

Louden Tribal Council  
City of Galena, Alaska

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Multi-Jurisdictional Hazard Mitigation Plan



**June 10, 2015**  
Prepared by: City of Galena  
Louden Tribal Council

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## **List of Acronyms and Abbreviations**

°F	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

## **Louden Tribal Council / City of Galena**

### **Multi-Jurisdictional Hazard Mitigation Plan 2015**

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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 this Multi-Jurisdictional Hazard Mitigation Plan (MJMP) 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”, subsections 6 and 7 (44 CFR §201.6, §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.

Current Federal regulations 44 CFR §201.6 and §201.7 require local communities and tribes, except under Regional Administrator approved “extraordinary circumstances” (§201.6(a)(3)), to have a FEMA approved hazard mitigation plan 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 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.

For implementation guidance, FEMA published the Final Rule in the Federal Register on September 16, 2009 [Docket ID FEMA-2006-0010], 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.

## **Louden Tribal Council / City of Galena**

### **Multi-Jurisdictional Hazard Mitigation Plan 2015**

#### **1. Community Profile**

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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 the communities' 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
- Appendices

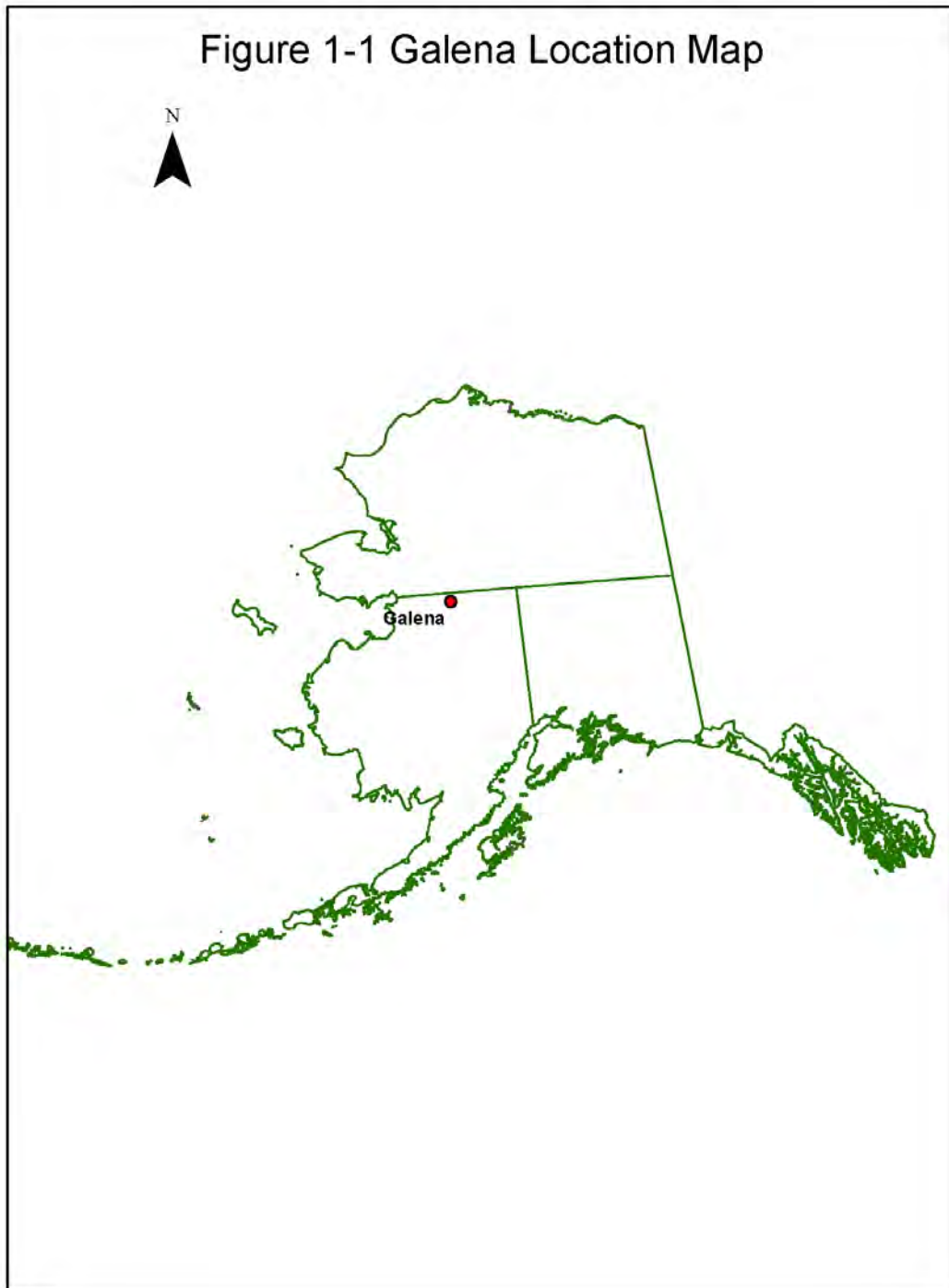
#### **1.4 Community Profile**

This section describes the location, geography, and history; demographics; and land use development trends of the City of Galena and the Loudon Tribal Council. 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] 2015*





## Louden Tribal Council / City of Galena

### Multi-Jurisdictional Hazard Mitigation Plan 2015

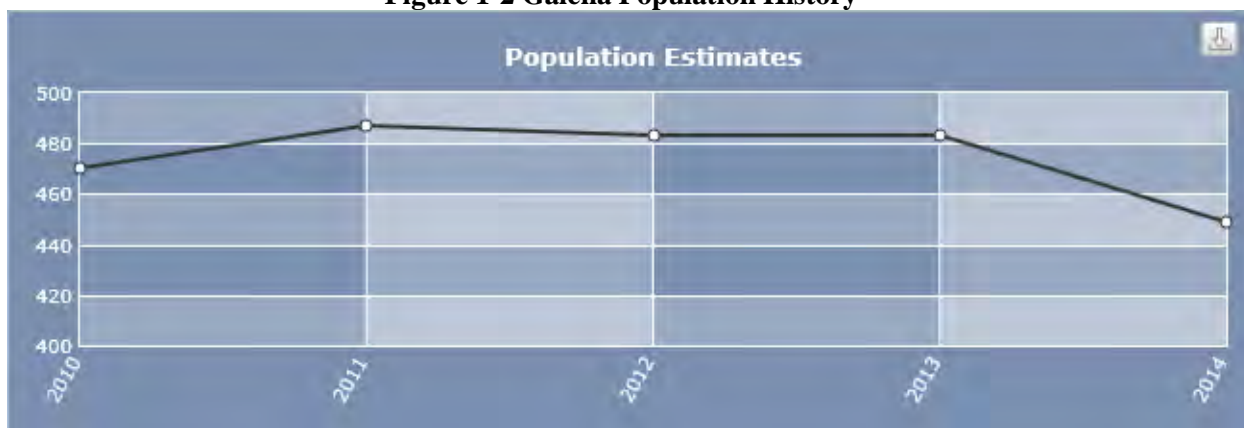
#### 1. Community Profile

##### Government

Galena is a first class city within the Unorganized Borough and the Yukon-Koyukuk Census District. The Loudon 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

**Figure 1-2 Galena Population History**



*Source: Alaska Department of Labor and Workforce Development 2015*

##### 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 Loudon or are descendants of Loudon 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 were maintained under contract by the Chugach Development Corporation until 2008. Ownership and maintenance were then transferred to the city.
- The community is currently recovering from the 2013 Spring Flood Disaster (DR-4122).

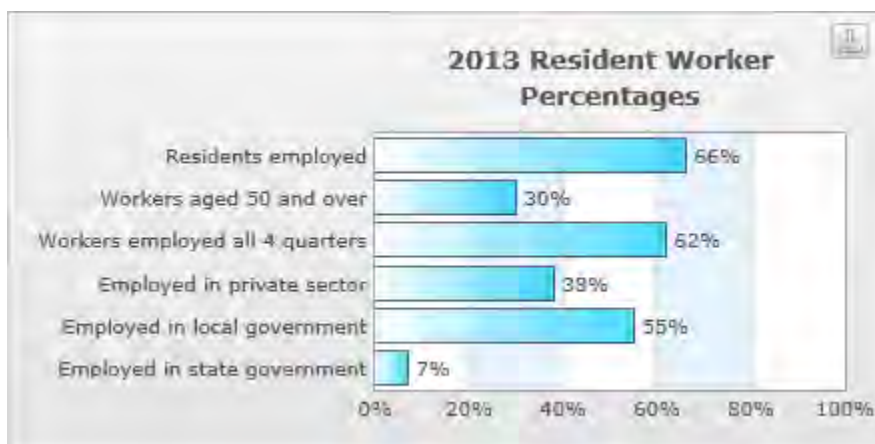
*Source: DCRA 2014, FEMA Region X*

### **Economy**

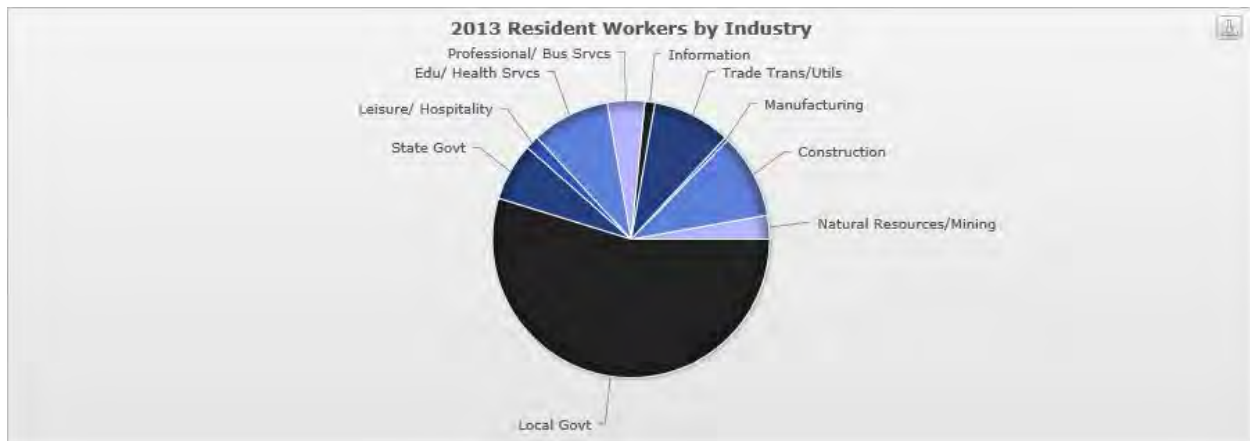
Galena is the unofficial hub for the State's western interior. Major employers are Federal, State, City, and Tribal governments. Additionally, Doyon Native Corporation, the Galena City School District, air transportation, retail businesses, commercial fishing, construction, and BLM firefighting, also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

**Figure 1-3 Worker Demographics 2013**



**Figure 1-4 2013 Resident Workers by Industry**



*Source: State of Alaska Department of Labor and Workforce Development 2015*

**Louden Tribal Council / City of Galena**  
Multi-Jurisdictional Hazard Mitigation Plan 2015  
1. Community Profile

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

*Table 1-1 Source: State of Alaska Department of Labor and Workforce Development, 2015*

**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**

Residents are dependent upon 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 (°F) to above 70°F during the summer with an extreme low of -64°F. 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. These photos depict the City's proximity to the Yukon River.



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



**Louden Tribal Council / City of Galena**  
**Multi-Jurisdictional Hazard Mitigation Plan 2015**  
**1. Community Profile**

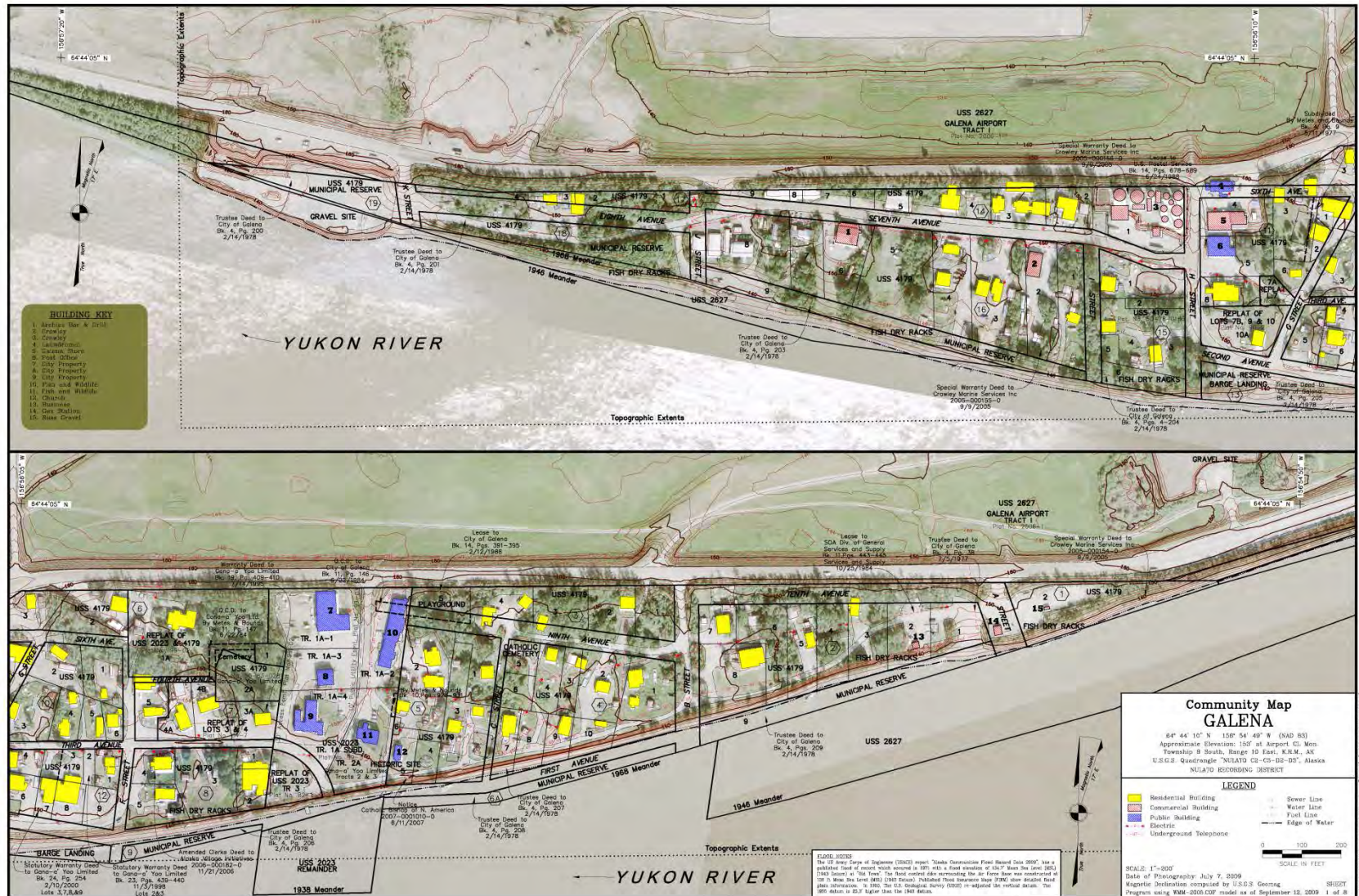


Figure 1-6 Split Map of Galena and the Yukon River (DCRA 2009)



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## **2. Planning Process**

This section provides an overview of the planning process, identifies the planning team members and key stakeholders, and summarizes the HMP review process.

### **2.1 Overview**

The Loudon Tribal Council and City of Galena 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.

An internal review of the City's HMP was conducted on April 14, 2015. During the meeting, the City and Tribal Council organized their planning team and reviewed their hazards, resources, and capabilities. They selected Nick Hruby, Galena's Long Term Recovery Specialist, to be the City Planning Team Leader and March Runner, Loudon's Tribal Administrator to be the Tribal Planning Team Leader.

The following five-step process took place from April through July 2015:

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 Loudon Tribal Council Administrator, March Runner and Long Term Recovery Specialist, Nick Hruby:

**Table 2-1 Hazard Mitigation Planning Team**

Name	Title	Organization	Key Input
March Runner	Administrator	Louden	Tribal Planning Team Lead, data input and HMP review.
Jenny Pelkola	First Chief	Louden	Planning Team Member, data input and HMP review.
Erica L. Frankson	Second Chief	Louden	Planning Team Member, data input and HMP review.
Harriet C. Carlo	Council Member	Louden	Planning Team Member, data input and HMP review.
Marjorie Attla	Council Member	Louden	Planning Team Member, data input and HMP review
Jennal Burgett	Council Member	Louden	Planning Team Member, data input and HMP review
Joyce Huntington	Council Member	Louden	Planning Team Member, data input and HMP review
Jon Korta	Mayor	City of Galena	Planning Team Member, data input and HMP review
Nick Hruby	Long Term Recovery	City of Galena	City Planning Team Lead, HMP review.
Shanda Huntington	City Manager	City of Galena	Planning Team Member, data input and HMP review
Brad Scotton	Council Member	City of Galena	Planning Team Member, data input and HMP review
Brian Landrum	Council Member	City of Galena	Planning Team Member, data input and HMP review
Cecelia Grant	Council Member	City of Galena	Planning Team Member, data input and HMP review
Kenneth Essex	Council Member	City of Galena	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 May 21, 2015, the planning team announced the hazard mitigation plan project during their public meeting. An invitation was extended to the entire community through public announcements over the local radio station and a newsletter posted at the City and Tribal Office (Appendix E). The newsletter was also placed on the DHS&EM website for review by the State Hazard Mitigation Advisory Council (SHMAC), Disaster Policy Cabinet (DPC), and general public, <http://ready.alaska.gov/plans/localhazmitplans>. During the meeting, participants reviewed seven hazards known to impact Loudon 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 tribal and community 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 June 9, 2015, the City of Galena and Loudon Tribal Council held a second public meeting to review their initial plan draft. An invitation was extended to the entire community through a public meeting notice, (Appendix F), and advertisements on the local radio station. The participants edited the draft for content, and approved it's submission to FEMA for formal 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 this MJHMP (Table 2-2).

**Table 2-2 Incorporated Planning Documents**

<b>Existing Plans, Studies, Reports &amp; Ordinances</b>	<b>Contents Summary</b>
12/5/2007- US Army Corps of Engineers, Alaska Baseline Erosion Assessment, Erosion Information Paper	Defined the region's risk of erosion. <a href="http://66.223.166.160/usace_disclaimer.html">http://66.223.166.160/usace_disclaimer.html</a>
2010, City of Galena Hazard Mitigation Plan	Assessed the region's risk to various hazards.

Existing Plans, Studies, Reports & Ordinances	Contents Summary
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.
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, Loudon HMGP structure elevation application DR 4094 & DR 4122	Identified tribal structures to be elevated.

Existing Plans, Studies, Reports & Ordinances	Contents Summary
2014 Loudon Tribal Hazard Mitigation Plan	Assessed the region's risk to specific natural hazards.

Section 6 documents all references used in this HMP.

## **2.5 Plan Maintenance**

This MJHMP will be maintained using the following six-step process:

1. Incorporation into existing planning mechanisms
2. Continued public involvement
3. Monitoring, reviewing, evaluating, and updating the HMP
4. State and FEMA review and technical assistance.
5. Formal plan adoption and assurances.
6. Continued integration with FEMA mitigation programs and initiatives.

### ***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.

The City of Galena and Loudon Tribal Council will involve the public to continually reshape and update this MJHMP. A paper copy of this plan will be available at the Tribal and City office. This MJHMP is also stored on the State Department of Commerce, Community, and Economic Development Community and Regional Affairs, (DCCED/DCRA) plans website for public reference,

<http://commerce.state.ak.us/dnn/dcra/PlanningLandManagement/CommunityPlansAndInfrastructure.aspx>. Planners are encouraged to integrate components of this HMP into their own plans.

### ***2.5.2 Continued Public Involvement***

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.

The planning team will solicit community involvement through the distribution of annual review questionnaires. The Annual Review Questionnaire (Appendix H) documents the Community's assessment of the Mitigation Action Plan and identifies potential changes to hazards, actions, and resource allocations.

### ***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 Loudon 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 planning team will review their goals and actions annually during the late winter season between January and March. During each annual review period, 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 designated council meeting date. The findings from the review will be presented at the public 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 planning team will review their HMP annually and update it every five years, or when hazards, actions, or priorities are changed

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.

- Determine the current status of the mitigation actions (projects) in progress.
  - Identify completed, deleted, or delayed projects. For statuses other than “completed”, include a reason for the designation.
  - Document changes to priorities.
  - Assess the impact of completed projects.
  - Identify any barriers preventing the implementation of mitigation projects such as financial, legal, or political restrictions and develop strategies to overcome them.
  - Thoroughly analyze and update their risks to natural hazards.
  - 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 and Technical Assistance***

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 Tribal Multi-Hazard Mitigation Planning Guidance and Crosswalk, March 2010 and the Local Hazard Mitigation Plan Review Guide, Appendix A, October 1, 2011. 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 Loudon Tribal Council Supports 44 CFR 201 and assures compliance with all applicable federal statutes and regulations during the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c), and will amend its plan whenever necessary to reflect changes in tribal or federal laws and statutes as required in 44 CFR 13.11(d). Galena and Loudon, with assistance from the State Hazard Mitigation Officer (SHMO), the State Hazard Mitigation Advisory Committee (SHMAC), and FEMA, are responsible for monitoring, evaluating, and updating their Hazard Mitigation Plan in accordance with 44 CFRs §201.6 and §201.7.

The City of Galena and the Loudon Tribal Council formally adopted their Multi-Jurisdictional Hazard Mitigation Plan on [REDACTED], 2015 and submitted the final draft to FEMA for formal approval. A scanned copy of their formal adoptions are attached (Appendix B).



### ***2.5.6 Continued Integration with FEMA Mitigation Programs***

As a result of DR-4122, the Loudon Tribal Council and Galena City Government are actively utilizing the following FEMA programs:

- Hazard Mitigation Grant Program (HMGP)
- Individual Assistance (IA)
- Public Assistance (PA)
- Small Business Association Loan Program (SBA)

The City and Tribe have applied for and received planning assistance, technical assistance, mitigation project assistance, individual and public infrastructure assistance. These FEMA assistance programs are designed to assist communities towards their recovery from natural disasters. Disaster DR-4122 was too extensive for the City to manage alone. Therefore, residential property recovery was delegated to The Loudon Tribal Council. Throughout the entire community Loudon is actively managing FEMA HMGP sponsored home elevations, relocations, and buyouts. Project completion is scheduled for October 2015. Meanwhile, the City of Galena is managing FEMA HMGP sponsored critical facilities elevations and seismic retrofits. Additionally, non-profit associations, such as Samaritan's Purse, are rebuilding homes and infrastructure.

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### 3. Hazard Profiles

Profiling hazards is the act of researching their nature, history, magnitude, frequency, location, extent, and probability. Communities identify hazards through historical and anecdotal information, and reviews of pertinent plans and studies. Mapping the hazards determines their geographic extent and proximity to populated areas. All natural phenomenon are considered, and those found to have minimal impact or an unlikely occurrence are eliminated from consideration (Table 3-1).

**Table 3-1      Hazard Identification and Screening**

<b>Hazard Type</b>	<b>Should It Be Profiled?</b>	<b>Explanation</b>
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	Galena experiences ice jams, snowmelt run-off and rainfall flooding during spring thaw and the fall rainy season. The last two major disasters were attributed to flooding.
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. 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.

During the kickoff meeting, the planning team reviewed their natural hazards: earthquake, erosion, flood, subsidence, wildland fire, and severe weather. These hazards were evaluated even if any particular one had not occurred within the past five years, considering their prior history, relative risk, mitigation potential, and availability of information.

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

- |                                   |   |
|-----------------------------------|---|
| <input type="checkbox"/> Nature   |   |
| <input type="checkbox"/> History  | <input type="checkbox"/> Impact           |
| <input type="checkbox"/> Location | <input type="checkbox"/> Probability      |
| <input type="checkbox"/> Extent   | <input type="checkbox"/> Climatic factors |

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 impact (Table 3-3).

**Table 3-2 Hazard Probability Criteria**

Probability	Criteria
4 - High	<input type="checkbox"/> Event is probable within the calendar year. <input type="checkbox"/> Event has up to 1 in 1 year chance of occurring (1/1=100 percent). <input type="checkbox"/> Probability is greater than 33 percent per year. <input type="checkbox"/> Event is Highly Likely.
3 - Likely	<input type="checkbox"/> Event is probable within the next three years. <input type="checkbox"/> Event has up to 1 in 3 years chance of occurring (1/3=33 percent). <input type="checkbox"/> Probability is greater than 20per cent but less than or equal to 33 percent per year. <input type="checkbox"/> Event is Likely.
2 - Plausible	<input type="checkbox"/> Event is probable within the next five years. <input type="checkbox"/> Event has up to 1 in 5 years chance of occurring (1/5=20 percent). <input type="checkbox"/> Probability is greater than 10 percent but less than or equal to 20 percent per year. <input type="checkbox"/> Event is Plausible.
1 - Remote	<input type="checkbox"/> Event is possible within the next ten years. <input type="checkbox"/> Event has up to 1 in 10 years chance of occurring (1/10=10 percent). <input type="checkbox"/> History of events is less than or equal to 10 percent likely per year. <input type="checkbox"/> Event is remote but credible.

**Table 3-3 Hazard Impact Criteria**

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

Table 3-4 indicates numerical values representing the factors of the Risk Priority Index. The planning team rated each factor using data from prior disasters, and used the results to assign relative importance to each hazard.

**Table 3-4 Calculated Priority Risk Index**

Calculated Priority Risk Index			
.45 Probability	.30 Impact	.15 Warning Time	.10 Duration
4 - High	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 - Plausible	2 - Limited	2 - 12-24 Hours	2 - Less Than 1 Day
1 - Remote	1 - Negligible	1 - 24+ Hours	1 - Less Than 6 Hours

Example: Probability = 4-High, Impact=3-Critical, Warning Time=2-12-24 Hours, Duration=4-More than 1 Week.

$$(4 \times 0.45) + (3 \times 0.30) + (2 \times 0.15) + (4 \times 0.10) = 1.8 + .9 + .3 = 3.0$$

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	Impact	Warning Time	Duration	Priority Risk Index
Earthquake	1 Remote	1 Negligible	4 < 6 Hours	1 < 6 Hours	1.45
Erosion	3 Likely	2 Limited	1 24+ Hours	4 > One Week	2.5
Flooding	4 High	3 Critical	2 12-24 Hours	3 < One Week	3.3
Subsidence	2 Plausible	2 Limited	1 24+ Hours	1 < 6 Hours	1.75
Severe Storm	4 High	1 Negligible	1 24+ Hours	3 < One Week	2.55
Wildfires	3 Likely	2 Limited	2 < 12-24 Hrs.	- 4>One Week -	2.65
Climate Change	1 Remote	4 Catastrophic	1 24+ Hours	4 > One Week	2.2

Table 3-6 documents the event history and damage extents for Loudon 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 Loudon 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. Earthquakes usually occur without warning and after only a few seconds, ground motion at the surface may cause extensive damage and many casualties.

Ground motion increases with the amount of energy released and decreases as seismic waves travel through and along the earth's surface, away from the fault or epicenter. 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 (Raleigh) wave. R waves move continuously forward, although the individual particles move in an elliptical path, similar to water waves. L (Love) waves, like Raleigh 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.

Secondary natural hazards associated with earthquakes are:

- ☐ **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** refers to a loss of soil structure as seismic waves pass through saturated granular soil. The higher pore water pressure suspends the soil grains and moves to areas of low pressure, moving the soil with it. The soil will behave as a liquid. 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 epicenter, which is the point on the earth's surface that is directly above the origin (Focus). 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 actual position of origin, known as the hypocenter (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 within 100 miles of the City. No damage resulted from these earthquakes.

**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.

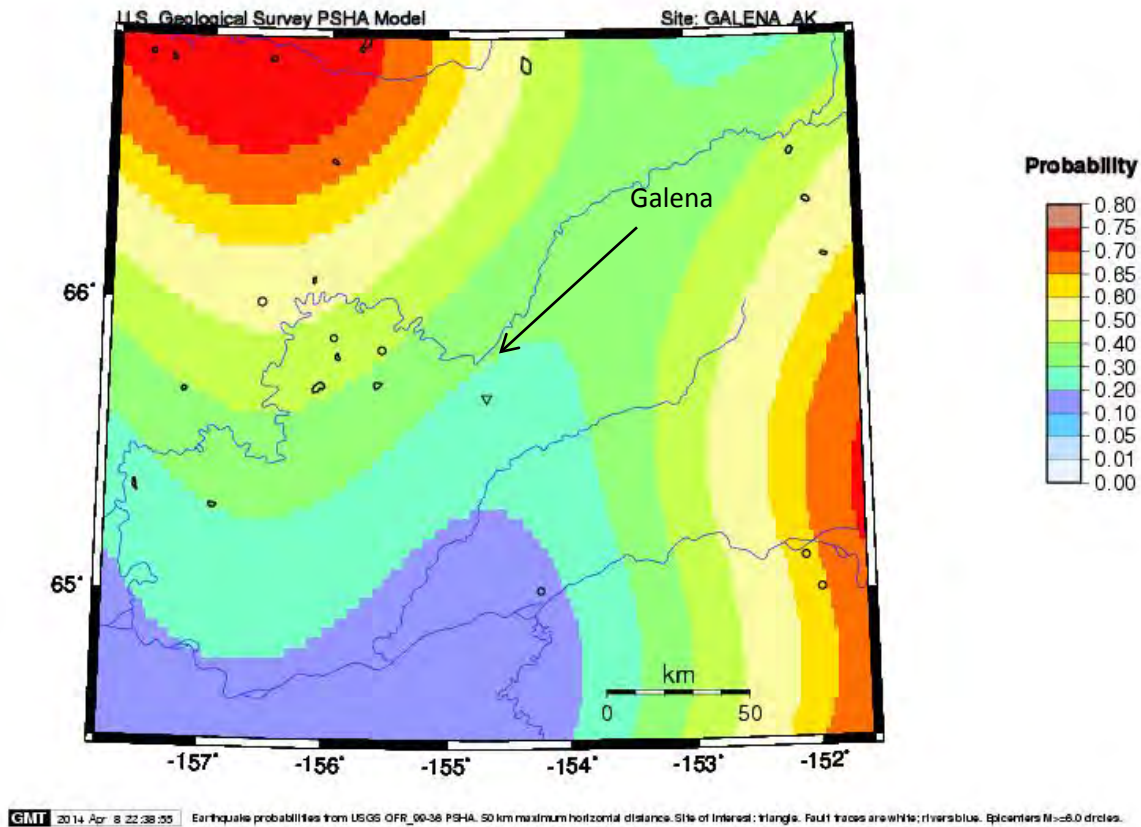
### **Location**

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**

Pr[Earthquake with  $M \geq 5.0$  within 50 years & 50 km]



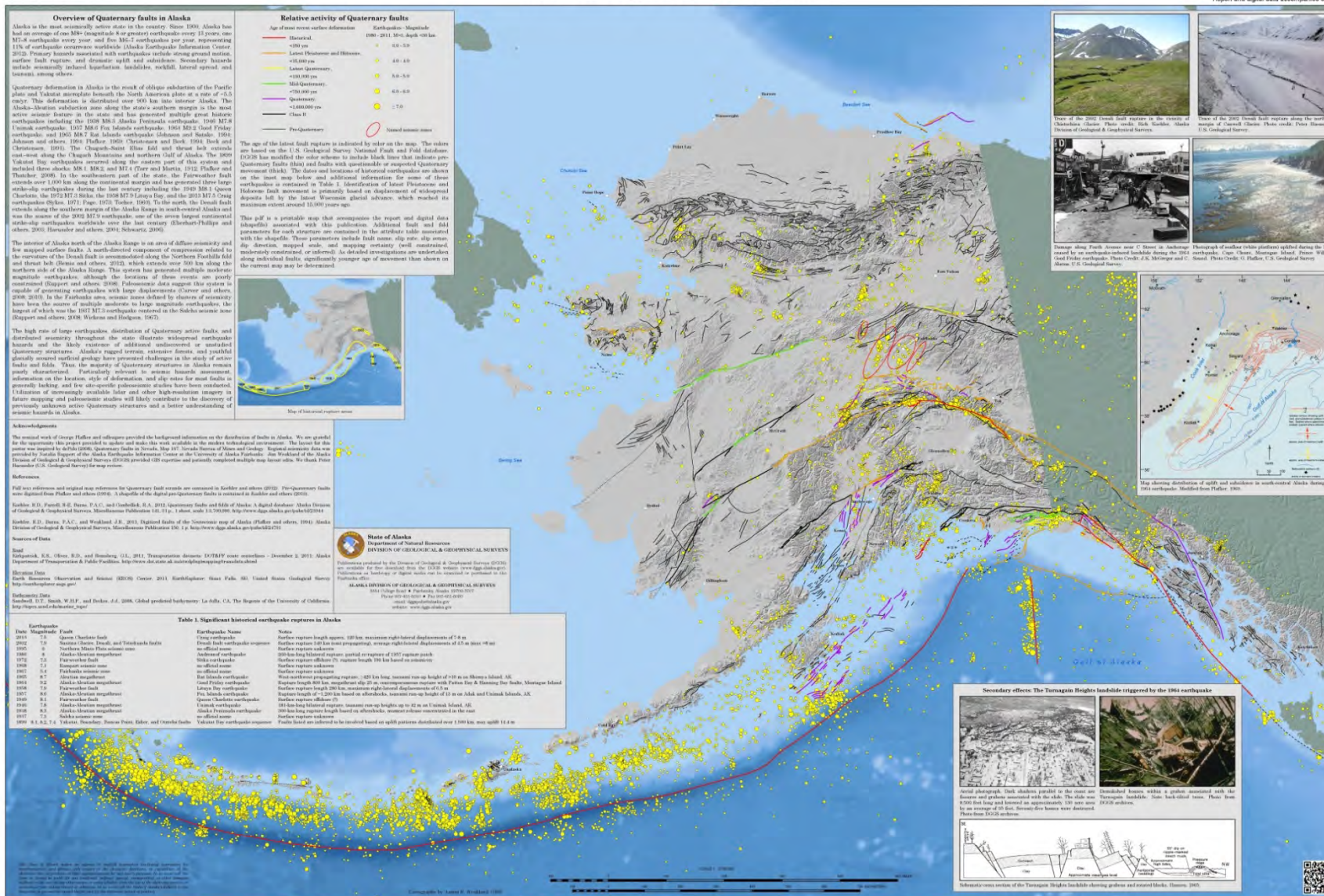
The Department of Geological and Geophysical Survey (DGGS) Map of Alaska's Quaternary Faults depicts Alaska's known earthquake fault locations (Figure 3-2).

**Louden Tribal Council / City of Galena**  
Multi-Jurisdictional Hazard Mitigation Plan 2015  
Chapter 3. Hazard Profiles

ALASKA DIVISION OF GEOLOGICAL &  
GEOPHYSICAL SURVEYS

## ALASKA'S QUATERNARY FAULTS

MISCELLANEOUS PUBLICATION 145  
Koehler and others, 2012  
SHEET 1 OF 1  
Report and digital data accompanies sheet



### **Extent**

Alaskans experience approximately 5,000 earthquakes annually, including 1,000 measuring above magnitude 3.5. Alaska is vulnerable to three types of earthquakes:

1. **Subduction zone earthquakes** begin with 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 resulted from movement along the Aleutian Megathrust subduction zone.
2. **Transform fault earthquakes** originate from crustal plates sliding 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.
3. **Intraplate earthquakes** occur within a tectonic plate, occasionally at great distance from the plate boundaries. These types of earthquakes may 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 region of low seismicity. Although the effects of distant earthquakes could be felt in the City, extensive damage and significant ground movement are not expected. However, possible impacts to the community are injury, illness, death, complete shutdown of critical facilities for at least two weeks, and more than 25 percent severely damaged property. The City, State, and FEMA has further mitigated future impact by adding seismic reinforcements to structures damaged by DR-4122.

### **Probability**

Considering the location, Figure 3-1 and Table 3-2, it is “Remote” an earthquake exceeding M 5.0 may occur within 100 miles of Galena within the next 10 years as the history of events is less than 10 percent per year (Table 3-2). 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, explained factors influencing probability in earthquake hazard mapping in 2009:

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.

Probability	Impact	Warning Time	Duration	Calculated Risk
<b>1 x .45</b>	<b>1 x .30</b>	<b>4 x .15</b>	<b>1 x .10</b>	<b>1.45</b>



## **3.2 Erosion**

### **Nature**

Erosion is the wearing and transportation of land. Occasionally flash floods, human activity, or severe weather greatly increase normal erosion rates. In developed regions, 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 vulnerable to riverine erosion. The water scours away the riverbed and deposits the material (silt) elsewhere, often altering the direction of flow and precluding channel navigation. In less stable braided channels, erosion and deposition are a constant issue. During spring break up along the Yukon River, large ice blocks scour Galena's protective levees.

### **History**

The City has received several erosion prevention and bank stabilization projects since the 1950's. According to the 2009 USACE Alaska Baseline Erosion Assessment Study:

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:

- 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 received State grant funds 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 stockpiled rock was proposed in a 2006 Corps assessment.

### **Location**

The Yukon River has removed most of the bank protecting “old town” and is continuing towards “new town.” The factors influencing erosion rates in this area are floods, ice scour, and thawing permafrost.

Erosion is occurring all along the Yukon riverbank. During break-up, the thawed riverbank is 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 create some of the most destructive 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 factors are:

- Riverbank composition
- Riverbank orientation
- Prevailing winds
- Wave action
- Geomorphology
- Human activity along the riverbank
- Density of development
- Erosion controlling structures
- Riverbed topography
- Riverbank Vegetation
- Riverbank exposure to wind and waves

### **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 such as fuel headers and electric and water/wastewater utilities, and economic impacts attributed to preventing or controlling erosion sites.

Referring to past events, the 2009 USACE Alaska Erosion Assessment, and the criteria identified in Table 3-3, the impact upon the Loudon Tribe and the City is “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 2009 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)

Since 2009, the State DOT moved Campion Road inland to mitigate the erosion threat. However, erosion continues to encroach upon the Crow Creek subdivision access, several houses between Campion Road and the River, and a section of unprotected riverbank between two separate revetments. The VOR station was damaged in the 2013 spring flood and remains out of service.

### **Probability**

Based on previous occurrences and applying the criteria identified in Table 3-2, it is “Likely” erosion will occur in the next three years as the probability is greater than 20 percent but less than or equal to 33 percent likely per year.

Probability	Impact	Warning Time	Duration	Calculated Risk
<b>3 x .45</b>	<b>2 x .30</b>	<b>1 x .15</b>	<b>4 x .10</b>	<b>2.5</b>

### 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 occasionally alter their course towards developments. 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, ice jam floods 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.

#### 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, and the swollen rivers broke their ice cover prematurely, forming large ice dams downstream. The 2013 Spring Ice Jam Flood disaster (DR-4122) was one of the largest events of its kind in Alaska's history.

Disasters attributed to the rapid spring thaw of 2013 were not limited to Alaska. Ivu disasters in northern Minnesota and Canada coincide with DR-4122. The rapid spring thaw in concert with high winds pushed lake ice into nearby homes. Some homes were completely destroyed in as little as 15 seconds (Figure 3-4).



*Figure 3-4 Source: New York Daily News, Author Erik Ortiz, Sunday, May 12, 2013*

**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. During the winter of 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 Risks**

In Galena, early summer is the period of highest risk for ice jams and snow melt flooding, 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 2009 USACE Baseline Erosion Assessment 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.

Several disaster declarations have been awarded for Galena flood damages such as the June 10, 1989 flood 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 will continue through 2016.

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

<b>Table 3-9 Historical Floods in Galena</b>				
<b>Zone(s)</b>	<b>Location(s)</b>	<b>Date(s)</b>	<b>Event</b>	<b>Description</b>
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	5/27/13	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 Loudon 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**

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

**Impact**

Impacts to the community are "Critical" with 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 (Table 3-3). Specific impacts resulting from floods include water damage to infrastructure, buildings, and structural damage caused by floating debris such as ice.

**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 "High" (Table 3-2).

Probability	Impact	Warning Time	Duration	Calculated Risk
<b>4 x .45</b>	<b>3 x .30</b>	<b>2 x .15</b>	<b>3 x .10</b>	<b>3.3</b>

### **3.4 Subsidence**

#### **Nature**

Permafrost is soil, sand, gravel, or bedrock remaining below 32°F / 0°C for a minimum of two years. 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 known as the active layer.

Permafrost degradation (thermokarst) occurs naturally as a result of climate change and is usually a very gradual process. As the ground completely thaws, it 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 transfer heat to the underlying permafrost and rapidly accelerate thermokarst. Permafrost is also degraded by damaging the insulating vegetative ground cover, allowing the summer thaw to penetrate deeper into the soil. Evidence of this type of thermokarst is evident along warped trails, roads, and railroads.

#### **Temperature Variations**

According to NOAA's "Arctic Report Card: Update for 2013", new record high temperatures at 20 meters depth were measured at some permafrost observatories on the North Slope of Alaska and in the Brooks Range, where measurements began in the late 1970s and early 1980s. Overall, temperature measurements since 2000 have increased by one quarter to one half a degree centigrade. However, permafrost temperatures in interior Alaska continued to decrease slightly since 2007. Permafrost temperatures in the interior are now slightly lower than those on the North Slope, whereas previously, they were on average 0.7 C higher. Galena is an interior Alaskan community.

#### **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 3-5).

Figure 3-5 Permafrost Map

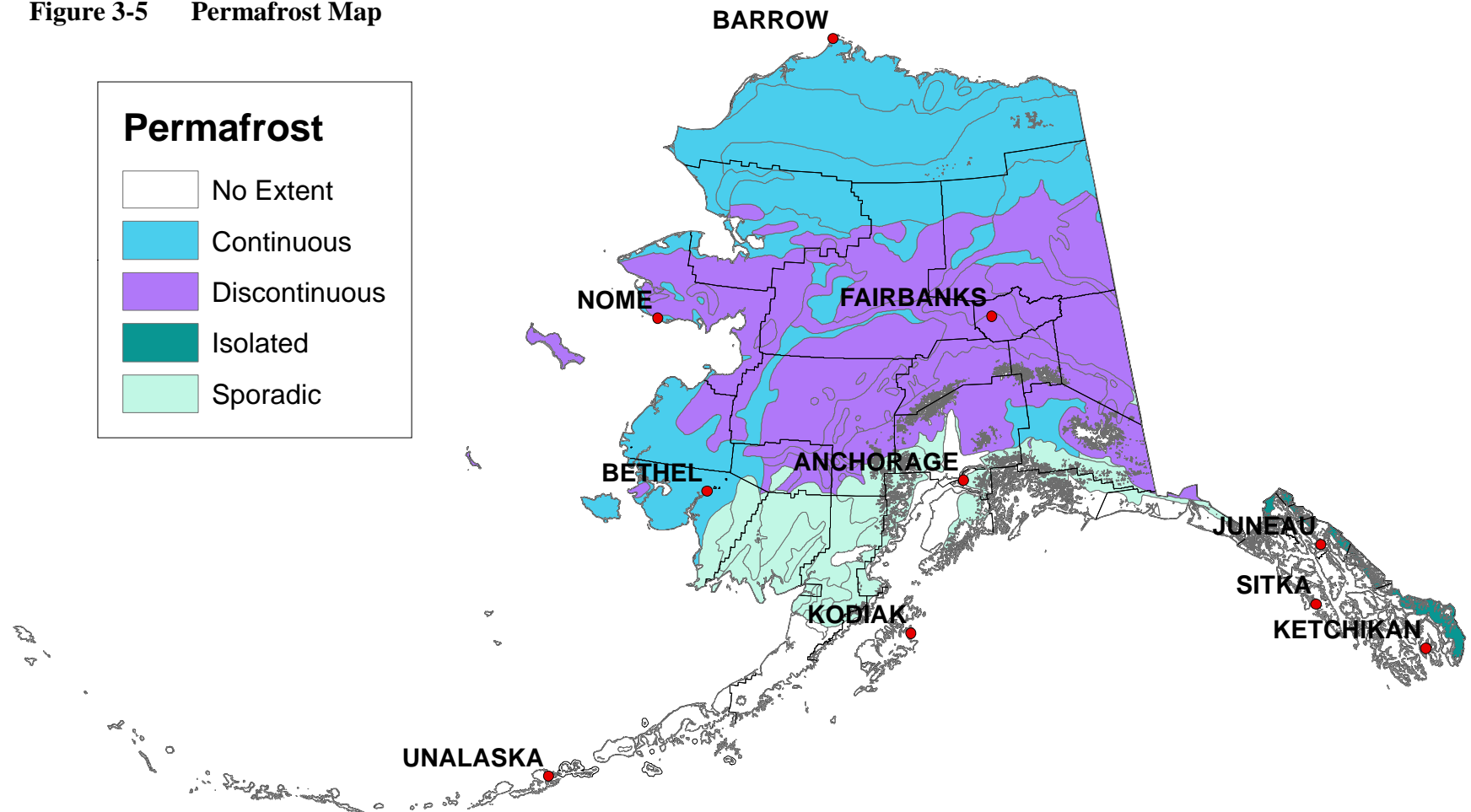


Figure 3.5 Brown, J., O.J. Ferrians Jr., J.A. Heginbottom, and E.S. Melnikov. 1998. revised February 2001. Circum-Arctic map of permafrost and ground-ice conditions. Boulder, CO: National Snow and Ice Data Center/World Data Center for Glaciology. Digital Media. <http://nsidc.org/data/ggd318.html>.

### **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 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 reasoned future damage from thermokarst is “Plausible” in the next five years as the probability is greater than 10 percent but less than or equal to 20 percent likely per year.

Probability	Impact	Warning Time	Duration	Calculated Risk
2 x .45	2 x .30	1 x .15	1 x .10	1.75

## **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 -40°F. 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.

### **Climatic Factors**

Current weather patterns are influenced by short term climate fluctuations, such as the El Nino/La Nina Southern Oscillation (ENSO). Long term changes in atmospheric composition and sea temperatures will exert a greater influence. The Governor appointed Alaska Climate, Ecosystems & Human Health Work Group is determining pending impacts to human health and regional ecosystems from long term changes in the Earth's climate.

### **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	Jan 89	Extreme Cold	Cold air mass, minus 50 to 60 Fahrenheit.
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	22-24 Jan 99	Heavy Snow	Blizzard Conditions, precipitation, strong winds Nulato 7", Ruby 10.2", Kaltag 12"

**Table 3-10 Severe Weather Events**

Zone(s)	Location(s)	Date(s)	Event	Description
	Kaltag, Ruby			
AK004 & AK008	Galena	29-31 Jan 99	Extreme Cold	Cold air mass -50 degrees Fahrenheit (°F) to during the period and reached the -60°F. The lowest recorded temperature for Galena: -64°F
AK004 & AK008	Galena, Kaltag, Ruby,	01-12 Feb 99	Extreme Cold	Cold air mass -50°F to during the period and reached the -60°F. The lowest recorded temperature for Galena: -64°F
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
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-



**Table 3-10 Severe Weather Events**

Zone(s)	Location(s)	Date(s)	Event	Description
				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 Snow	Heavy snow over the Nulato Hills including 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: -51°F on the 2nd
AK216 & AK219	Galena &	2 Jan 09	Temperat ures	Zone 216- Galena: -51 °F, 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. 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 -64°F.

### **Extent**

Galena experiences the following severe weather events:

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

### **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 a “High” probability a severe storm will occur in the next three years as the event cycle is greater than 33 percent likely per year.

Probability	Impact	Warning Time	Duration	Calculated Risk
<b>4 x .45</b>	<b>1 x .30</b>	<b>1 x .15</b>	<b>3 x .10</b>	<b>2.55</b>

## 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 (WUI) areas, where structures and other human development meet or intermingle with undeveloped wildland. 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.

### Climatic Influence

A potential increase in global atmospheric temperature may influence weather activity in Alaska. Hotter and drier summers and increased electrical storm activity would contribute to volatile and rapidly expansive tundra fires in the vicinity of Galena.

### History

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).

<b>Table 3-11 Wildfire Locations Since 1938 Within 50 Miles of the City</b>			
<b>Fire Name</b>	<b>Fire Year</b>	<b>Estimated Acres</b>	<b>Specific Cause</b>
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

<b>Table 3-11 Wildfire Locations Since 1938 Within 50 Miles of the City</b>			
<b>Fire Name</b>	<b>Fire Year</b>	<b>Estimated Acres</b>	<b>Specific Cause</b>
South Koto Mt.	1953	9700	Lightning
Koto 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
Kayih Mtn	1959	5100	Lightning
Kokrines NW-19	1959	6400	Lightning
Nulato	1960	16500	Lightning
Koto 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
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

<b>Table 3-11 Wildfire Locations Since 1938 Within 50 Miles of the City</b>			
<b>Fire Name</b>	<b>Fire Year</b>	<b>Estimated Acres</b>	<b>Specific Cause</b>
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**

Wildland fires have not been documented within the boundaries of Galena; however, wildland fires have occurred in the vicinity (Figure 3-6).

**Figure 3-6 Galena Fire History Map**

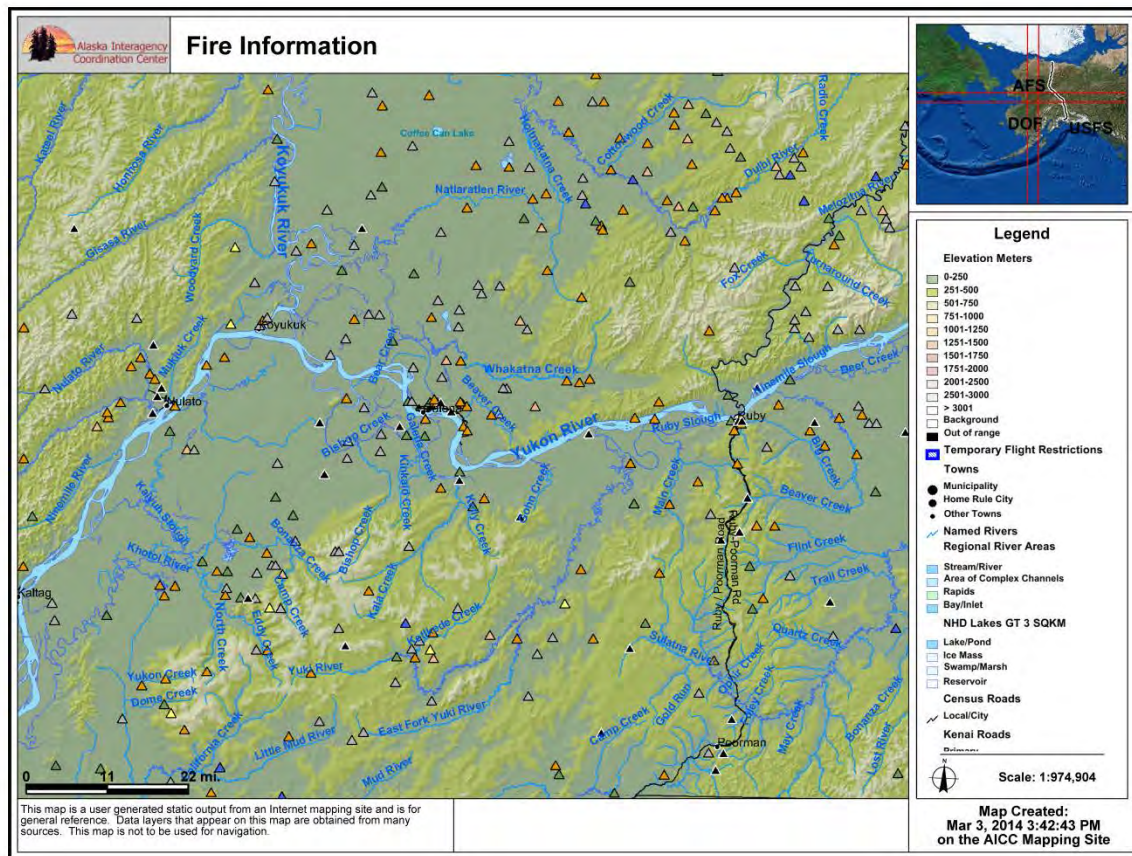


Figure 3-6 Source: Alaska Interagency Coordination Center Mapping Site, 2014

### Extent

During the summer, the entire community is vulnerable to wildland fire as most of the structures are constructed of wood and other flammable materials. The exception is the old USAF base, which used concrete, steel, and corrugated metal construction. Standing timber and other natural fuels interface with the community.

### Impact

Based on past wildland fire events and the criteria identified in Table 3-3, the magnitude and severity are considered “Limited” with non-permanent injuries and illnesses, the potential for critical facilities to be shut down for more than one week, more than 10 percent of property or critical infrastructure being severely damaged, and little to no permanent damage to transportation or infrastructure or the economy.

Impacts of a wildland fire interface with Galena range in intensity and scope, but will grow into an emergency or disaster if not properly controlled. Even a small fire can take lives and destroy property. Additionally, wildland fires may destroy livestock and pets.



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 and water bodies. 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.

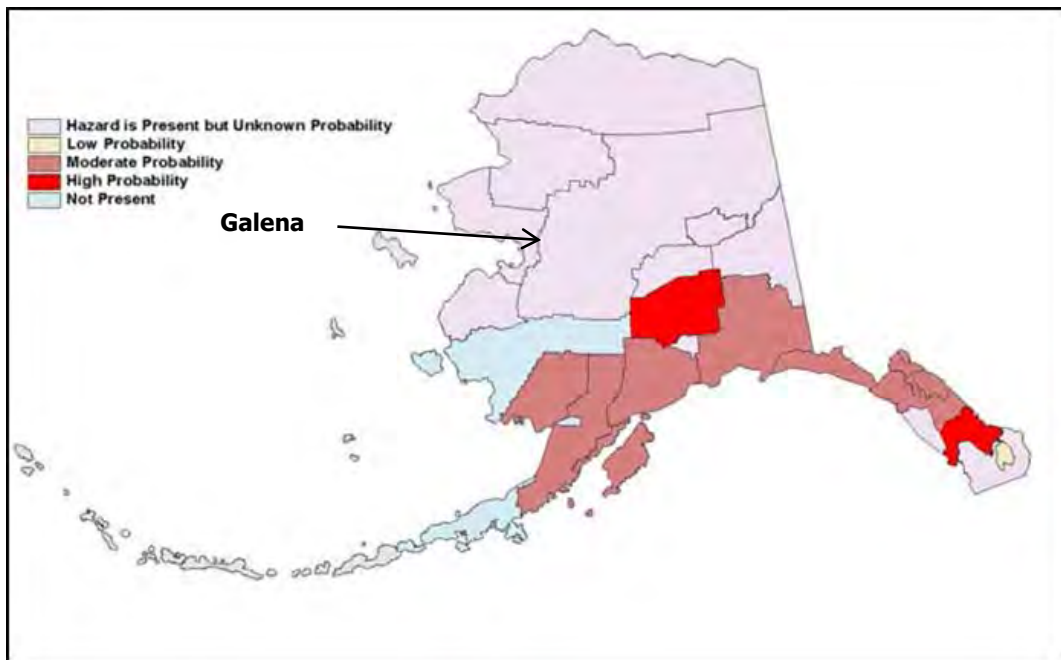
**Probability**

Recorded wildland fires within 50 miles of Galena have an average recurrence rate of approximately 2.5 to 3 years (Table 3-10). Therefore it is “Likely” a wildland fire will occur within 50 miles of Galena, as the probability is greater than 20 percent but less than or equal to 33 percent likely each year.

Probability	Magnitude	Warning Time	Duration	Priority
<b>3 x .45</b>	<b>2 x .30</b>	<b>2 x .15</b>	<b>4 x .10</b>	<b>2.65</b>

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 3-7 Wildland Fire Risk in Alaska**



*Source: State of Alaska Hazard Mitigation Plan 2013*

According to the Alaska Interagency Coordination Center, 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 (CO<sub>2</sub>) and methane (CH<sub>4</sub>) 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 successive volcanic eruptions. 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 Loudon 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**

“Catastrophic”, 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, Galena and other Yukon River Communities may need to relocate.

**Global Impact**

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 event 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 “Remote” a disaster event attributed to climate change will occur in the next ten years as the probability is less than or equal to 10 percent likely per year.

## 4. Risk Analysis

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 Loudon and Galena.

<b>Table 4-1A Vulnerability Overview for Loudon</b>				
<b>Hazard</b>	<b>Percent of Geographic area</b>	<b>Percent of Population</b>	<b>Percent of Building Stock</b>	<b>Percent of Community Facilities and Utilities</b>
<b>Earthquake</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
<b>Erosion</b>	<b>14%</b>	<b>0%</b>	<b>14%</b>	<b>50%</b>
<b>Flood</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
<b>Subsidence</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
<b>Weather</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
<b>Tundra / Wildland Fire</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
<b>Climate Change</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

<b>Table 4-1B Vulnerability Overview for Galena</b>				
<b>Hazard</b>	<b>Percent of Geographic area</b>	<b>Percent of Population</b>	<b>Percent of Building Stock</b>	<b>Percent of Community Facilities and Utilities</b>
<b>Earthquake</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
<b>Erosion</b>	<b>12%</b>	<b>19%</b>	<b>12%</b>	<b>20%</b>
<b>Flood</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
<b>Subsidence</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
<b>Weather</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
<b>Tundra / Wildland Fire</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
<b>Climate Change</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

## 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.

<sup>1</sup> 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 Loudon 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 Loudon and the Galena City Council. They are inventoried in Tables 4-3A-C, but not analyzed in HAZUS-MH.

**Table 4-3A Loudon Critical Facility Inventory**

Facility Type	Facility Name	Location	Replacement Value	Occupancy
<b>Government Facilities</b>	Louden Tribal Council Office, two stories	Tiger Street	\$250,000	4 People
<b>Residential</b>	Louden Administration Log House	Tiger Street	\$200,000	
	Louden Rental Home #1	Crow Creek Rd.	\$300,000	4 people
	Louden Rental Home #2	Crow Creek Rd.	\$300,000	4 people
<b>Commercial</b>	Admin House Garage	Tiger Street	\$50,000	N/A
	Louden Office Storage Shed 10'x7'	Tiger Street	\$15,000	N/A
<b>Community Facilities</b>	Community Hall	Tiger Street	\$500,000	0 People

**Table 4-3B Galena Critical Facility Inventory**

<b>Facility Type</b>	<b>Facility Name</b>	<b>Location</b>	<b>Replacement Value</b>	<b>Occupancy</b>
<b>Government Facilities</b>	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
<b>Transportation Facilities</b>	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
<b>Emergency Response</b>	Fire Station	Antoski Avenue	\$75,000	0 People
	Police Station	Antoski Avenue	\$30,000	2 People
	Troopers Post	Air Base	\$100,000	4 People
<b>Educational Facilities</b>	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

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Facility Type	Facility Name	Location	Replacement Value	Occupancy
		Air Base		
	Birchwood Adult Dorm	#1 Birchwood Drive	\$10,000,000	10 People
<b>Care Facilities</b>	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
<b>Community Facilities</b>	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
<b>Roads</b>	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
<b>Bridges</b>	None	N/A	N/A	N/A
<b>Utilities</b>	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

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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
<b>Fuel Storage &amp; Distribution Facilities</b>	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
	New Town Fuel Header	Antoski Avenue	\$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
<b>Residential</b>	Worker Housing (Seven plex facility)	H Street	\$1,000,000	Unknown
	Blue Housing Bldg.	N64.7325/W156.934	\$200,000	Unknown
<b>Commercial</b>	Administration Office (one story facility)	H Street	\$100,000	Unknown

Facility Type	Facility Name	Location	Replacement Value	Occupancy
	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 %
<b>Residential</b>		
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
<b>Commercial</b>		
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
<b>Industrial</b>		
Heavy	Factory	150

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



**Table 4-5A Loudon Loss Estimates by Occupancy Class**

Type (Occupancy Class)	Total Count	Estimated Value	Contents	
			HAZUS Contents Value (%) by Occupancy Class	Estimated Value of Contents
<b>Residential</b>	<b>3</b>	\$800,000	50%	\$400,000
<b>Commercial</b>	<b>2</b>	\$65,000	50%	\$97,500
<b>Religious/Non-Profit</b>	<b>1</b>	\$350,000	100%	\$350,000
<b>Government</b>	<b>1</b>	\$250,000	150%	\$375,000
<b>Total</b>	<b>7</b>	<b>\$1,265,000</b>	NA	<b>\$1,122,500</b>

**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
<b>Residential</b>	<b>264</b>	\$52,800,000	50%	\$26,400,000
<b>Commercial</b>	<b>19</b>	\$32,376,994	150%	\$48,565,491
<b>Industrial</b>	<b>0</b>	\$0	150%	\$0
<b>Religious/Non-Profit</b>	<b>5</b>	\$410,000	100%	\$410,000
<b>Government</b>	<b>10</b>	\$23,045,000	150%	\$34,567,500
<b>Educational</b>	<b>9</b>	\$43,867,103	150%	\$65,800,655
<b>Utilities</b>	<b>25</b>	\$35,557,500	NA	\$0
<b>Total</b>	<b>332</b>	<b>\$188,056,597</b>	NA	<b>\$175,743,646</b>

*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
<b>Residential</b>	3	\$800,000	\$400,000	\$1,200,000
<b>Commercial</b>	2	\$65,000	\$97,500	\$162,500
<b>Religious/Non-Profit</b>	1	\$350,000	\$350,000	\$700,000
<b>Government</b>	1	\$250,000	\$375,000	\$625,000
<b>Total</b>	<b>7</b>	<b>\$1,265,000</b>	<b>\$1,122,500</b>	<b>\$2,387,500</b>

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

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 Loudon 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	\$800,000	\$400,000	\$1,200,000	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	\$800,000	\$400,000	\$1,200,000	4	\$665,000	\$822,500	\$1,487,500	7	\$1,265,000	\$1,122,500	\$2,387,500
Subsidence	3	\$800,000	\$400,000	\$1,200,000	4	\$665,000	\$822,500	\$1,487,500	7	\$1,265,000	\$1,122,500	\$2,387,500
Severe Weather	3	\$800,000	\$400,000	\$1,200,000	4	\$665,000	\$822,500	\$1,487,500	7	\$1,265,000	\$1,122,500	\$2,387,500
Wildfire	3	\$800,000	\$400,000	\$1,200,000	4	\$665,000	\$822,500	\$1,487,500	7	\$1,265,000	\$1,122,500	\$2,387,500
Climate Change	3	\$800,000	\$400,000	\$1,200,000	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**

Hazard	Residential Structures					Community Facilities				Total			
	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 Loudon, 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, Loudon 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 Loudon 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, Loudon has participated in the NFIP since 1984. The City and Loudon 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**

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

Type includes: RL or SRL

<sup>1</sup>Insured structural value n/a.

<sup>2</sup>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 land use ordinances. City lands are designated for institutional and recreational uses such as schools, parks and government facilities. The community has also designated lands for hunting. However, people may not actively hunt within the City.

### **Development Trends**

Table 4-10 lists previous infrastructure improvement projects for Loudon 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 Loudon and Galena Project History**

<b>Lead Agency</b>	<b>Fiscal Year</b>	<b>Project Description</b>
DHS&EM/DCCED/FEMA	2014	List all structures located within 100 & 500 year floodplains.
DHS&EM/DCCED/FEMA	2014	Map residential & commercial buildings within 100 & 500 year floodplains.
DHS&EM/DCCED/FEMA	2014	Update all locations subject to frequent flooding.
USACE	2013	Home Baseline Elevation Surveys
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
DOT/PF	2009	Galena Maintenance Building Efficiency Modifications Legislative Grant
DCCED	2008	Galena Interior Learning Academy Classroom Expansion Remodel
DCCED	2008	Ptarmigan Dorm Sprinkler System Installation
Department of Environmental	2008	Water System Improvements, Phase III Legislative Grant DEC/VSW

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Lead Agency	Fiscal Year	Project Description
Conservation (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
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

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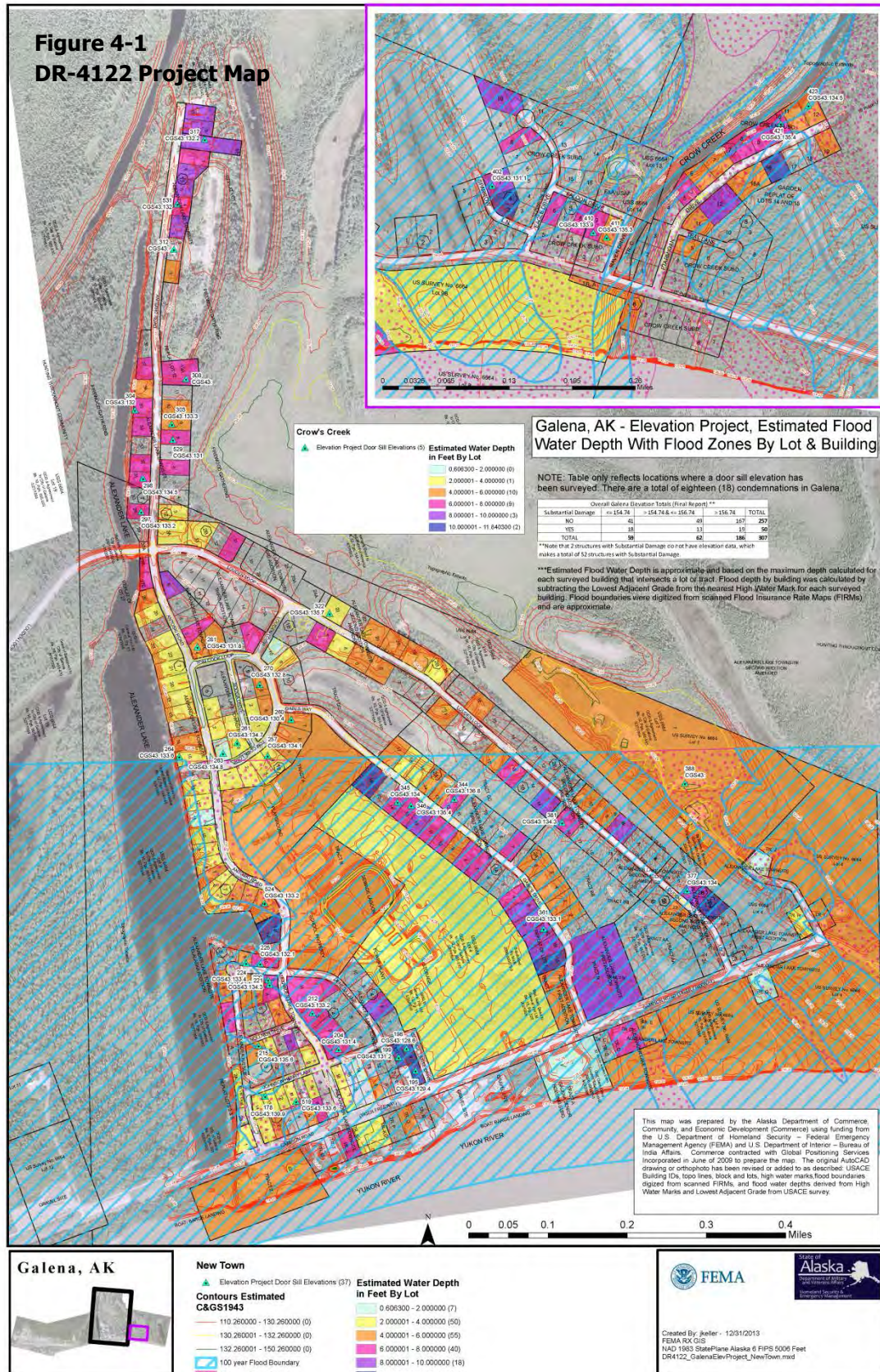
Lead Agency	Fiscal Year	Project Description
HUD	2003	IHBG-NAHASDA administration, operation, and construction funds
Federal Aviation Administration (FAA), Department of Transportation/Public Facilities (DOT/PF)	2003	Edward G. Pitka Sr: Rehabilitate Apron FAA-DOT/PF
FAA-DOT/PF	2003	Edward G. Pitka Sr: 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
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 grant

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Lead Agency	Fiscal Year	Project Description
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





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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 community for mitigation actions, funding, and training. Table 5-1 delineates the City of Galena’s regulatory tools. While the Loudon Tribal Council is a sovereign and federally recognized tribe, they are not a regulatory authority in Galena. Tables 5-2 and 5-3 identify technical specialists, and financial resources available for project management through the City. Additional funding resources are identified in Chapter 6, “Resources”.

**Table 5-1 Management Tools**

<b>Regulatory Tools (ordinances, codes, plans)</b>	<b>Existing?</b>	<b>Comments (Year of most recent update)</b>
Comprehensive Plan	Yes	The City Comprehensive Plan 1998 Update
Economic Plan	Yes	City plan 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 With adjustment per 2013 flood and 2014 survey.
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 Loudon 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



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Special purpose ordinances	Yes	The City adopted a 2 foot freeboard minimum building elevation for construction and 3 foot for critical infrastructure.
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**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	The City of Galena has a temporary Long Term Recovery Planner.
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	Yes	Louden and Galena's city Manager 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 (Hazard-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

Financial Resource	Accessible or Eligible to Use for Mitigation Activities
Incur debt through private activity bonds	No
Hazard Mitigation Grant Program (HMGP)	Yes, funded at 15% of a federally declared disaster
Hazard Mitigation Technical Assistance Program (HMTAP)	Yes, through the State DHS&EM
Earthquake Hazards Reduction Program (EHRP)	Yes, for Seismic retrofits and earthquake mitigation
Pre-Disaster Mitigation (PDM) grant program	Yes, nationally competitive mitigation grant
Flood Mitigation Assistance (FMA) grant program	Yes, as a member of the NFIP
United State Fire Administration (USFA) Grants	Yes, for wildfire mitigation projects
Fire Mitigation Fees	No

The City of Galena and Loudon Tribal Council depend upon any available government and private grants for much of their mitigation projects. With an approved hazard mitigation plan, sovereign tribes, such as Loudon, may apply directly to FEMA for grants or apply through the State. If a tribe applies to the State for FEMA mitigation grants, the State may pay the required matching funds. Tribes may also apply to the City for financial assistance.

## 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 as mitigation funds were appropriated to other communities involved in a disaster. However, given the recent federal flood disaster DR-4122 and the increased likelihood of future ice jam floods, the Loudon Tribal Council and the City of Galena decided to develop new goals and retain any pertinent goals from the 2010 Galena HMP (Table 5-4). Since this HMP is multi-jurisdictional, both the Loudon Tribal Council and City of Galena selected and prioritized the 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 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 May 21, 2015, the City of Galena and Loudon Tribal Council reviewed their prior mitigation actions (Table 5-5) and developed future actions (Table 5-6). Mitigation actions are activities, measures, or projects supporting the goals of a mitigation plan.

**Table 5-5 Accomplished Mitigation Actions**

No.	Accomplished Actions from 2010
1	Develop and maintain an inventory for all structures located within 100-year and 500-year floodplains. (Accomplished in 2014)
2	Develop and maintain a map of residential and commercial buildings within 100-year and 500-year floodplains. (Accomplished in 2014)
3	Develop and maintain an inventory of locations subject to frequent storm water flooding based on historical flood data. (Accomplished in 2014)
4	Develop, implement, and enforce floodplain management ordinances, specifically, a two foot above BFE ordinance. (Adopted in 2013)
5	Form an emergency advisory task force. Completed in 2012
6	Implement seismic construction methods. Completed in 2014-15 with home elevations.

**Table 5-6 Mitigation Actions**

Goals		Actions	
No.	Description	ID	Description
1	Reduce the risk of flood damage.	1.1	Acquire (buy-out), relocate, elevate, or otherwise flood-proof public and private buildings. In progress courtesy DR-4122 HMGP funds.
		1.2	Consult the State Floodplain Manager regarding continued compliance with the NFIP.
		1.3	Install, monitor, and maintain streamflow gages upriver and downriver.
		1.4	Extend, elevate, and reinforce the levy along the riverbank. The levy may need a complete rebuild for code compliance.
		1.5	Participate in the RiskMap program.
		1.6	Add culverts where necessary and reinforce existing culverts against washouts.
		1.7	Evaluate, develop, and reinforce access roads against riverine flooding.
		1.8	Evaluate and survey the Campion area as an alternate relocation and development subdivision.

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Goals		Actions	
No.	Description	ID	Description
		1.9	Mitigate the generator building's risk to flooding using any applicable methods to include building a new elevated structure and abandoning the current building in place.
2	Reduce the risk of erosion damage.	2.1	Relocate buildings at risk to erosion.
		2.2	Fully implement riverbank protection methods.
		2.3	Extend and complete the sheet-piling or riprap 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	Utilize educational outreach programs addressing the benefits of mitigating natural hazard events.
5	Develop a coordinated community response to natural disasters.	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.
		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 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.

Goals		Actions	
No.	Description	ID	Description
		7.4	Encourage all future public structure development meets international requirements for seismic protection.
8	Implement HMP goals and actions into other 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.

The City of Galena and the Loudon Tribal Council have 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. Both Galena and Loudon have completed project applications to elevate 51 homes, and repair public infrastructure, 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 May 21, 2015. 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 5-7) 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 5-7      Evaluation Criteria for Mitigation Actions**

<b>Evaluation Category</b>	<b>Discussion "It is important to consider..."</b>	<b>Considerations</b>
<b>Social</b>	The public support for the overall mitigation strategy and specific mitigation actions.	Community acceptance Adversely affects population
<b>Technical</b>	If the mitigation action is technically feasible and if it is the whole or partial solution.	Technical feasibility Long-term solutions Secondary impacts
<b>Administrative</b>	If the community has the appropriate personnel and administrative capabilities or if outside help is necessary.	Staffing Funding allocation Maintenance/operations
<b>Political</b>	Public perceptions related to the environment, economic development, safety, and emergency management.	Political support Local champion Public support
<b>Legal</b>	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
<b>Economic</b>	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
<b>Environmental</b>	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 May 21, 2015, 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 planning team emphasized projects to reduce risk on both planned and current buildings and infrastructure.

The Mitigation Action Priority Matrix arranges goals for the Mitigation Action Plan, (Table 5-8).

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**Table 5-8 Prioritizing Mitigation Actions**

Goals		Rank	Action
1	Reduce the risk of flood damage.	HIGH	1.1 – Acquire (buy out), relocate, elevate, or otherwise flood-proof public and private buildings.
			1.2 – Consult the State Floodplain Manager regarding continued compliance with the NFIP.
			1.3 – Install, monitor, and maintain streamflow gages upriver and downriver.
			1.4– Extend, elevate, and reinforce the levy along the riverbank. The levy may need a complete rebuild for code compliance.
			1.6 – Add culverts where necessary and reinforce existing culverts against washouts.
			1.7 – Evaluate, develop, and reinforce access roads against riverine flooding and washouts.
			1.9 - Mitigate the generator building's risk to flooding using any applicable methods to include building a new elevated structure and abandoning the current building in place.
		LOW	1.5 - Participate in the RiskMap program.
			1.8 – Evaluate and survey the Campion area as an alternate relocation and development subdivision.
2	Reduce the risk of erosion damage.	HIGH	2.1 - Relocate buildings at risk to erosion.
			2.2 - Fully implement riverbank protection methods.
			2.3 - Extend and complete the sheet-piling or riprap lining the riverbank.
3	Reduce the risk of damage from ground failure.	MEDIUM	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.



Goals		Rank	Action
			4.2 – Utilize educational outreach programs addressing the benefits of mitigating natural hazards events.
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.		6.1 – Create fire breaks.
			6.2 – Promote FireWise building design, sites, and construction.
7	Reduce the community's risk to earthquake damage.	LOW	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.
8	Implement HMP goals and actions into other Tribal and City plans and projects.	MEDIUM	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.
		LOW	9.3 - Research available grant opportunities for a backup power system.

## 5.5 Implementing a Mitigation Action Plan

On May 21, 2015, the City of Galena and Loudon Tribal Council reviewed the list, and chose to implement nine mitigation actions into their mitigation action plan. The results are shown in Table 5-9.

**Table 5-9 Mitigation Action Plan**

<b>1.1</b>	<b>Action Item</b>	<b>Acquire (buy out), relocate, elevate, or otherwise flood-proof public and private buildings</b>
	Ranking	High
	Department / Agency	Louden, Galena, DHS&EM, FEMA, USACE, NRCS
	Potential Funding Source	HMGP, DR-4122 & 4094 mitigation, PDM Grants, USACE, NRCS, ANTHC
	Implementation Timeline	1 to 5 years
	Benefit-Costs	This mitigation action reduces the community's flood risk and NFIP insurance rates.
<b>1.2</b>	<b>Action Item</b>	<b>Consult the State Floodplain Manager regarding continued compliance with the NFIP.</b>
	Ranking	High
	Department / Agency	Louden, Galena, DCCED, FEMA
	Potential Funding Source	DHS Preparedness Technical Assistance Program; HMGP; PDM Grants
	Implementation Timeline	1 to 5 years
	Benefit-Costs	This action promotes community involvement in preventing flood damage.
<b>1.3</b>	<b>Action Item</b>	<b>Install, monitor, and maintain streamflow gages upriver and downriver</b>
	Ranking	High
	Department / Agency	Louden, Galena, 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.
<b>1.4</b>	<b>Action Item</b>	<b>Extend, elevate, and reinforce the levy along the riverbank. The levy may need a complete rebuild for code compliance</b>
	Ranking	High
	Department / Agency	Louden, Galena, USACE, NRCS
	Potential Funding Source	USACE, HMPG, Federal / State grants
	Implementation Timeline	1 to 5 years
	Benefit-Costs	Protect evacuation routes and ensure the levy will function properly during a flood event.
<b>1.6</b>	<b>Action Item</b>	<b>Add culverts where necessary and reinforce existing culverts against washouts.</b>
	Ranking	High
	Department / Agency	Louden, Galena, USACE, NRCS
	Potential Funding Source	USACE, HMPG, Federal / State grants
	Implementation Timeline	1 to 5 years
	Benefit-Costs	Protect evacuation routes and ensure the roads won't wash out when flooded.

<b>1.9</b>	<b>Action Item</b>	<b>Mitigate the generator building's risk to flooding using any applicable methods to include building a new elevated structure and abandoning the current building in place.</b>
	Ranking	High
	Department / Agency	Louden, Galena, USACE, NRCS
	Potential Funding Source	USACE, HMPG, Federal / State grants
	Implementation Timeline	1 to 5 years
	Benefit-Costs	Protect the community's power generators during a flood event.
<b>5.6</b>	<b>Action Item</b>	<b>Develop a Small Community Emergency Response Plan (SCERP) with assistance from Alaska State DHS&amp;EM.</b>
	Ranking	High
	Department / Agency	Louden, Galena, 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.
<b>6.1</b>	<b>Action Item</b>	<b>CREATE FIRE BREAKS</b>
	Ranking	High
	Department / Agency	Louden, Galena, DHS&EM, BLM, DNR, FEMA, NRCS, USACE, ANTHC, for profit agencies
	Potential Funding Source	BLM, DNR, FEMA, USACE, NRCS, ANTHC, for profit agencies (buy / trade raw logs)
	Implementation Timeline	1 to 2 years
	Benefit-Costs	An inexpensive and proven method of coordinating local emergency response efforts.
<b>8.2</b>	<b>Action Item</b>	<b>Integrate HMP risk assessments, goals, and actions into capital improvement, emergency management, and community projects.</b>
	Ranking	Medium
	Department / Agency	Louden; Galena, 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 Galena and Loudon planning teams will incorporate it into existing planning mechanisms using the following methods:

- ☐ Integrate the mitigation goals and actions using the City of Galena's regulatory tools. These regulatory tools are identified in Section 5.1 Capability Assessment.
- ☐ Encourage relevant departments and authorities to implement HMP goals and actions into relevant planning mechanisms.
- ☐ Update or amend specific planning mechanisms to integrate HMP goals and principles.

The Loudon Tribal Council may advise the City as appropriate regarding the incorporation of the mitigation strategy into new plans, plan updates, and applicable City ordinances addressing land management and construction (Table 5-1). The City of Galena and the Loudon Tribal Council are responsible for prioritizing their mitigation projects and submitting them for grant programs.

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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**

<b>Activities</b>	<b>HMGP</b>	<b>PDM</b>	<b>FMA</b>
<b>1. Mitigation Projects</b>	✓	✓	✓
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	✓		
<b>2. Hazard Mitigation Planning</b>	✓	✓	✓
<b>3. Management Costs</b>	✓	✓	✓

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 (EHRSA). 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 EHRSA 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 through 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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## **Louden Tribal Council / City of Galena**

### Multi-Jurisdictional Hazard Mitigation Plan 2015

#### Chapter 6. Resources

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## Appendix A

### FEMA Review

Placeholder  
Contingent Upon FEMA Review  
Galena, Alaska

Resolution 2015-?

A resolution of the Louden Tribal Council adopting the Louden Tribal Hazard Mitigation Plan.

WHEREAS the Louden Tribal Council is vulnerable to damages from natural hazard events which pose a threat to public health and safety and could result in property loss and economic hardship;

WHEREAS a Hazard Mitigation Plan has been developed through the work of the Louden Planning Team, and interested parties within the State of Alaska.

WHEREAS the Hazard Mitigation Plan recommends actions to protect people and property at risk from natural hazards. The actions will reduce future public and personal costs of disaster response and recovery, and will reinforce the Louden Tribal Council's leadership in emergency preparedness efforts.

WHEREAS public meetings and surveys were conducted during the formation and adoption of the Louden Tribal Hazard Mitigation Plan.

IT IS THEREFORE RESOLVED by the Louden Tribal Council of Alaska that:

1. The Hazard Mitigation Plan is hereby adopted as an official plan of the Louden Tribal Council.
2. The Louden Planning Team will complete periodic updates of the Hazard Mitigation Plan indicated by the Plan Maintenance Section, but no less frequently than every five years.

PASSED AND APPROVED BY A DULY CONSTITUTED QUORUM OF THE LOUDEN TRIBAL COUNCIL THIS    DAY OF    2014

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Louden Tribal President



## Mitigation Action Progress Report

Page 1 of 3

Progress Report Period: \_\_\_\_\_ to \_\_\_\_\_  
(date) (date)

Project Title: \_\_\_\_\_ Project ID# \_\_\_\_\_

Responsible Agency: \_\_\_\_\_

Address: \_\_\_\_\_

Contact Person: \_\_\_\_\_ Title: \_\_\_\_\_

Phone #(s): \_\_\_\_\_ email address: \_\_\_\_\_

List Supporting Agencies and Contacts:

Total Project Cost: \_\_\_\_\_

Anticipated Cost Overrun/Underrun: \_\_\_\_\_

Date of Project Approval: \_\_\_\_\_ Start date of the project: \_\_\_\_\_

Anticipated completion date: \_\_\_\_\_

Description of the Project (include a description of each phase, if applicable, and the time frame for completing each phase): \_\_\_\_\_

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[illegible]

Plan Goal (s) Addressed: Page 2 of 3

Goal: \_\_\_\_\_

Indicator of Success: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

#### Project Status

☐ Project on schedule

☐ Project completed

☐ Project delayed\*

\*explain: \_\_\_\_\_

\_\_\_\_\_

☐ Project canceled

#### Project Cost Status

☐ Cost unchanged

☐ Cost overrun\*

\*explain: \_\_\_\_\_

\_\_\_\_\_

☐ Cost underrun\*

\*explain: \_\_\_\_\_

\_\_\_\_\_

Summary of progress on project for this report:

A. What was accomplished during this reporting period?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

B. What obstacles, problems, or delays did you encounter, if any?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

C. How was each problem resolved?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Next Steps: What is/are the next step(s) to be accomplished over the next reporting period?

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Other Comments:

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### ***Benefit-Cost Analysis Fact Sheet***

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

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

#### ***All Benefit-Costs must be:***

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

#### ***General Data Requirements:***

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

#### ***Damage and Benefit Data:***

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

***Building Data:***

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

***Use Correct Occupancy Data:***

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

***Questions to Be Answered:***

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

***Common Shortcomings:***

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



# Galena & Loudon Hazard Mitigation Plan Update

May 2015

## *Contact the Planning Team!*

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Mayor  
City of Galena  
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sally.cox@alaska.gov

## We're Updating Our Plan!

The plan update team is reviewing Galena's Hazard Mitigation Plan for 2015.

### Join the Planning Team

Any interested community member may join the plan update team.

### Offer Your Advice

Academia, businesses, and government agencies are encouraged to participate.

Alert us to any new or revised publications for our Mitigation Plan Update.

### Public Meeting

We will hold a council meeting on May 20, 2015 at noon to review our Hazard Mitigation Plan.

For a copy of the current plan, visit the City office or the web at:

<http://commerce.state.ak.us/dnn/dcra/PlanningLandManagement/CommunityPlansAndInfrastructure.aspx>.

### Community Importance

Hazard Mitigation Plans are required by the Federal Emergency Management Agency (FEMA) for disaster mitigation funding. The plans are updated every 5 years.

## What We're Updating

Community Demographics

Planning Process

New Planning Team

Expert Contributors

Public Involvement Strategy

Maps, Figures, and Tables

Hazard Profiles

Incident History

New Hazards

Any Changes in Land Status

Revised Ordinances

Boundary or Zone Revisions

New Construction or Demolition

Vulnerability and Risk Assessment

Incorporates changes to Hazard Profiles and Land Status

Critical Facility and Infrastructure Inventory

Mitigation Strategy

Reflects changes to Hazard Profiles, Land Status, and Vulnerability Assessment

NFIP Information



# Mitigation Planning Resources

## Hazard Mitigation

Alaska State Hazard Mitigation Plan

<http://ready.alaska.gov/plans/documents/Alaska%20HMP%202013%20reduced%20file%20size.pdf>

FEMA Mitigation Planning Guidance

<http://www.fema.gov/plan/mitplanning/resources.shtm>



## Floods

FEMA=Floodsmart <https://www.floodsmart.gov/floodsmart/>

NFIP <https://www.fema.gov/national-flood-insurance-program>

National Weather Service <http://www.weather.gov/>

Alaska Department of Commerce, Community and Economic Development Floodplain Management

<http://commerce.state.ak.us/dnn/dcra/PlanningLandManagement/FloodplainManagement.aspx>

U.S. Army Corps of Engineers -

2204 3rd Street, Elmendorf AFB,

AK 99506 – phone: 907-753-2610 <http://www.poa.usace.army.mil/>



## Wildfires

FEMA - <http://www.fema.gov/hazard/wildfire/index.shtm>

Fire Ready - <http://fireready.com/>

Firewise <http://www.firewise.org/?sso=0>

US Geological Survey (USGS)

[http://www.usgs.gov/natural\\_hazards/#fire](http://www.usgs.gov/natural_hazards/#fire)

Alaska Dept. of Natural

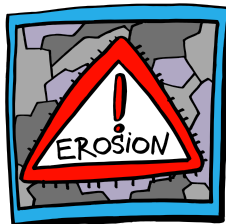
Resources – Division of Forestry

<http://forestry.alaska.gov/fire/current.htm>

## Erosion

US Army Corps of Engineers Alaska Baseline Erosion Assessments

<http://www.poa.usace.army.mil/Library/ReportsandStudies/AlaskaBaselineErosionAssessments.aspx>



## Earthquakes

United States Geological Survey – USGS [http://www.usgs.gov/natural\\_hazards/#eq](http://www.usgs.gov/natural_hazards/#eq)

FEMA <https://www.fema.gov/earthquake>

Alaska Earthquake Information Center

<http://www.aEIC.alaska.edu/>

## Tsunami

FEMA - <http://www.ready.gov/tsunamis>

National Oceanic Atmospheric Administration (NOAA)

<http://ptwc.weather.gov/>

Univ. of Washington -

<http://earthweb.ess.washington.edu/tsunami/index.html>

National Weather Service/West Coast and

Alaska Tsunami Warning Center

<http://wcatwc.arh.noaa.gov/>

## Severe Weather

FEMA - <http://www.ready.gov/winter-weather>

National Weather Service

<http://www.weather.gov/>

National Weather Service (Fairbanks)

<http://pafg.arh.noaa.gov/>

<http://pafg.arh.noaa.gov/>





# Galena & Louden Hazard Mitigation Plan Update

May 2015

## *Contact the Planning Team!*

Nick Hruby  
Lead Planner  
City of Galena  
907-656-1301  
Galena.ltrpm@gmail.com

Scott Nelsen  
State Mitigation Planner  
907-428-7010  
scott.nelsen@alaska.gov

March Runner  
Louden Tribal  
Administrator  
907-656-1711  
March.runner@aol.com

Jon Korda  
Mayor  
City of Galena  
907-269-4588  
sally.cox@alaska.gov

## We're Updating Our Plan!

The plan update team is reviewing Galena's Hazard Mitigation Plan for 2015.

## Public Meeting

We will hold a council meeting on June 9, 2015 at noon to review and approve our draft Hazard Mitigation Plan.

For a copy of the draft plan, visit the City office or the web at:

<http://ready.alaska.gov/plans/localhazmitplans>

## Community Importance

Hazard Mitigation Plans are required by the Federal Emergency Management Agency (FEMA) for disaster mitigation funding. The plans are updated ever 5 years.

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AK 99506 – phone: 907-753-2610 <http://www.poa.usace.army.mil/>



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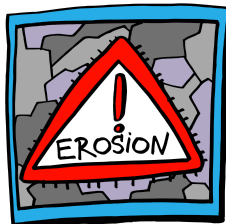
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FEMA <https://www.fema.gov/earthquake>

Alaska Earthquake Information Center

<http://www.aeic.alaska.edu/>

## Tsunami

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National Oceanic Atmospheric Administration (NOAA)

<http://ptwc.weather.gov/>

Univ. of Washington -

<http://earthweb.ess.washington.edu/tsunami/index.html>

National Weather Service/West Coast and

Alaska Tsunami Warning Center

<http://wcatwc.arh.noaa.gov/>

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National Weather Service

<http://www.weather.gov/>

National Weather Service (Fairbanks)

<http://pafg.arh.noaa.gov/>

<http://pafg.arh.noaa.gov/>

# Galena City Council Agenda

Special Meeting

City Hall Conference Room

Thursday, May 21, 2015, 12:00 PM

## Mayor

John Korda

## Council Members

Brad Scotton  
Brian Landrum  
Cecelia Grant  
Erica Cleaver Frankson  
Kenneth Essex  
March Runner

## City Manager

Shanda Huntington

## Long Term Recovery PM

Nick Hruby

### **A. CALL TO ORDER**

### **B. ROLL CALL**

Mayor John Korda, City Manager Shanda Huntington, LTRPM  
Nick Hruby, Brad Scotton, Brian Landrum, Kenneth Essex.

### **C. APPROVAL OF AGENDA**

### **D. NEW BUSINESS**

#### **1. Hazard Mitigation Plan (HMP) Review**

Guest presenter, Scott Nelsen, SOA  
Mitigation Planner.

### **E. AUDIENCE PARTICIPATION**

### **F. COMMISSION COMMENTS**

### **G. SCHEDULE FINAL HMP MEETING**

### **H. ADJOURNMENT**

# Galena City Council Agenda

Special Meeting

City Hall Conference Room

Tuesday, June 9, 2015, 6:00 PM

## Mayor

John Korda

## Council Members

Brad Scotton  
Brian Landrum  
Cecelia Grant  
Erica Cleaver Frankson  
Kenneth Essex  
March Runner

## City Manager

Shanda Huntington

## Long Term Recovery PM

Nick Hruby

### **A. CALL TO ORDER**

### **B. ROLL CALL**

Mayor John Korda, City Manager Shanda Huntington, LTRPM  
Nick Hruby, Brad Scotton, Brian Landrum, Kenneth Essex,  
March Runner

### **C. APPROVAL OF AGENDA**

### **D. NEW BUSINESS**

#### **1. Hazard Mitigation Plan (HMP) Approval**

### **E. AUDIENCE PARTICIPATION**

### **F. COMMISSION COMMENTS**

### **G. SCHEDULE FINAL HMP MEETING**

### **H. ADJOURNMENT**

# **City of Galena**

## **Meeting Minutes**

### **5/21/2015**

#### **General Information:**

The City of Galena Hazard Mitigation Plan was completed in 2010 by a contractor. The Federal Emergency Management Agency (FEMA) requires an update every 5 years. Hazard Mitigation Plans (HMP) are an eligibility requirement for the Hazard Mitigation Grant Program (HMGP), Pre-disaster Mitigation (PDM) grants, and Flood Mitigation Assistance (FMA) grants, all appropriated through FEMA.

#### **Plan Review Session:**

A special council meeting was held on May 21, 2015, at 12:00 pm to review the Hazard Mitigation Plan (HMP). Council members from the Loudon Tribe and the City reviewed their HMPs intending to combine them into a joint local/tribal HMP. Both plans are over 100 pages and only one paper copy of each was available for the council. Scott Nelsen, State mitigation planner, and Nick Hruby, Galena long term recovery manager, had electronic copies on their laptops. The plans were also on the State's website, which greatly helped.

#### **Scope of Changes:**

The council reviewed their goals and projects for progress. DR-4122 provided a substantial amount of mitigation funds for home and critical facility elevations. John Korda noted projects either completed or in progress with a suspense date. Scott Nelsen noted this in the draft HMP. The council suggested additional projects addressing wildfire mitigation and decided to elevate the wildfire risk, probability, and scope. They also added the influence of a changing climate to each hazard and profiled climate change as a stand-alone hazard. Additional changes are as follows:

- Demographics, City and Loudon infrastructure values, home values
- NFIP statistics, land use, and City ordinances
- City and Loudon capabilities and resources update
- Flood scope extended beyond Old Town to the entire community

Scott Nelsen noted the changes and agreed to deliver a draft of the updated HMP to Galena within two weeks. The next plan review session is scheduled for June 9, 2015, at 12:00 pm.

# **City of Galena Meeting Minutes 6/9/2015**

## **General Information:**

The City of Galena and Loudon Tribal Hazard Mitigation Plan Draft was completed by Scott Nelsen, SOA Mitigation Planner, and reviewed by Nick Hruby, LTRPM. The Federal Emergency Management Agency (FEMA) requires an update every 5 years. Hazard Mitigation Plans (HMP) are an eligibility requirement for the Hazard Mitigation Grant Program (HMGP), Pre-disaster Mitigation (PDM) grants, and Flood Mitigation Assistance (FMA) grants, all appropriated through FEMA.

## **Plan Review Session:**

A special council meeting was held on June 9, 2015, at 6:00 pm to review the Hazard Mitigation Plan draft (HMP). Council members from the Loudon Tribe and the City reviewed the HMP draft as a joint local/tribal HMP. The plan is over 100 pages and only two paper copies were available for the council. Nick Hruby, Galena long term recovery manager, had an electronic copy on his laptop. The plan was also on the State's website, which greatly helped.

## **Scope of Changes:**

The council reviewed the draft HMP goals and projects. DR-4122 provided a substantial amount of mitigation funds for home and critical facility elevations. The council reviewed projects listed as completed or in progress. The council approved additional projects addressing wildfire mitigation and the increased wildfire risk, probability, and scope. They also approved the addition climate change factors to each hazard and adding climate change as a stand-alone hazard. Additional changes were approved as follows:

- Demographics, City and Loudon infrastructure values, home values
- NFIP statistics, land use, and City ordinances
- City and Loudon capabilities and resources update
- Flood scope extended beyond Old Town to the entire community

Nick Hruby informed the council they were not required to formally adopt the plan at this time. Instead, they would re-convene and formally adopt the plan after FEMA's formal review. The meeting was adjourned at 7:00 pm.