.

[2]Content and building claims.

4.6 Land Use and Development Trends

Land Use

Land use in Galena is predominately residential with some areas of commercial and community facilities. Suitable developable vacant land is in short supply within the boundaries of the City. One area of town is classified as airport land use.

The old Galena Air Station now serves the civilian air traffic needs and is classified as airport land use. The facilities at the Galena Air Station are now occupied by the Galena School District and are used as school classroom, dormitory facilities, and teacher residences.

The City has formal zoning and community enacted land use controls. Community lands are designated for institutional land uses such as schools and government facilities. The community has also designated lands for hunting and recreation. People may not actively hunt within the City.

Development Trends

Table 4-10 lists previous infrastructure improvement projects for Louden and Galena. Much of the infrastructure was damaged during the 2013 Spring Flood Disaster (DR-4122). However, portions of Galena, such as the airport and runway, maintenance hangar, and the former military buildings were undamaged. Future development will primarily involve repair and mitigation projects addressing DR-4122 (Figure 4-1).

Table 4-10 Louden and Galena Project History

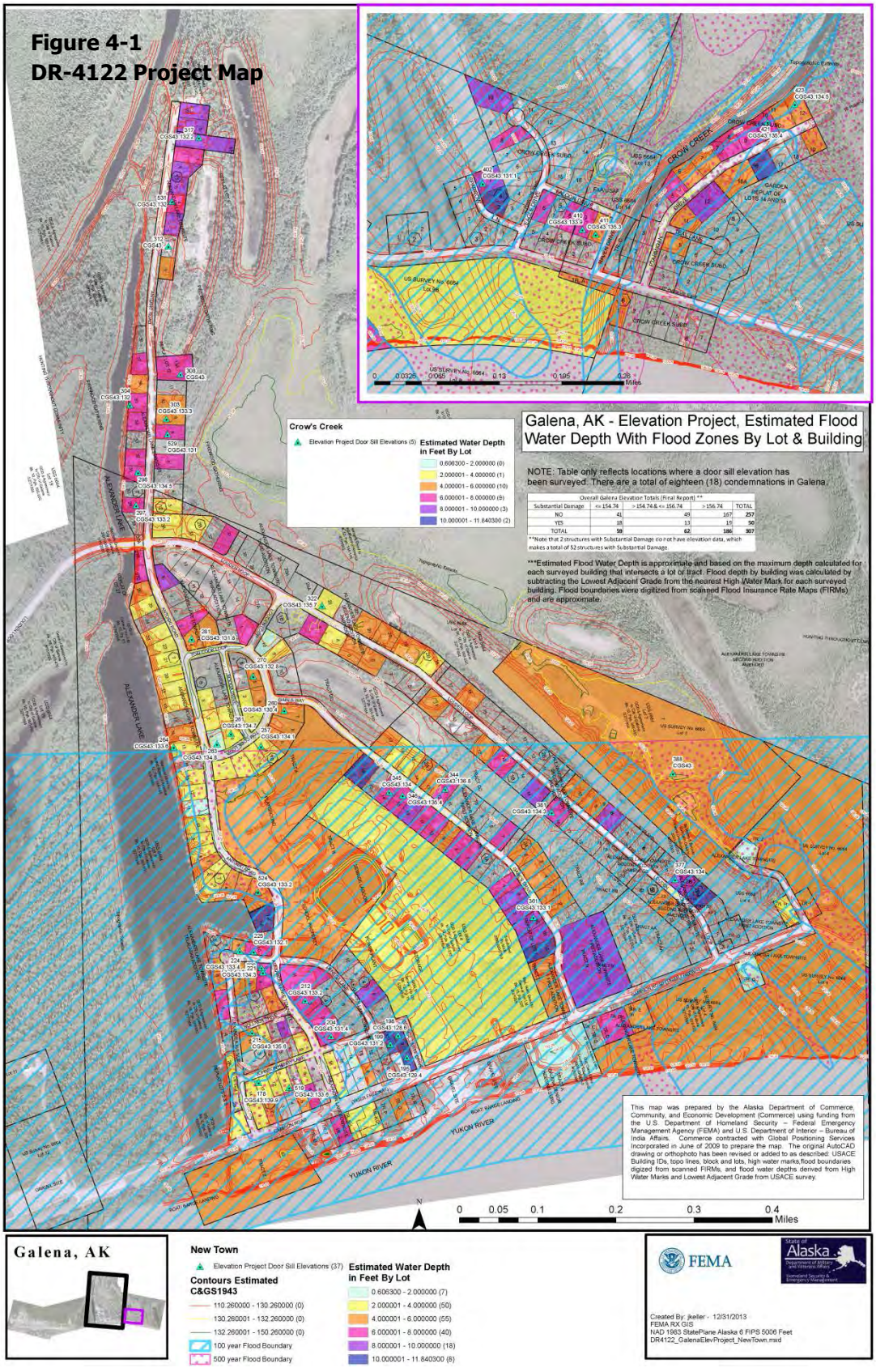
Lead Agency	Fiscal Year	Project Description
Federal Aviation Administration (FAA), Department of Transportation/Public Facilities (DOT/PF)	2011	Edward G. Pitka Sr. Airport: Improve Runway Safety Area 07/25 FAA, DOT/PF
FAA/DOT/PF	2011	Edward G. Pitka Sr. Airport: Rehabilitate Snow Removal Equipment Building
Department of Education and Early Development (DEED)	2010	Galena Regional Learning Center Gym Building Upgrade Renovate the existing 15,610 square foot facility built in 1966 as the Galena City High School and Galena Interior Learning Academy consolidate into one high school on the existing Galena Air Force Base. A fire suppression system will be added, heating, ventilation and air conditioning (HVAC) will be upgraded along with providing a Direct Digital Control system, Americans with Disability Association (ADA) accessibility issues will be addressed, the gym floor finish will be upgraded, ceiling tiles and the roof will be replaced, lighting and electrical systems will be upgraded; asbestos containing material will be removed DEED
DOT/PF	2009	Galena Maintenance Building Efficiency Modifications Legislative Grant
Department of Community, Commerce, and Economic Development (DCCED)	2008	Galena Interior Learning Academy Classroom Expansion Remodel DCCED
DCCED	2008	Ptarmigan Dorm Sprinkler System Installation
Department of Environmental Conservation	2008	Water System Improvements, Phase III Legislative Grant DEC/VSW

Lead Agency	Fiscal Year	Project Description
(DEC)/Village Safe Water (VSW)		
Alaska Tribal Health Consortium (ANTHC)	2007	Water & Sewer Phase IIIANTHC
Department of Community, Commerce, and Economic Development (DCCED)	2007	Boarding School Expansion DCCED
Housing and Urban Development (HUD)	2007	Indian Housing Block Grant (IHBG) - Native American Housing Assistance and Self Determination Act (NAHASDA) administration, operation, and construction funds HUD
DCCED	2006	Expert Legal and Technical Analysis for Proposed Mini-Nuclear Power Plant
HUD	2006	IHBG-NAHASDA administration, operation, and construction funds
ANTHC	2006	Water/Sewer Project Design
ANTHC	2006	Individual Septic Systems
Denali	2006	Dock Denali Commission (Denali)
DCCED/Denali	2006	Feasibility Assessment of a Bio-fuels Plant to supply clean diesel fuel
HUD	2005	IHBG-NAHASDA administration, operation, and construction funds
DCCED	2005	Fire Hall upgrades
Denali	2005	Solid Waste Equipment Purchase
US Army Corp of Engineers (USACE)	2004	Emergency Bank Stabilization - Cost Range $1-5M. Provide additional erosion protection along the Yukon River using riprap and tiebacks USACE
ANTHC	2004	Water Treatment Plant and Lagoon Project - Secondary treatment for the lagoon; rehabilitate the Water Treatment Plant
HUD	2004	Senior Assisted Living Facility
HUD	2004	IHBG-NAHASDA administration, operation, and construction funds
United State Department of Agriculture and Rural Development (USDA/RD)	2003	Design - Fire & EMS Building for the City - Finished up LOC paperwork; construction should be underway soon
DCCED	2003	CP&I/Dental Wing upgrade
US Department of Education (DOE)/ Human Health Services (HHS)/Alaska Housing Finance Corporation (AHFC)	2003	Rural Residential Rehabilitation Program - improvements DOE/HHS/AHFC

Lead Agency	Fiscal Year	Project Description
HUD	2003	IHBG-NAHASDA administration, operation, and construction funds
Federal Aviation Administration (FAA), Department of Transportation/Public Facilities (DOT/PF)	2003	Edward G. Pitka Sr: Rehabilitate Apron FAA-DOT/PF
FAA-DOT/PF	2003	Edward G. Pitka Sr: Construct Taxiway - Other Share - DOT/PF
Department of Education and Early Development (DEED)	2003	Galena High School Floor Renovation - Funded by State GO Bond DEED
DOT/PF	2003	Separated Path - Extend the existing bike/pedestrian facility 1/2 mile to the housing up river
FAA-DOT/PF	2003	Edward G. Pitka Sr: Expand Apron - Other Share - DOT/PF
ANTHC	2003	Water and Sewer Services
ANTHC	2002	Utilization of Airbase Water System Feasibility Study - Review options for water supply to Old Town
USDA/RD	2002	Sub-Regional Clinic Expansion/Mental Health Center USDA/RD
ANTHC/ Environmental Protection Agency (EPA)	2002	Water/Sewer Phase 2 - EPA $1,875.0 DEC $625. Install water main, connect 70 homes and learning center. Install 10 sewage disposal systems ANTHC/EPA
DEED	2002	High School Remodel
DCCED	2002	Senior Assisted Living Facility - Multi-purpose Center Feasibility Study
Health and Social Services (DHSS) / USDA/RD/Denali/ Community Development Block Grant (CDBG)	2002	Sub-Regional Clinic Expansion/ DHSS - Other Funding: USDA/RD $1,000K, Denali Commission $1,995K, CDBG $200K. The mental health portion of the new health clinic in Galena
USACE	2002	Emergency Bank Stabilization - Feasibility complete Oct 2001; Design to be completed Feb 2002
ANTHC/EPA/DEC	2002	Water/Sewer Phase II - EPA $1,875. Department of Environmental Conservation (DEC) $625. Install water main, connect 63 homes and learning center. Install 10 sewage disposal systems
DCCED	2002	Community Hall Renovation
HUD	2002	IHBG-NAHASDA administration, operation, and construction funds
DEED	2002	Project Education Food Service Renovation
DCCED	2002	Vocational School/Cosmetology Center - Community Priorities Program

Lead Agency	Fiscal Year	Project Description
		grant
DOT/PF	2001	Campion Road Erosion Prevention - Relocate or protect approximately 1/4 mile of gravel road
DCCED	2001	Police Station Remodel
EDA	2001	Galena Vocational Training Center - Western Alaska Fisheries Disaster
DHSS	2001	Mental Health Program - Office Equipment. - Essential Program Equipment
Private	2001	Working Together: Koyukon Basin Economic Development Initiative - Funded by the First Alaskans Foundation
HUD	2001	IHBG-NAHASDA administration, operation & construction funds
ANTHC	2001	Sewer Systems - Install individual sewer systems. This project will fund a portion of Phase II sewer improvements for the Alexander Lake
State of Alaska (SOA) / Denali//USDA/ Indian CDBG/	2001	Expansion of Health Center - Other Funding = SOA : $616,000; State of Alaska: $564,000; USDA: $1,000,000; Community Matching Grant Program: $25,000; Indian CDBG: $20,0000. The scope of work on this project is the expansion of the existing Galena Health Clinic. The new addition will house both a primary care program and a mental health program. The existing offices will be remodeled and continue to function for dental services and staff offices. The entire facility will be connected to a City-power plant waste heat system to reduce operating costs
DCCED	2000	Clinic Repairs - Capital Matching
DCCED	2000	Sub-Regional Clinic Expansion/Mental Health Center – CDBG
HUD	2000	IHBG-NAHASDA administration, operation, and construction funds
DCCED	2000	Parks and Recreation Upgrades
Denali Commission	2000	Senior Assisted Living Facility - Phase II Development - Denali Commission $125,000. Complete phase II development work for assisted living facility serving elderly in the Koyukon Basin

Figure 4-1
DR-4122 Project Map



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5. Strategy and Goals

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

1. Identifying Community Capability
2. Developing Mitigation Goals
3. Identifying Mitigation Actions
4. Evaluating Mitigation Actions
5. Implementing Mitigation Action Plans

5.1 Capability Assessment

This section outlines the resources available to the Louden Tribal Council for mitigation actions, funding, and training. Tables 5-1, 5-2, and 5-3 delineate Louden's regulatory tools, technical specialists, and financial resources available for project management. Additional funding resources are identified in Chapter 6, *Resources*.

Table 5-1 Management Tools

Regulatory Tools (ordinances, codes, plans)	Existing?	Comments (Year of most recent update; problems administering it, etc.)
Comprehensive Plan	Yes	Galena Comprehensive Plan 1998 Update
Economic Plan	Yes	For the years 2004-2009
Erosion Plan	Yes	USAFCE 2009 Alaska Baseline Erosion Assessment City of Galena Information Paper, December 5, 2007
Flood Insurance Study	Yes	City of Galena Flood Insurance Study, 1983
Land Use Plan	Yes	Galena USAF Base Reuse Plan 2007
Transportation Plan	Yes	City of Galena Transportation Plan
Tribal Corporation Land Use Plan	No	The native corporation doesn't manage Louden tribal land in Galena.
Emergency Response Plan	Yes	Galena Emergency Response Plan
Wildland Fire Protection Plan	Yes	Galena Wildfire Mitigation Plan 2009
Building codes	No	The City can exercise this authority
Fire Insurance Rating	No	The City can exercise this authority
Zoning ordinances	No	The City can exercise this authority
Subdivision ordinances or regulations	No	The City can exercise this authority
Special purpose ordinances	Yes	Galena adopted a 2 foot freeboard minimum building elevation for construction

Table 5-2 Technical Specialists

Staff/Personnel Resources	Y/N	Department/Agency and Position
Planner or engineer with knowledge of land development and land management practices	No	No engineers or planners on staff.
Engineer or professional trained in construction practices related to buildings and/or infrastructure	No	Engineer work is contracted.
Planner or engineer with an understanding of natural and/or human-caused hazards	No	Louden and Galena contract consultants with hazard mitigation knowledge.
Floodplain Manager	No	Louden and Galena consult with the State Floodplain Manager
Surveyors	No	Survey work is contracted
Staff with education or expertise to assess the jurisdiction's vulnerability to hazards	No	The State of Alaska is consulted for HVA's.
Personnel skilled in Geospatial Information System (GIS) and/or Hazards Us-Multi Hazard (Hazus-MH) software	No	HAZUS and Geospatial work is either contracted or supplied by federal & state resources.
Scientists familiar with the hazards of the jurisdiction	No	No scientists on staff. US Fish and Wildlife Service local office; Alaska Department of Fish and Game local office.
Emergency Manager	Yes	Louden Administrator and Galena City Manager function as emergency managers. Community consults with the State of Alaska Department of Homeland Security and Emergency Management (DHS&EM).
Grant Writers	Yes	Louden has a staff with grant writing experience.
Public Information Officer	No	Louden and Galena leadership can appoint or delegate this authority.

Table 5-3 Financial Resources

Financial Resource	Accessible or Eligible to Use for Mitigation Activities
General funds	No
Community Development Block Grants	Yes
Capital Improvement Project Funding	Yes
Authority to levy taxes for specific purposes	Galena – Yes, Louden - No
Incur debt through general obligation bonds	No
Incur debt through special tax and revenue bonds	No
Incur debt through private activity bonds	No
Hazard Mitigation Grant Program (HMGP)	Yes
Hazard Mitigation Technical Assistance Program (HMTAP)	Yes

Financial Resource	Accessible or Eligible to Use for Mitigation Activities
Earthquake Hazards Reduction Program (EHRP)	Yes
Pre-Disaster Mitigation (PDM) grant program	Yes
Flood Mitigation Assistance (FMA) grant program	Yes
United State Fire Administration (USFA) Grants	Yes
Fire Mitigation Fees	No

5.2 Developing Mitigation Goals

Results from the risk assessment were used to develop mitigation goals and actions. Referencing the City of Galena's 2010 Hazard Mitigation Plan, none of their nine goals were accomplished. However, given the recent federal flood disaster DR-4122 and the increased likelihood of future ice jam floods, the Louden Tribal Council decided to develop new goals and retain any pertinent goals from the 2010 Galena HMP (Table 5-4). Since this HMP is specifically for Louden, the Galena City Council was not involved in selecting or prioritizing goals and actions.

Table 5-4 Mitigation Goals

No.	Goal Description
1	Reduce the risk of flood damage.
2	Reduce the risk of erosion damage.
3	Reduce the risk of damage from ground failure.
*4	Promote public awareness of all natural hazards in the area.
5	Develop a coordinated community response to natural disasters.
*6	Reduce the risk of wildland fire damage.
7	Reduce the Louden community's vulnerability to earthquake damage.
8	Implement HMP goals and actions into other Tribal and City plans and projects.
9	Reduce the risk of severe weather damage.

*=Goals retained from City of Galena 2010 HMP

5.3 Identifying Mitigation Actions

During a public meeting on September 9, 2014, the Louden Tribal Council reviewed their local capabilities and developed their mitigation actions (Table 5-5). Mitigation actions are activities, measures, or projects supporting the goals of a mitigation plan.

Table 5-5 Mitigation Actions

Goals		Actions	
No.	**Description**	**ID**	**Description**
1	Reduce the risk of flood damage.	1.1	Develop and maintain an inventory for all structures located within 100-year and 500-year floodplains. (Accomplished in 2014)
		1.2	Develop and maintain a map of residential and commercial buildings within 100-year and 500-year floodplains. (Accomplished in 2014)
		1.3	Develop and maintain an inventory of locations subject to frequent storm water flooding based on historical flood data. (Accomplished in 2014)
		1.4	Develop, implement, and enforce floodplain management ordinances.
		1.5	Acquire (buy-out), relocate, elevate, or otherwise flood-proof public and private buildings.
		1.6	Coordinate with the State Floodplain Manager to explain NFIP participation benefits and regulations and promote continued compliance with the NFIP.
		1.7	Install, monitor, and maintain streamflow gages upriver and downriver.
		1.8	Extend, elevate, and reinforce the levy along the riverbank.
2	Reduce the risk of erosion damage.	2.1	Relocate buildings that are at risk of being affected by erosion.
		2.2	Apply for grants or the USACE to implement riverbank protection methods.
		2.3	Extend the sheet-piling lining the riverbank.
3	Reduce the risk of damage from ground failure.	3.1	Promote permafrost sensitive construction practices.
		3.2	Elevate and reinforce roads against subsidence and frost heaving.
		3.3	Elevate or reinforce homes and critical infrastructure against subsidence.
4	Promote public awareness of all natural hazards in the area.	4.1	Produce and distribute information materials concerning mitigation, preparedness, and safety procedures for all natural hazards.
		4.2	Develop and implement strategies and educational outreach programs addressing the benefits of mitigating natural hazard events.
5	Develop a coordinated community response to natural disasters.	5.1	Form an emergency advisory task force.
		5.2	Develop a local emergency communication plan.
		5.3	Develop an evacuation plan for the community.
		5.4	Encourage residents to develop a home evacuation and a long term relocation plan

Goals		Actions	
No.	**Description**	**ID**	**Description**
		5.5	Investigate opportunities to participate in the National Warning system and receive weather warning information from the NWS.
		5.6	Develop a Small Community Emergency Response Plan (SCERP) plan with assistance from Alaska DHS&EM
6	Reduce the risk of wildland fire damage.	6.1	Create fire breaks
		6.2	Promote FireWise building design, sites, and construction.
7	Reduce the Louden community's vulnerability to earthquake damage.	7.1	Teach the community how to protect themselves during an earthquake.
		7.2	Educate the community about ways to mitigate structural and non-structural damage from earthquakes.
		7.3	Encourage use of earthquake resistant materials and construction practices
		7.4	Encourage all future public structure development meets international requirements for seismic protection.
		7.5	Evaluate Louden owned structures for seismic retrofits.
8	Implement HMP goals and actions into other Tribal and City plans and projects.	8.1	Integrate HMP risk assessments, goals, and actions into emergency response, land use, and comprehensive planning.
		8.2	Integrate HMP risk assessments, goals, and actions into capital improvement, emergency management, and other community projects.
9	Reduce the risk of severe weather damage.	9.1	Encourage use of weather resistant materials and construction techniques.
		9.2	Educate residents to the risks of severe weather.
		9.3	Research available grant opportunities for a backup power system.

Louden has not completed a detailed cost benefit analysis for all of their selected mitigation actions. However, cost-benefit methodology was addressed during the public planning forum. Louden has completed project applications to elevate 51 homes, which include BCAs. The applications have been approved and funded by the State of Alaska and federally declared disasters DR-4122 and DR-4094 (HMGP).

5.4 Evaluating and Prioritizing Mitigation Actions

The planning team evaluated and prioritized each local hazard and corresponding mitigation action on September 9, 2014. The selected mitigation actions are included in the Mitigation Action Plan. The Mitigation Action Plan represents mitigation projects and programs to be implemented through the cooperation of the community.

The planning team reviewed the simplified social, technical, administrative, political, legal, economic, and environmental (STAPLEE) evaluation criteria (Table 5-6) and the Benefit-Cost Analysis Fact Sheet (Appendix D) 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 5-6 Evaluation Criteria for Mitigation Actions

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

On September 9, 2014, planning team prioritized their 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 5-7).

Table 5-7 Prioritizing Mitigation Actions

Goals		Rank	Action
1	Reduce the risk of flood damage.	HIGH	1.5 – Acquire (buy out), relocate, elevate, or otherwise flood-proof public and private buildings.
			1.6 – Coordinate with the State Floodplain Manager to explain NFIP participation benefits and regulations and promote continued compliance with the NFIP.
			1.7 – Install, monitor, and maintain streamflow gages upriver and downriver.
			1.8– Extend and reinforce the levy along the riverbank.
2	Reduce the risk of erosion damage.		2.2 - Apply for grants or the USACE to implement riverbank protection methods.
			2.3 - Extend the sheet-piling lining the riverbank.
3	Reduce the risk of damage from ground failure.		3.1 – Promote permafrost sensitive construction practices.
			3.2 – Elevate and reinforce evacuation roads against subsidence and frost heaving.
			3.3 – Elevate and reinforce homes and critical infrastructure against subsidence and frost heaving.
4	Promote public awareness of all natural hazards in the area	LOW	4.1 – Produce and distribute information materials concerning mitigation, preparedness, and safety procedures for all natural hazards.
5	Develop a coordinated community response to natural disasters.	HIGH	5.2 – Develop a local emergency communication plan.
			5.3 – Develop an evacuation plan for the community.
			5.4 – Encourage residents to develop a home evacuation plan and a long term relocation plan.
			5.6 – Develop a Small Community Emergency Response Plan (SCERP) with assistance from Alaska State DHS&EM.
6	Reduce the risk of wildland fire damage.	MEDIUM	6.2 – Promote FireWise building design, sites, and construction.
7	Reduce the Louden community's risk to earthquake damage.		7.1 – Teach the community how to protect themselves during an earthquake.
			7.2 – Educate the community about ways to mitigate structural and non-structural damage from earthquakes.

Goals		Rank	Action
8	Implement HMP goals and actions into other Tribal and City plans and projects.	HIGH	8.1 – Integrate HMP risk assessments, goals, and actions into emergency response, land use, and comprehensive planning.
			8.2 – Integrate HMP risk assessments, goals, and actions into capital improvement, emergency management, and other community projects.
9	Reduce risk of severe weather damage.		9.1 – Promote use of weather resistant materials and construction techniques.
			9.2 – Educate residents to the risks of severe weather.

5.5 Implementing a Mitigation Action Plan

On September 9, 2014, the Louden Tribal Council reviewed the list, and chose to implement six mitigation actions into their mitigation action plan. The results are outlined in Table 5-8.

Table 5-8 Mitigation Action Plan

1.5	**Action Item**	**Acquire (buy out), relocate, elevate, or otherwise flood-proof public and private buildings**
	Ranking	High
	Department / Agency	Louden, DHS&EM, FEMA, USACE, NRCS
	Potential Funding Source	HMGP, DR-4122 & 4094 mitigation, PDM Grants
	Implementation Timeline	1 to 5 years
	Benefit-Costs	This mitigation action reduces the community's flood risk.
1.6	**Action Item**	**Coordinate with the State Floodplain Manager to explain NFIP participation benefits and regulations and promote continued compliance with the NFIP**
	Ranking	High
	Department / Agency	Louden, DCCED, FEMA
	Potential Funding Source	DHS Preparedness Technical Assistance Program; HMGP; PDM Grants
	Implementation Timeline	1 to 2 years
	Benefit-Costs	This action promotes community involvement in preventing flood damage.
1.7	**Action Item**	**Install, monitor, and maintain streamflow gages upriver and downriver**
	Ranking	High
	Department / Agency	Louden, DHS&EM, USACE, FEMA, USGS, NOAA/NWS
	Potential Funding Source	HMGP; PDM Grants, NOAA, Rasmussen, Lindbergh
	Implementation Timeline	1 to 5 years

	Benefit-Costs	This mitigation action will warn the community, State, and federal agencies of high river levels and blockages.
1.8	**Action Item**	**Extend and reinforce the levy along the riverbank.**
	Ranking	High
	Department / Agency	Louden, USACE
	Potential Funding Source	USACE, HMPG, Federal / State grants
	Implementation Timeline	1 to 5 years
	Benefit-Costs	Ensure the evacuation routes will function during a flood event.
5.6	**Action Item**	**Develop a Small Community Emergency Response Plan (SCERP) with assistance from Alaska State DHS&EM.**
	Ranking	High
	Department / Agency	Louden, DHS&EM
	Potential Funding Source	DHS&EM
	Implementation Timeline	1 to 2 years
	Benefit-Costs	An inexpensive and proven method of coordinating local emergency response efforts.
8.1	**Action Item**	**Integrate HMP risk assessments, goals, and actions into emergency response, land use, and comprehensive planning.**
	Ranking	Medium
	Department / Agency	Louden, DHS&EM, FEMA, NWS, USGS,
	Potential Funding Source	HMTAP, FEMA HMGP, NWS
	Implementation Timeline	1 to 5 years
	Benefit-Costs	Improves communication and coordination of multiple community planning efforts.
8.2	**Action Item**	**Integrate HMP risk assessments, goals, and actions into capital improvement, emergency management, and community projects.**
	Ranking	Medium
	Department / Agency	Louden; DHS&EM, FEMA, NWS, USGS,
	Potential Funding Source	HMTAP, FEMA HMGP, NWS
	Implementation Timeline	1 to 5 years
	Benefit-Costs	Improves communication and coordination of multiple community projects.

5.6 Existing Planning Mechanisms

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

- ☐ Review the regulatory tools to determine where to integrate the mitigation goals and actions. These regulatory tools are identified in Section 5.1 *Capability Assessment*.
- ☐ Involve relevant departments and authorities when implementing HMP goals and actions into relevant planning mechanisms.
- ☐ Implementing HMP goals and actions may require updating or amending specific planning mechanisms.

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6. Resources

6.1 Hazard Mitigation Funding

6.1.1 State Mitigation Funding

Direct State Disaster Mitigation Funding
While the State of Alaska has Public Assistance and Individual Assistance programs under State declared disasters, it does not have a State disaster mitigation program. However, there have been a few occasions in which the Governor and/or Legislature have elected to identify and fund mitigation work through the State Disaster Relief Fund (DRF). These actions were taken under discretionary authority and no permanent State mitigation program was established.

State Provision of Non-Federal Match to Federal Mitigation Programs
Many federal mitigation programs require a local match of non-federal funds. The match required varies with the program regulations and community being granted funds. There are several mitigation programs in which the State of Alaska provides the entire non-federal match for local communities resulting in 100% funds being granted to the community for mitigation. These programs, described in detail below, include the Public Assistance (also called 406 mitigation) and Hazard Mitigation Grant Program (HMGP) which are funded under federally declared disasters. The matching funds are paid through the State DRF. Therefore, while these programs are listed below under "Federal mitigation programs" for convenience, the State provides substantial funding for these programs, sometimes in the millions of dollars. On occasion the State has likewise provided a portion of the non-Federal match for National Resource Conservation Service (NRCS) projects.

State of Alaska Supporting Mitigation Programs

Division of Homeland Security and Emergency Management Disaster Relief Fund
The State of Alaska provides State funding for Public Assistance (PA) and Individual Assistance (IA) in State declared disasters and cost share funds for federally declared disasters through the State Disaster Relief Fund.

Department of Commerce, Community & Economic Development

Community Development Block Grants
These grants fund community projects and planning activities improving health, safety and essential community services.

Alaska Regional Development Organizations
The Alaska Regional Development Organizations (ARDORs) funds cooperative economic development.

Rural Development Assistance Mini-Grants
These grants partially fund plan development, feasibility engineering studies, and capital projects. Mini-grants are awarded by the State Legislature.

Unincorporated Community Grants
These grants are awarded by the State Legislature to unincorporated communities and nonprofits for a wide range of projects and programs.

6.1.2 Federal Mitigation Funding

There are several Federal agencies and programs funding mitigation projects in the State of Alaska. Mitigation grants are administered through the DHS&EM as the grantee to local communities functioning as sub-grantees with the State providing the required matching funds for HMGP. Table 6.1 is an overview of grant programs and their eligible programs.

Table 6.1 FEMA 2013 HMA Eligible Activities

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	√	√	√

FEMA administers Hazard Mitigation Assistance (HMA) grants through Congressional authorization of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 2000 as amended (DMA 2000). While many features of the HMA grants overlap, such as the benefit cost analysis (BCA) requirement, each grant program has specific features. Detailed guidance for these grants is provided by FEMA at http://www.fema.gov/library/viewRecord.do?id=3649.

Federal Disaster Mitigation Grants

406 Public Assistance Mitigation
FEMA Public Assistance repair projects are eligible for additional mitigation funds through (406 PA mitigation). Section (406) of the Stafford Act stipulates the mitigation project must relate directly to the disaster damages.

Hazard Mitigation Grant Program
In contrast, whenever there is a presidentially declared disaster in the State of Alaska, FEMA offers mitigation grant funds based on a percentage of the overall Federal share of disaster costs (15% in 2013). This program, called the Hazard Mitigation Grant Program (HMGP), was created in 1988 by the Stafford Act, Section 404 (404 mitigation) and allows HMGP funds to be used anywhere in the State if it is stipulated in the State disaster declaration to the President. While HMGP is funded through a presidentially declared disaster, HMGP funds are not used to repair disaster damage but to reduce future disaster losses through mitigation projects and planning.

Federal Unmet Needs Program
Unmet Needs is a program activated in specific disasters based upon a Congressional determination there are unmet needs following a disaster. Mitigation funds may be available for jurisdictions receiving an unmet needs allocation. Mitigation projects are specified in the Unmet Needs allocation. The Unmet Needs funds up to 75% of an approved project.

Additional Primary Federal Mitigation Programs

FEMA

Pre-Disaster Mitigation Grant Program
The FEMA Pre-Disaster Mitigation (PDM) grant program funds mitigation projects and planning for State, local, and eligible tribal organizations.

The PDM program is annual, subject to Congressional appropriation, and nationally competitive. PDM sets aside a minimum monetary amount for each State and offers any remaining funds for national competition. Congress controls the PDM program and may award PDM funds in lieu of any competitive application process.

The State is the grantee of PDM funds and communities are the sub-grantees. Grant awards are a 75 % Federal/25 % applicant cost share match. Communities identified as “small and impoverished” (Appendix 10) are eligible for 90 % Federal and 10% applicant match. The State of Alaska does not pay the applicant match for the PDM program.

Earthquake Hazards Reduction State Assistance Program
In 2012 and 2013 the State of Alaska received funds through the FEMA Earthquake Hazards Reduction State Assistance Program (EHRSAP). These funds were awarded through FEMA to States with earthquake hazards based upon specific Congressional authorization and are designed to support State earthquake program activities. Out of the total Congressional allocation, a portion of the funds are awarded to each state based upon a FEMA earthquake risk calculation. FEMA intends to continue this program subject to Congressional appropriation. The State of Alaska has used EHRSAP funds to support earthquake active fault mapping and earthquake/tsunami education outreach displays. The SHMO manages and administers these funds.

Hazard Mitigation Technical Assistance Program
Through the Hazard Mitigation Technical Assistance Program (HMTAP), FEMA creates technical products for Federal, State, and local community use. FEMA administers HMTAP contracts with State advisement. HMTAPs continue to be a potential tool to accomplish specific, clearly defined mitigation planning work as identified by the SHMO.

Department of Commerce National Oceanic and Atmospheric Administration

National Tsunami Hazard Mitigation Grant Program
The National Tsunami Hazard Mitigation Grant Program (NTHMP) combines Federal and State partners involved in mitigating tsunami risk. This NOAA directed program includes Federal partners from the USGS, FEMA and NSF, and States with tsunami risk. The State of Alaska serves as a member of the Coordination Committee for the NTHMP and is the grantee for NTHMP funds allocated to Alaska. In Alaska, NTHMP funds are combined with State managed projects, local community sub-grants, and intra-state reimbursable services agreements (RSAs) for tsunami hazard mapping, outreach and warning systems. See Appendix 6 for the project selection process and prioritization criteria. In Alaska, the NTHMP is managed though the SHMO.

Remote Community Alert Systems Program
The Remote Community Alert Systems Program (RCASP) funds multi-hazard warning communication systems for remote communities with limited 911 services, cell phone access, and communications capability. Where appropriate, the State directly manages the project (Unincorporated community in the Unorganized Borough) or sub-grants the funds. To date funds have been used to install multi-hazard community warning sirens. In Alaska the RCASP is managed through the SHMO.

Small Business Administration
Business Physical Disaster Loans are for available for businesses and non-profit organizations in the area of a declared Federal disaster or Small Business Administration (SBA) declared disaster. SBA often sends representatives on federally declared disasters to present their disaster loan program.

Department of Agriculture

Natural Resource Conservation Service
Emergency Watershed Protection Program
The Natural Resource Conservation Service (NRCS) is responsible for the Emergency Watershed Protection (EWP) program. EWP provides financial and technical assistance to remove debris from streams, protect destabilized stream banks, establish cover on critically eroding lands, establish conservation practices, and purchase flood plain easements.

Department of Defense

U.S. Army Corps of Engineers
The U. S. Army Corps of Engineers (USACE) has accomplished many, extensive hazard mitigation studies and projects in Alaska, including the 2009 Kivalina community seawall and the Chena River flood control project in the Fairbanks North Star Borough. Funding for USACE projects and studies is dependent on Congressional appropriation and program requirements.

Additional Federal Agencies

Department of Agriculture

U.S. Forest Service

Department of Commerce

National Oceanic & Atmospheric Administration – See above under NTHMP and RCASP.
National Weather Service
Office of Coastal Resource Management

Department of Defense

USACE Army Corps of Engineers - National Flood Proofing Committee

Department of Health, Education & Welfare

Center for Disease Control (CDC)

Department of Housing & Urban Development

Community Development Block Grant
HOME Investment Partnerships Program

Department of the Interior

U.S. Geological Survey
U.S. Fish & Wildlife Service
Bureau of Land Management
Bureau of Indian Affairs

Environmental Protection Agency

Department of Transportation

Federal Highway Administration
Federal Aviation Administration

National Trust for Historic Preservation

Additional Mitigation Grant Resources

Information about other grant programs may be found in these sources:

- FEMA Disaster Assistance: A Guide to Recovery Programs

http://www.ready.gov/library/viewRecord.do?id=2152&fromSearch=fromsearch

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