The City of Nenana
Hazard Mitigation Plan

Prepared by
The City of Nenana
Mitigation Planning Team

September 2010

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

FEMA

September 23, 2010

Honorable Jason Mayrand
Mayor, City of Nenana
P.O. Box 70
Nenana, Alaska 99760

Dear Mayor Mayrand:

The U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) has approved the ***City of Nenana Hazard Mitigation Plan*** as a local plan as outlined in 44 CFR Part 201. With approval of this plan, the City of Nenana is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through September 23, 2015.

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

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

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

Sincerely,

Mark Carey, Director
Mitigation Division

cc: Mark Roberts, Alaska Division of Homeland Security and Emergency Management

Enclosure

BH:bb

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Acronyms/Abbreviations

°F	Degrees Fahrenheit
AFG	Assistance to Firefighters Grant
AHFC	Alaska Housing Finance Corporation
AICC	Alaska Interagency Coordination Center
ANA	Administration for Native Americans
ANTHC	Alaska Native Tribal Health Consortium
APA	American Planning Association
ARC	American Red Cross
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CD	compact disc
CDBG	Community Development Block Grant
cfs	cubit feet per second
CHEMS	Community Health and Emergency Medical Services
CFR	Code of Federal Regulations
City	City of Nenana
DCCED	Department of Commerce, Community, and Economic Development
DCRA	Division of Community and Regional Affairs
DGGS	Division of Geological and Geophysical Survey
DEC	Department of Environmental Conservation
DHSS	Department of Health and Social Services
DHS	Department of Homeland Security
DHS&EM	Division of Homeland Security and Emergency Management
DIP	Ductile Iron Pipe
DMA 2000	Disaster Mitigation Act of 2000
DMVA	Department of Military and Veterans Affairs
DNR	Department of Natural Resources
DOF	Division of Forestry
DOI	Division of Insurance
DOT/PF	Department of Transportation and Public Facilities
DSS	Division of Senior Services
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FMA	Flood Mitigation Assistance
FP&S	Fire Prevention and Safety
ft	feet

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FY	Fiscal Year
g	gravity as a measure of peak ground acceleration
HDPE	High-Density Polyethylene
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HWE	High Water Elevation
HMP	Hazard Mitigation Plan
HUD	Housing and Urban Development
IBHS	Institute for Business and Home Safety
ICDBG	Indian Community Development Block Grant
IHBG	Indian Housing Block Grant
IRS	Internal Revenue Service
M	Magnitude
MMI	Modified Mercalli Intensity
mph	miles per hour
MSL	Mean Sea Level
NAHASDA	Native American Housing Assistance and Self Determination Act
NFIP	National Flood Insurance Program
PDM	Pre-Disaster Mitigation
PGA	peak ground acceleration
PVC	Polyvinyl Chloride
RL	repetitive loss
RFC	Repetitive Flood Claim
ROW	Right-of-Way
SAFER	Staffing for Adequate Fire and Emergency Response
SBA	U.S. Small Business Administration
SHMP	Alaska State Hazard Mitigation Plan
Sq.	Square
SRL	Severe Repetitive Loss
Stafford Act	Robert T. Stafford Disaster Relief and Emergency Assistance Act
STAPLEE	Social, Technical, Administrative, Political, Legal, Economic, and Environmental
URS	URS Corporation
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
US or U.S.	United States
USC	United States Code
USGS	United States Geological Survey

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

1.1 HAZARD MITIGATION PLANNING

Hazard mitigation, as defined in Title 44 of the Code of Federal Regulations (CFR), Part 201.2, is "any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards." Many areas have expanded this definition to also include human-caused hazards. As such, hazard mitigation is any work done to minimize the impacts of any type of hazard event before it occurs. It aims to reduce losses from future disasters. Hazard mitigation is a process in which hazards are identified and profiled, people and facilities at risk are analyzed, and mitigation actions are developed. The implementation of the mitigation actions, which include long-term strategies that may include planning, policy changes, programs, projects, and other activities, is the end result of this process.

1.2 PLANNING REQUIREMENTS

1.2.1 Local Mitigation Plans

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

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

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

1.3 GRANT PROGRAMS WITH MITIGATION PLAN REQUIREMENTS

FEMA Hazard Mitigation Assistance grant programs provide funding to States, Tribes, and local entities that have a FEMA-approved State, Tribal, or Local Mitigation Plan. Two of the grants

are authorized under the Stafford Act and DMA 2000, while the remaining three are authorized under the National Flood Insurance Act and the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act. As of June 19, 2008, the grant programs were segregated. The HMGP is a directly funded competitive disaster grant program. Whereas the Unified Mitigation Assistance Programs: PDM, FMA, RFC, and SRL programs although competitive, rely on specific grant pre-disaster grant funding sources, sharing several common elements.

> *"The Department of Homeland Security (DHS) FEMA Hazard Mitigation Assistance (HMA) grant programs present a critical opportunity to protect individuals and property from natural hazards while simultaneously* ***reducing reliance on Federal disaster funds.*** *The HMA programs provide pre-disaster mitigation grants annually to States, Territories, Tribes, and local communities. The statutory origins of the programs differ, but all share the common goal of reducing the loss of life and property due to natural hazards.*
>
> *The PDM program is authorized by the Stafford Act and focuses on mitigation project and planning activities that address multiple natural hazards, although these activities may also address hazards caused by manmade events. The FMA program, RFC program, and SRL program are authorized by the National Flood Insurance Act, and focus on reducing claims against the NFIP."* (FEMA 2006e)

1.3.1 Hazard Mitigation Assistance (UHMA) Unified Programs

The HMGP provides grants to States, Tribes, and local entities to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. Projects must provide a long-term solution to a problem, for example, elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight the flood. In addition, a project's potential savings must be more than the cost of implementing the project. Funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. The amount of funding available for the HMGP under a particular disaster declaration is limited. FEMA may provide a State or Tribe with up to 20 percent of the total aggregate disaster damage costs to fund HMGP project or planning grants. The cost-share for this grant is 75 percent Federal/25 percent non-Federal.

The PDM grant program provides funds to State, Tribes, and local entities, including universities, for hazard mitigation planning and mitigation project implementation prior to a disaster event. PDM grants are awarded on a nationally competitive basis. Like HMGP funding, a PDM project's potential savings must be more than the cost of implementing the project. In addition, funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. The total amount of PDM funding available is appropriated by Congress on an annual basis. In Fiscal Year (FY) 2008, PDM program funding totaled approximately $54 million. The cost-share for this grant is 75 percent Federal/25 percent non-Federal.

The goal of the FMA grant program is to reduce or eliminate flood insurance claims under the NFIP. Particular emphasis for this program is placed on mitigating repetitive loss (RL) properties. The primary source of funding for this program is the National Flood Insurance Fund. Grant funding is available for three types of grants, including Planning, Project, and Technical Assistance. Project grants, which use the majority of the program's total funding, are awarded to States, Tribes, and local entities to apply mitigation measures to reduce flood losses to properties insured under the NFIP. In FY 2008, FMA funding totaled $32 million. The cost-share for this grant is 75 percent Federal/25 percent non-Federal. However, 90 percent Federal/10 percent non-Federal to mitigate SRL properties is available in certain situations.

The City of Nenana has participated in the National Floodplain Insurance Program (NFIP) since June 9, 1972 with a flood hazard map dated April 2, 1999.

NFIP participation qualifies the City for all five FEMA mitigation grant programs.

The SRL program provides funding to reduce or eliminate the long-term risk of flood damage to residential structures insured under the NFIP. Structures considered for mitigation must have at least four NFIP claim payments over $5,000 each, when at least two such claims have occurred within any 10-year period, and the cumulative amount of such claim payments exceeds $20,000; or for which at least two separate claim payments have been made with the cumulative amount of the building portion of such claims exceeding the value of the property, when two such claims have occurred within any 10-year period. Congress authorized $40 million for FY 2006 and FY 2007, $80 million for FY 2008, and $80 million for FY 2009. The cost-share for this grant is 75 percent Federal/25 percent non-Federal. However, 90 percent Federal/10 percent non-Federal to mitigate SRL properties is available when the State or Tribal plan addresses ways to mitigate SRL properties.

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

1.4 HMP DESCRIPTION

The remainder of this HMP consists of the following sections and appendices:

Prerequisites

Section 2 addresses the prerequisites of plan adoption, which include adoption by the City of Nenana (City). The adoption resolution is included in Appendix B.

Community Description

Section 3 provides a general history and background of the City, including historical trends for population and the demographic and economic conditions that have shaped the area. Trends in land use and development are also discussed. A location figure of the area is included.

Planning Process

Section 4 describes the planning process and identifies the Planning Team Members, the meetings held as part of the planning process, the URS Corporation (URS) consultants, and the key stakeholders within the City and the surrounding area. In addition, this section documents public outreach activities (Appendix C) and the review and incorporation of relevant plans, reports, and other appropriate information.

Hazard Analysis

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

Vulnerability Analysis

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

Mitigation Strategy

Section 7 defines the mitigation strategy which provides a blueprint for reducing the potential losses identified in the vulnerability analysis. The Planning Team developed a list of mitigation goals and potential actions to address the risks facing the City. Mitigation actions include preventive actions, property protection techniques, natural resource protection strategies, structural projects, emergency services, and public information and awareness activities. In the spirit of the new requirements, mitigation strategies were developed encouraging participation with the NFIP and the reduction of flood damage to flood-prone structures.

Plan Maintenance

Section 8 describes the Planning Team's formal plan maintenance process to ensure that the HMP remains an active and applicable document. The process includes monitoring, evaluating (Appendix E), and updating the HMP; implementation through existing planning mechanisms; and continued public involvement.

References

Section 9 lists the reference materials used to prepare this HMP.

Appendix A

Appendix A provides the FEMA crosswalk, which documents compliance with FEMA criteria.

Appendix B

Appendix B provides the adoption resolution for the City.

Appendix C

Appendix C provides public outreach information, including newsletters.

Appendix D

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

Appendix E

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

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2.1 ADOPTION BY LOCAL GOVERNING BODIES AND SUPPORTING DOCUMENTATION

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

DMA 2000 REQUIREMENTS: PREREQUISITES

Local Plan Adoption

Requirement §201.6(c)(5): The local hazard mitigation plan shall include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, Commissioner, Tribal Council).

Element

- Has the local governing body adopted the new or updated plan?
- Is supporting documentation, such as a resolution, included?

Source: FEMA, July 2008.

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

The local governing body of the City adopted the HMP by resolution on August 12, 2010. A scanned copy of the resolution is included in Appendix B.

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

3.1 LOCATION, GEOGRAPHY, AND HISTORY

"*Nenana is located in Interior Alaska, 55 road miles southwest of Fairbanks on the George Parks Highway. Nenana is located at mile 412 of the Alaska Railroad, on the south bank of the Tanana River, just east of the mouth of the Nenana River. It lies 304 road miles northeast of Anchorage. It lies at approximately 64.563890 North Latitude and -149.093060 West Longitude. (Sec. 14, T004S, R008W, Fairbanks Meridian.) Nenana is located in the Nenana Recording District.*" (Division of Community and Regional Affairs [DCRA] 2010)

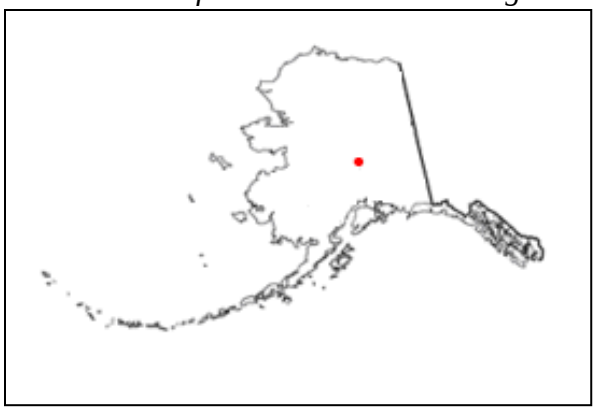

Figure 3-1 Nenana Location Map

The City land covers approximately 6.0 square (sq.) miles and 0.1 sq. miles of water. Extreme temperature changes occur throughout Alaska's interior. The City of Nenana's average winter temperatures range from -19 degrees Fahrenheit (°F) to average summer temperatures of 68 ºF during the summer. Extreme winter low of -69 ºF and an extreme summer high of 98 ºF. The area receives approximately 11.4 inches of rain annually and 49 inches of annual snowfall.

The City of Nenana was originally called Tortella, which stems from the native word "Toghotthele," meaning "mountain that parallels the river." The area has a rich history,

- The Nenana Valley is the site of one of the earliest archaeological sites in North America, dating between about 11,000 and 12,000 years
- 1875 and 1885Marked the arrival of the first non-Native explorers to enter the Tanana Valley; Allen, Harper, and Bates
- The Tanana Village was an established trading point where Russians traded western goods for furs from area tribes and trappers
- 1902 Gold was discovered in Fairbanks which dramatically increased travelers seeking gold. Telegraph line completed from Nenana to Fairbanks.
- 1903 A trading post/roadhouse was constructed by Jim Duke as a trade and supply center for river travelers and local Natives
- 1905 St. Mark's Episcopal Mission and School opened; students came from distant areas to attend such as Minto
- 1908 A post office opened
- 1910 At this time there were about 12,000 residents in the Fairbanks area, most drawn by gold mining activities

- 1915 The Alaska Railroad's construction doubled Nenana's population
- 1917 The Nenana Ice Classic began when surveyors for the Alaska Railroad began to bet on the date and time of the Tanana River ice break-up each spring
- 1921 The City became incorporated.
- 1922 The Alaska Railroad Depot was constructed
- 1923 President Warren Harding drove the "golden spike" at the north end of the 700-foot steel bridge over the Tanana River to symbolize the completion of the railroad link between Fairbanks and Seward
- 1925 Nenana was the beginning of the humanitarian effort to deliver diphtheria serum to Nome during the influenza epidemic in Nome via dogsled. The serum was transported from Anchorage to Nenana by train, then by dogsled from Nenana to Nome
- 1930 The population was recorded at 291
- 1960 Nenana highway completed to Fairbanks
- 1961 Road built from Nenana for civilian contractors to travel to the new Clear Air Force Station construction site.
- 1967 The community was devastated by one of the largest floods ever recorded in the valley
- 1970 The George Parks Highway completed connecting Nenana to Anchorage

(DCRA 2009, Nenana 2006)

3.2 DEMOGRAPHICS

The 2000 census recorded 402 residents, of which the median age was 26.0 indicating a relatively young population. The population of Nenana is expected to grow at the same or accelerated rate because nearly half of the population is between 15 and 44 years of age. Nenana has approximately 53 percent males and 47 percent females in a blended non-native and Athabascan community. About 47.3 percent of residents recognize themselves as Alaska Native. The 2000 census revealed that there are 186 households with the average household having approximately 2.8 individuals. The most recent 2008 DCRA certified population is 479. Figure 3-2 illustrates the historic population of the City.

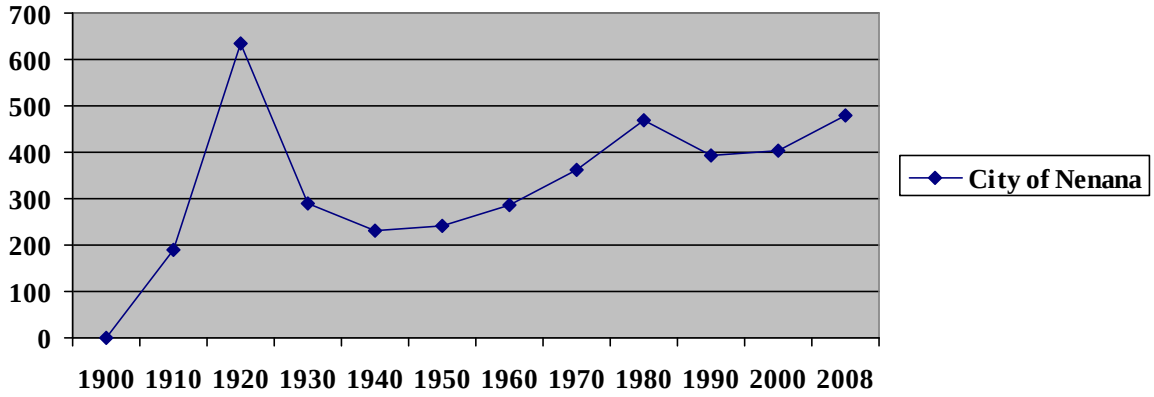

Figure 3-2 Nenana's Historic Population

3.3 ECONOMY

Established government provides full and part-time employment opportunities with the City, Tribe, and the Nenana and Yukon-Koyukuk School Districts. Crowley Marine provides seasonal employment to enable them to supply goods and fuel to over 40 villages along the Tanana and Yukon Rivers when the rivers are ice free (DCRA 2009).

According to the 2000 census, the median household income in Nenana was $33,333. Approximately 82 individuals (17.8 percent) were reported to be living below the poverty level. The potential work force (those aged 16 years or older) in Nenana was estimated to be 356, of which 223 were actively employed. In 2000 the unemployment rate was 14.9 percent; however, this rate included part-time and seasonal jobs, and practical unemployment or underemployment is likely to be significantly higher.

3.4 CULTURAL SITES

There are numerous known cultural sites located close to the city of Nenana as identified in the 2005 Cultural Resource Background, Water and Sewer Master Plan, and the 2006 Nenana Sanitation Master Plan. The plans' state,

> *"There are 15 known sites located within a five-mile radius of the [City]. These sites include Saint Marks Mission, the [paddle wheeler] MV Taku Chief, the Nenana Railroad Depot, St. Theresa's Catholic Church, and the location of the golden spike marking the completion of the Alaska Railroad. Also included are several dwellings, prehistoric artifacts, a fish camp and village site, a native cemetery north of town, and a railroad cemetery"* (Nenana 2006).
>
> *"…Northern Archaic period sites are identified primarily based on side-notched projectile points and steep-angled end scrapers and are found throughout the interior of Alaska and southwestern Yukon. Notched points are reported at five Nenana Valley localities: Dry Creek component IV, below the Big Panguingue site, the Usibelli site, Moose Creek Component IV and at a site above McKinley Park.*

The Athabascan tradition is a prehistoric culture attributed to ancestors of the northern Modern Athabascan Indians, whose archaeological history precedes Euroamerican contact. At present, sites all around the interior Alaska (south of the Brooks Range) dating to at least 2000 years ago and up to AD 1880 are generally attributed to the Athabascan Tradition. It is important to note that the "Athabascan Tradition", in its archaeological denotation, refers to the archaeological culture. In common usage, the Athabascan Tradition continues to the present. Materials of Athabascan sites near the project area are similar to Athabascan sites in interior Alaska containing copper, wood and bone tools, crude pottery, fire-cracked rock, lithic unifaces, bifaces, pecked and ground-stone tools and other lithic flakes…" (Nenana 2005).

Figure 3-3 depicts the City of Nenana's geographic location in conjunction with the Tanana River and the surrounding topography.

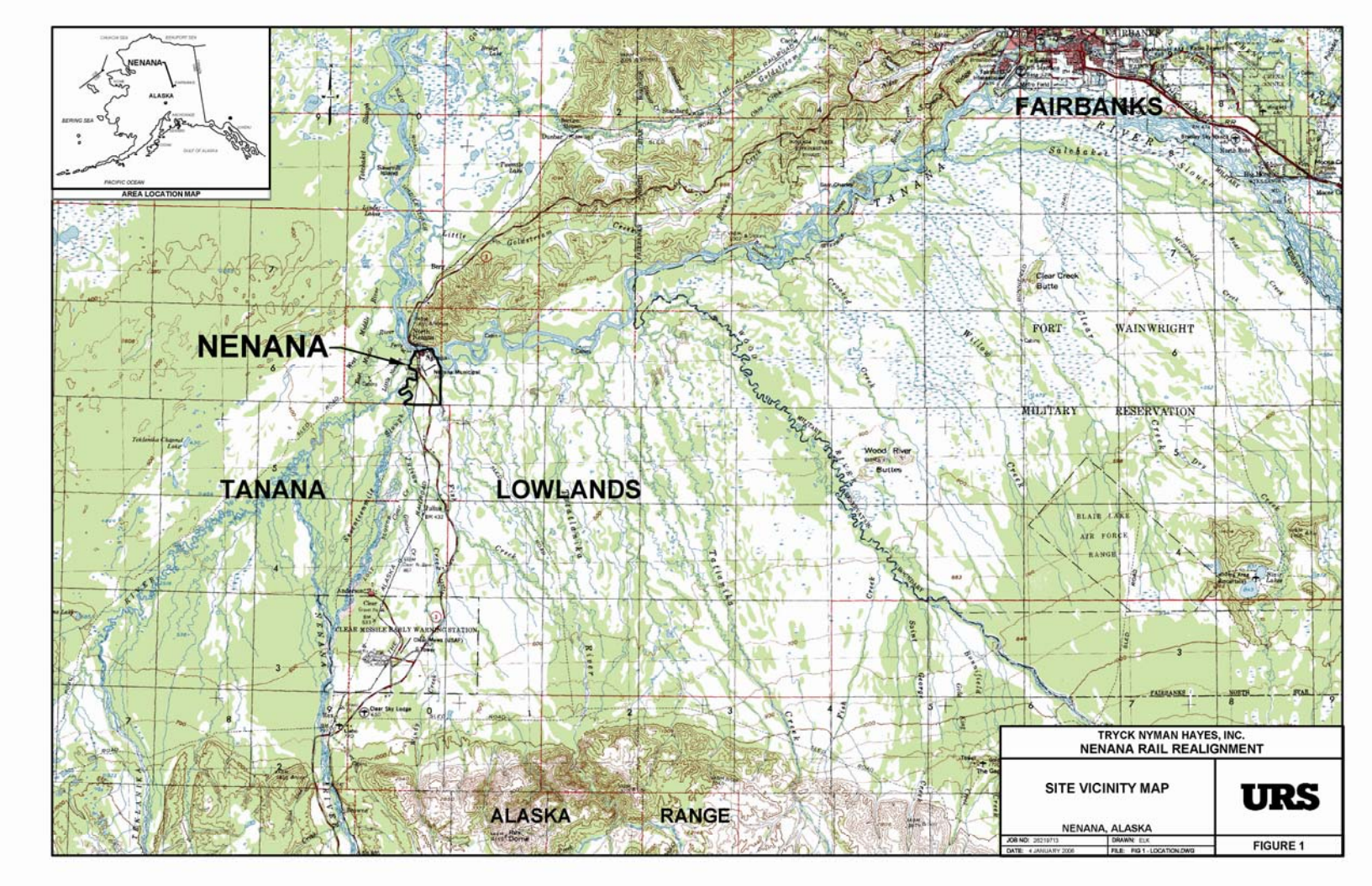

Figure 3-3 Nenana's geologic and topographic area

Figure 3-4 is an aerial photograph of the City, which depicts the confluence of the Nenana (smaller river), and the Tanana (larger river fronting the community) Rivers. The photo is used with permission from the Interior Regional Housing Authority and the Department of Community, Commerce, and Economic Development/Division of Community and Regional Affairs (DCCED/DCRA). The photo was obtained by DCRA as part of their community mapping update efforts.

Figure 3-4 Aerial Photograph of the City of Nenana (DCRA 2009a).

This section provides an overview of the planning process; identifies the Planning Team Members and key stakeholders; documents public outreach efforts; and summarizes the review and incorporation of existing plans, studies, and reports used to develop this HMP. Additional information regarding the Planning Team and public outreach efforts is provided in Appendix C.

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

DMA 2000 Requirements: Planning Process

Local Planning Process

Requirement §201.6(b): An open public involvement process is essential to the development of an effective plan.

In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

Element

- An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
- An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and nonprofit interests to be involved in the planning process; and
- Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Requirement §201.6(c)(1): [The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

Element

- Does the plan provide a narrative description of the process followed to prepare the new or updated plan?
- Does the new or updated plan indicate who was involved in the planning process?
- Does the new or updated plan indicate how the public was involved?
- Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?
- Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?
- *Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process? (Not applicable until 2013 update)*

Source: FEMA, July 2008.

4.1 OVERVIEW OF PLANNING PROCESS

The first step in the planning process began with the Mayor Jason Mayrand as the Planning Team Leader and selected community members working together as the Nenana HMP Planning Team in February 2010. The project's kickoff meeting was held on February 23, 2010. During the meeting, the City identified resources, capabilities, and potential public meeting activities. The role of the Planning Team was discussed to include: acting as an advocate for the planning process, assisting with gathering information, and support for the public meeting and other public participation opportunities. There was also a brief discussion about hazards that affect the community such as earthquake, erosion, floods, permafrost, severe weather, and wildland fire.

The Planning Team distributed a HMP Process focused newsletter on February 26, 2010. The hazard mitigation planning process was described and participants were asked to help identify hazards that affect the City and to also identify critical facilities.

In summary, the following five-step process took place from January 2010 through May, 2010.

1. Organize resources: Members of the Planning Team identified resources, including staff, agencies, and local community members, who could provide technical expertise and historical information needed in the development of the hazard mitigation plan.
2. Assess risks: The Planning Team identified the hazards specific to Nenana, and with the assistance of a hazard mitigation planning consultant (URS), developed the risk assessment for the eight identified hazards. The Planning Team reviewed the risk assessment, including the vulnerability analysis, prior to and during the development of the mitigation strategy.
3. Assess capabilities: The Planning Team reviewed current administrative and technical, legal and regulatory, and fiscal capabilities to determine whether existing provisions and requirements adequately address relevant hazards.
4. Develop a mitigation strategy: After reviewing the risks posed by each hazard, the Planning Team developed a comprehensive range of potential mitigation goals and actions. Subsequently, the Planning Team identified and prioritized the actions to be implemented.
5. Monitor, evaluate, and update the plan: The Planning Team developed a process to ensure the plan was monitored to ensure it was used as intended while fulfilling community needs. The team then developed a process to evaluate the plan to compare how their decisions affected hazard impacts. They then outlined a method to share their successes with community members to encourage support for mitigation activities and to provide data for incorporating mitigation actions into existing planning mechanisms and to provide data for the plans five year update.

4.2 HAZARD MITIGATION PLANNING TEAM

The Planning Team consists of Mayor Mayrand, Gene Jensen, Edna Hancock, Jim Sackett, and Erick Gebhart. The State of Alaska, Division of Homeland Security and Emergency Management (DHS&EM) provided funding and project oversight. URS, DHS&EM's contractor, provided assistance to the Planning Team. Table 4-1 identifies the hazard mitigation Planning Team.

Table 4-1 Hazard Mitigation Planning Team

Name	Title	Organization	Phone
Jason Mayrand	Mayor, Team Leader	City of Nenana	832-5441/5501
Gene Jensen	Fire Chief	City of Nenana	832-5632
Edna Hancock	Tribal Administrator	Nenana Native Association	832-5461
Jim Sackett	President	Toghotthele Corporation	832-5461
Erick Gebhart	Superintendent	Nenana School District	832.5464
Scott Simmons	Planner/Consultant	URS Corporation	562.3366
Laura Young	Planner/Consultant	URS Corporation	562.3366
Mark Roberts	State Hazard Mitigation Officer	DHS&EM	428.7000

Table 4-1 Hazard Mitigation Planning Team

Name	Title	Organization	Phone
Ervin Petty	Mitigation Specialist	Department of Homeland Security & Emergency Management (DHS&EM)	428.7000

4.3 PUBLIC INVOLVEMENT & OPPORTUNITY FOR INTERESTED PARTIES TO PARTICIPATE

Table 4-2 lists the community's public involvement initiatives focused to encourage participation and insight for the HMP effort.

Table 4-2 Public Involvement Mechanisms

Mechanism	Description
Newsletter #1 Distribution (February 2010)	In January 2009, the City distributed a newsletter describing the upcoming planning activity. The newsletter encouraged the whole community to provide hazard and critical facility information. It was posted at the City and Tribal Offices and the Post Office to ensure everyone was aware of the meeting.
Newsletter #2 Distribution	In April 2010, the City distributed a newsletter describing the HMP's progress to date. The newsletter encouraged the public to review and provide comments on the draft plan and the identified mitigation projects to provide the Planning Team. It was posted at the City and Tribal Offices and the Post Office to ensure everyone was aware of the meeting.

An introductory newsletter was developed and placed on the DSH&EM website and was either mailed, faxed, or emailed to relevant academia, nonprofits, and local, state, and federal agencies on February 26, 2010 to introduce the hazard mitigation planning project to the community and other interested parties.

The City worked through a hazard identification and screening exercise and subsequently identified six potential hazards that threaten the City. (earthquake, erosion, flood, permafrost, severe weather, and wildland fire)

Following the hazard screening process, the Planning Team led the attendees through the process of identifying critical facilities in the community. URS also described the specific information needed from the Planning Team and public to complete the risk assessment including the location, value, and population of residents and critical facilities in the community.

After the community asset data was collected by the Planning Team over the spring of 2010, a risk assessment was completed that illustrated the assets that are exposed and vulnerable to specific hazards.

A Planning Team meeting was held on April 6, 2010 to review and prioritize the mitigation actions identified based on the results of the risk assessment. A second newsletter was prepared and delivered describing the process to date, presenting the prioritized mitigation actions, and announcing the availability of the draft HMP for public review and comment.

4.4 INCORPORATION OF EXISTING PLANS AND OTHER RELEVANT INFORMATION

During the planning process, the Planning Team reviewed and incorporated information from existing plans, studies, reports, and technical reports into the HMP. The following were reviewed and used as references for the jurisdiction information and hazard profiles in the risk assessment of the HMP for Nenana:

- *City of Nenana Charter defined the City's governance, staffing, and financial capabilities.*
- *U.S. Army Corps of Engineers, Alaska Baseline Erosion Assessment, Erosion Information Paper – Nenana, Alaska. September 20, 2007 defined the City's erosion threat.*
- *Flood Insurance Study, City of Nenana, Alaska, Unorganized Borough, revised: April 7, 1999 defined the City's flood threat.*
- *Community Wildfire Protection Plan, For At-Risk Communities in the Fairbanks North Star Borough, Alaska, Phase I, 10/30/2006 defined the City's wildfire threat.*
- *City of Nenana Sanitation Master Plan, October 2006 defined the City's soils and Vegetation composition, and the flood, erosion, permafrost, and seismic threats.*
- *Cultural Resource Background, Water and Sewer Master Plan, Nenana, Alaska, March 2005. Prepared by Northern Land Use Research, Inc. provided cultural background and historic site information.*
- *Alaska Railroad Nenana Rail Realignment, Environmental Filed Survey and Preliminary Jurisdictional Determination of Wetlands, Prepared for ARRC by URS Corp, July 2005 provided City topographic, floodplain, and wetlands information.*
- *State of Alaska, Department of Commerce, Community and Economic Development Community Profile Map provided historical and demographic information.*

A complete list of references consulted is provided in Section 9.

This section identifies and profiles the hazards that could affect the City of Nenana.

5.1 OVERVIEW OF A HAZARD ANALYSIS

A hazard analysis includes the identification, screening, and profiling of each hazard. Hazard identification is the process of recognizing the natural events that threaten an area. Natural hazards result from unexpected or uncontrollable natural events of sufficient magnitude. Human and Technological, and Terrorism related hazards are beyond the scope of this plan. Even though a particular hazard may not have occurred in recent history in the study area, all natural hazards that may potentially affect the study area are considered; the hazards that are unlikely to occur or for which the risk of damage is accepted as being very low, are eliminated from consideration.

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

5.2 HAZARD IDENTIFICATION AND SCREENING

The requirements for hazard identification, as stipulated in DMA 2000 and its implementing regulations are described below.

DMA 2000 Requirements: Risk Assessment: Identifying Hazards

Identifying Hazards

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type of all natural hazards that can affect the jurisdiction.

Element

- Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?

Source: FEMA, July 2008.

For the first step of the hazard analysis, in February 2010, the Planning Team reviewed ten possible hazards that could affect the Nenana Recording District. They then evaluated and screened the comprehensive list of potential hazards based on a range of factors, including prior knowledge or perception of their threat and the relative risk presented by each hazard, the ability to mitigate the hazard, and the known or expected availability of information on the hazard (see Table 5-1). The Planning Team determined that six hazards pose the greatest threat to the City: earthquake, erosion, flood, permafrost, severe weather, and wildland fire. The remaining hazards excluded through the screening process were considered to pose a lower threat to life and property in the City due to the low likelihood of occurrence or the low probability that life and property would be significantly affected.

Table 5-1 Identification and Screening of Hazards

Hazard Type	Should It Be Profiled?	Explanation
Avalanche	No	This hazard does not exist for the City.
Earthquake	Yes	Periodic, unpredictable occurrences. Earthquakes damage could threaten approximately 7 houses on the north end of town. Cracks form on the runway.
Erosion	Yes	Riverine erosion by high water flow, ice flows, wind, and surface runoff occur continually.
Flood	Yes	Snowmelt and ice jam flooding occurs during spring thaw. Fall flooding rainy season events occur from soil saturation. Several minor flood events cause damage. Severe damages occur from major floods.
Landslide	No	This hazard does not exist for the City.
Permafrost	Yes	Permafrost is present throughout Alaska and periodically causes very minor and road surface impacts from permafrost thawing and upheaval.
Tsunami & Seiche	No	This hazard does not exist for the City.
Volcano	No	This hazard does not exist for the City.
Weather	Yes	Annual weather patterns, severe cold, freezing rain, snow accumulations are the predominate threats. Severe weather events cause fuel price increases and frozen pipes. Heavy snow loads potentially damage residential, commercial and public facility damages.
Wildland Fires	Yes	The City and the surrounding area become very dry in summer months with weather and human caused incidents igniting dry vegetation (i.e., lightning, trash burning, etc.).

5.3 HAZARD PROFILE

The requirements for hazard profiles, as stipulated in DMA 2000 and its implementing regulations are described below.

DMA 2000 Requirements: Risk Assessment – Profiling Hazards

Profiling Hazards

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Element

- Does the risk assessment identify the location (i.e., geographic area affected) of each natural hazard addressed in the new or updated plan?
- Does the risk assessment identify the extent (i.e., magnitude or severity) of each hazard addressed in the new or updated plan?
- Does the plan provide information on previous occurrences of each hazard addressed in the new or updated plan?
- Does the plan include the probability of future events (i.e., chance of occurrence) for each hazard addressed in the new or updated plan?

Source: FEMA, July 2008.

The specific hazards selected by the Planning Team for profiling have been examined in a methodical manner based on the following factors:

- Nature
- History
- Location
- Extent (to include magnitude and severity)
- Impact (general impacts associated with each hazard are described in the following profiles – detailed impacts to City residents and critical facilities are further described in Section 6 as part of the overall vulnerability summary for each hazard)
- Probability of future events

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

Probability is determined based on historic events to provide the likelihood of a future event.

Table 5-2 Hazard Probability Criteria

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

Similar to estimating probability; magnitude and severity are determined based on historic events using the following criteria:

Table 5-3 Hazard Magnitude/Severity Criteria

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

The hazards profiled for the City are presented in the rest of Section 5.3. The order of presentation does not signify the level of importance or risk.

5.3.1 Earthquake

5.3.1.1 Nature

An earthquake is a sudden motion or trembling caused by a release of strain accumulated within or along the edge of the earth's tectonic plates. The effects of an earthquake can be felt far beyond the site of its occurrence. Earthquakes usually occur without warning and after only a few seconds can cause massive damage and extensive casualties. The most common effect of earthquakes is ground motion, or the vibration or shaking of the ground during an earthquake.

Ground motion generally increases with the amount of energy released and decreases with distance from the fault or epicenter of the earthquake. An earthquake causes waves in the earth's interior (i.e., seismic waves) and along the earth's surface (i.e., surface waves). Two kinds of seismic waves occur: P (primary) waves are longitudinal or compressional waves similar in character to sound waves that cause back and forth oscillation along the direction of travel (vertical motion), and S (secondary) waves, also known as shear waves, are slower than P waves and cause structures to vibrate from side to side (horizontal motion). There are also two types of surface waves: Raleigh waves and Love waves. These waves travel more slowly and typically are significantly less damaging than seismic waves.

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

- **Surface Faulting** is the differential movement of two sides of a fault at the earth's surface. Displacement along faults, both in terms of length and width, varies but can be significant (e.g., up to 20 ft), as can the length of the surface rupture (e.g., up to 200

miles). Surface faulting can cause severe damage to linear structures, including railways, highways, pipelines, and tunnels.

- **Liquefaction** occurs when seismic waves pass through saturated granular soil, distorting its granular structure, and causing some of the empty spaces between granules to collapse. Pore water pressure may also increase sufficiently to cause the soil to behave like a fluid for a brief period and cause deformations. Liquefaction causes lateral spreads (horizontal movements of commonly 10 to 15 ft, but up to 100 ft), flow failures (massive flows of soil, typically hundreds of ft, but up to 12 miles), and loss of bearing strength (soil deformations causing structures to settle or tip). Liquefaction can cause severe damage to property.
- **Landslides/Debris Flows** occur as a result of horizontal seismic inertia forces induced in the slopes by the ground shaking. The most common earthquake-induced landslides include shallow, disrupted landslides such as rock falls, rockslides, and soil slides. Debris flows are created when surface soil on steep slopes becomes totally saturated with water. Once the soil liquefies, it loses the ability to hold together and can flow downhill at very high speeds, taking vegetation and/or structures with it. Slide risks increase after an earthquake during a wet winter.

The severity of an earthquake can be expressed in terms of intensity and magnitude. Intensity is based on the damage and observed effects on people and the natural and built environment. It varies from place to place depending on the location with respect to the earthquake epicenter, which is the point on the earth's surface that is directly above where the earthquake occurred. The severity of intensity generally increases with the amount of energy released and decreases with distance from the fault or epicenter of the earthquake. The scale most often used in the U.S. to measure intensity is the Modified Mercalli Intensity (MMI) Scale. As shown in Table 5-4, the MM Intensity 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) (see Table 5-4). (MMI 2006)

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

Table 5-4 Magnitude / Intensity / Ground-Shaking Comparisons

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

(MMI 2006)

5.3.1.2 History

The Planning Team stated that the City has had significant historical damaging earthquake impacts but few events below M5.0 caused damage. They subsequently decided to only be concerned with earthquake events which exceeded M 5.0. Table 5-5 lists historical earthquakes from 1971 to present which exceeded M 5.0 located within 100 miles of the City. They further stated that M 5.0 earthquakes and below do not induce any major damage due primarily to their community structure types and foundation support system designs.

Table 5-5 Historical Earthquakes for the City of Nenana

(Highlight is earthquake of record)

YEAR	MO	DA	Origin / Time	LAT	LONG	Depth (Miles)	Magnitude	DIST (Miles)
2002	11	8	11/22/74 10:48	63.483	-148.262	3.1	5.1	78.9
2002	11	3	5/22/07 20:38	63.483	-147.846	3.1	5	83.88
2002	11	3	9/25/05 0:00	63.517	-147.444	2.4	7.9	87.6
2002	10	23	8/11/08 10:19	63.514	-147.912	2.4	6.7	80.77
2002	7	5	5/24/49 2:52	63.502	-147.425	0	5.1	88.85
2000	12	6	11/4/03 5:45	63.909	-150.278	11.18	5.3	57.78
2000	11	29	7/2/83 2:38	63.884	-150.15	13.7	5.8	58.54
1995	10	6	3/28/43 12:57	65.170	-148.565	5.6	6.2	44.73
1992	11	1	6/19/25 16:04	64.154	-149.898	0.45	5	37.28
1990	1	7	9/23/01 15:50	64.778	-148.868	0.79	5.5	16.15
1981	12	30	5/24/83 12:00	64.558	-148.089	0.58	5.2	29.82
1983	4	19	8/13/23 21:21	63.371	-149.957	0.61	5.1	86.37

Since 1971, 2802 earthquakes have been recorded within a 100 mile radius of the City. The average magnitude of these earthquakes is 3.15; only 12 exceeded M 5.0. The City was impacted by an M 6.7 Nenana Mountain earthquake on October 23, 2002 and was deemed a precursor to the November 3, 2002, M 7.9 Denali Fault earthquake. The 7.9 event was the largest recorded earthquake within 100 miles of the City. This earthquake occurred along the Denali Fault and caused damage to critical facilities, residences, non-residential buildings, and infrastructure.

North America's strongest recorded earthquake occurred on March 27, 1964 in Prince William Sound, measuring M 9.2 and was felt by many residents throughout Alaska. The City of Nenana felt ground motion resulting from this historic event; however, no local damage occurred.

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

Location

The entire geographic area of Alaska, including the City of Nenana, is prone to earthquake effects. The City of Nenana lies within seismic zone 3, approximately 89 miles from the Denali Fault which has generated numerous earthquakes affecting the City.

> *"Any structures constructed in [Nenana] must be designed to the standards for this zone. It is unlikely that below ground structures will be impacted by UBC requirements, but all above ground structures [are] required to comply with seismic structural details for Zone 3"* (Nenana 2006).

Figure 5-1 shows the locations of active and potentially active faults in Alaska.

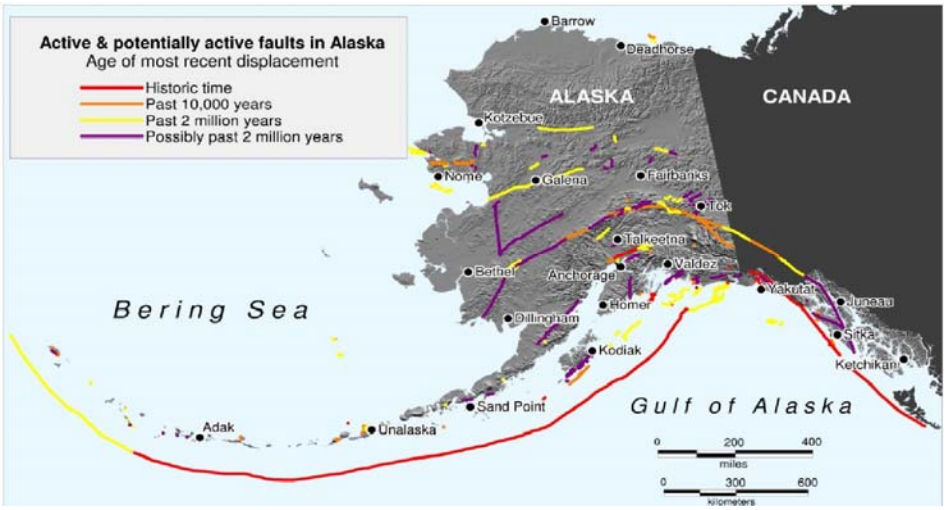

Figure 5-1 Active and Potentially Active Faults in Alaska

The Department of Geological and Geophysical Survey (DGGS) Neotectonic Map of Alaska (Figure 5-2) depicts Alaska's known earthquake fault locations. Numerous faults are depicted on this map such as the Stevens Creek Fault Zone located north of the city and many minor faults that are located south of the City adjacent to the Denali Fault They predominately run northeast by southwest. The DGGS states,

> *"The Neotectonic Map of Alaska is the most comprehensive overview of Alaskan Neotectonics published to date; however, users of this map should be aware of the*

fact the map represents the author's understanding of Alaskan Neotectonics at the time of publication. Since publication of the Neotectonic map, our understanding of Alaskan Neotectonics has changed and earthquakes have continued to occur. For example, M7.9 Denali fault earthquake ruptured three faults, including the Susitna Glacier fault, which was previously undiscovered and is not included on this map" (DGGS 2009).

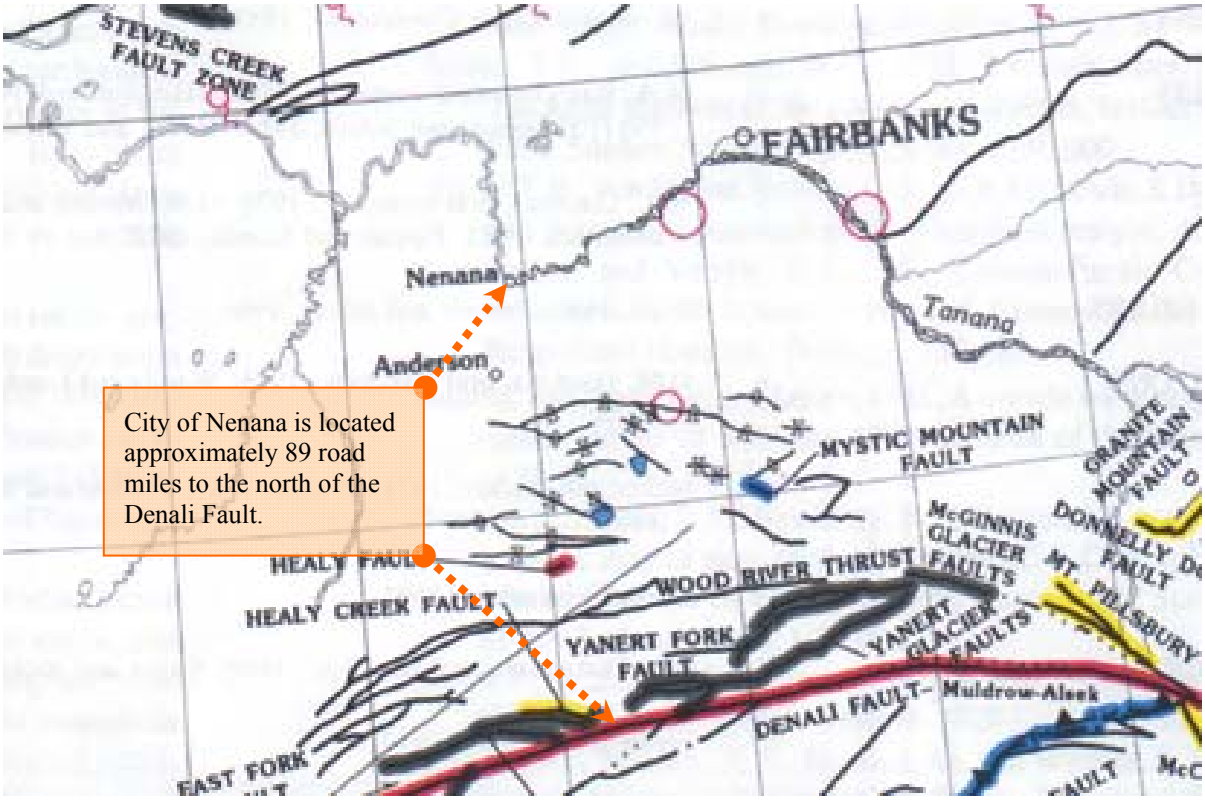

Figure 5-2 City of Nenana's Relationship to the Denali Fault (DGGS 2009)

The City experienced two events that occurred relatively close together (time and location) the M 6.7 Nenana Mountain (located approximately 81 miles southeast of the City) and the M 7.9 Denali Fault (located 87.6 miles southeast of the City) earthquakes. There were over 1,000 after shocks from the Nenana Mountain event and over 35,000 aftershocks generated from the Denali Fault event. The number of aftershocks for each event was high; however, the United States Geologic Survey (USGS) lists only 25 events which exceeded M 2.9 (UAF 2002).

Of the 2802 USGS recorded earthquakes since 1971; twelve exceeded M 5.0 (USGS 2007).

Extent

The University of Alaska Fairbanks, Alaska Earthquake Information Center (AEIC) states,

"The largest inland earthquake in North America in almost 150 years struck Alaska on November 3, 2002. It ruptured three different faults ending with a total rupture length of ~330 km. It started on the previously unrecognized Susitna Glacier Thrust fault, a splay fault south of the McKinley strand of the Denali fault system (DFS). Then the rupture transferred onto the main strand of the DFS and

continued as a right-lateral strike-slip event for ~220 km until it reached the Totschunda fault near 143°W longitude. At that point, it right-stepped onto the more south-easterly trending Totschunda fault and stopped after rupturing nearly 70 km of it.

…The estimated magnitude of this earthquake ranges from the body wave magnitude (m_b) of 7.0 to the moment magnitude (M_W) of 7.9 to the surface wave magnitude (M_S) of 8.5. While the fault rupture lasted for approximately 100 sec from its initiation to the arrest, its [aftershocks] were felt for many days. Of the population centers, the hardest hit were the villages of Mentasta and Northway, located at the eastern end of the rupture zone. This event caused significant damage to the transportation systems in central Alaska. The Trans-Alaska Pipeline suffered some damage, but no oil spills occurred. Multiple land slides and rock avalanches occurred in the Alaska Range with the largest slide on the Black Rapids Glacier. The Denali Fault event was felt as far as Washington and caused seiches in pools and lakes as far as Texas and Louisiana. There were reports of triggered seismicity in volcanic and geothermal centers in Washington and California and regional seismicity in Utah. The M 7.9 Denali Fault event was preceded by the magnitude 6.7 Nenana Mountain event on October 23, 2002. Its epicenter was located on the Denali fault 22 km [west] of the M 7.9 event epicenter. In response to the magnitude 6.7 and 7.9 events, the Alaska Earthquake Information Center (AEIC) staff installed a network of temporary instruments for the aftershock monitoring. The temporary network was dismantled in June, 2003" (UAF 2002).

Earthquakes felt in Nenana area have generally not exceeded M 5.0 in the past 38 years, excluding the Nenana Mountain and Denali Fault events.

Based on historic earthquake events and the criteria identified in Table 5-3, the magnitude and severity of earthquake impacts in Nenana are considered limited with minor injuries, with critical facilities shutdown for more than one week with more than 10 percent of property is severely damaged, and little to no permanent damage to transportation or infrastructure or the economy.

Impact

The City is located in an area that has become more active in recent history than others in the Interior of the State.

The City experienced a variety of impacts from the Denali Fault earthquake. Residential, commercial, and public structure impacts included intense, severe shaking. Everything not secured fell to the floor, fuel drums were shaken from their support systems causing minor fuel losses, and isolated locations experienced subsidence related settling due to the high water table. Overall, the City received "…moderate damages to the community… [with] lots of broken household items. [The City's] water and sewer mains broke as well as [the event creating] some pretty severe surface cracking on the main roadway of the airport" (Nenana 2010).

Impacts to the community such as significant ground movement that may result in infrastructure damage are not expected. Intense shaking may be seen or felt based on past events. Impacts to future populations, residences, critical facilities, and infrastructure are anticipated to remain the same.

Probability of Future Events

The City has received significant earthquake activity resulting in damage or injuries. While it is not possible to predict when an earthquake will occur, Figure 5-3 was generated using the USGS Earthquake Mapping model and indicates approximately a 100 percent probability (1 in I year chance) of an M 5.0 or greater earthquake occurring within 10 years and 31 miles of the City.

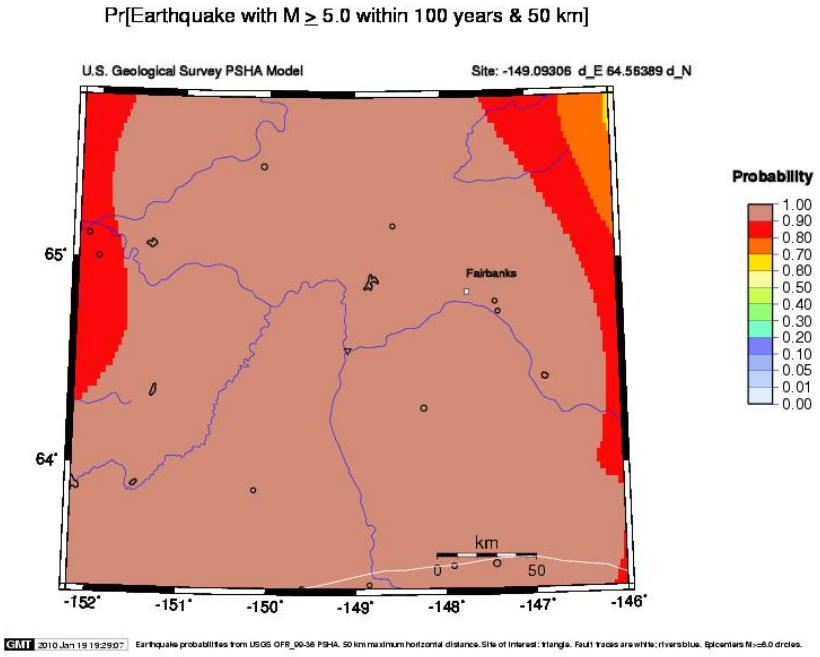

Figure 5-3 Nenana Earthquake Probability (USGS 2010)

This 2002 shake map is the most current map available for this area. However, it is a viable representation to support probability inquiries. According to Peter Haeussler, USGS, Alaska Region:

> *"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. For… [the City of Nenana], I don't think anything has changed"* (Haeussler, 2009).

5.3.2 Erosion

5.3.2.1 Nature

Erosion rarely causes death or injury. However, erosion causes the destruction of property, development and infrastructure. Erosion is the wearing away, transportation, and movement of land. Erosion is usually gradual but can occur rapidly as the result of floods, storms, and other events or slowly as the result of long-term environmental changes. Erosion is a natural process, but its effects can be exacerbated by human activity.

Erosion is a problem in developed areas where the disappearing land threatens development and infrastructure. Only riverine erosion affects human activity in the City.

Riverine erosion results from the force of flowing water and ice formations in and adjacent to river channels. This erosion affects the bed and banks of the channel and can alter or preclude any channel navigation or riverbank development. In less stable braided channel reaches, erosion, and deposition of material are a constant issue. In more stable meandering channels, episodes of erosion may only occur occasionally.

The City is located at the confluence of the Tanana and Nenana Rivers. "The banks of the Tanana River [the larger of the two] are used for a number of community activities and land use, including access ramps for boats, snow machines and ATVs; cultural and social events; recreation, and residences and associated out-buildings." (USACE 2009b)

5.3.2.2 History

The City's Planning Team stated that erosion incidents occur during spring and fall high water flood events and from spring break-up ice scour (Nenana 2010).

The Nenana Sanitation Plan states,

> *"The community of Nenana is threatened by erosion from the Tanana River. A study completed in 1986 assessed erosion control at the end of the airport runway—upstream from Nenana on the Tanana River. The river eroded several hundred feet of stream bank in this area (approximately 30 feet per year) and was threatening the end of the runway. Placing riprap in the affected area controlled erosion. For many years dumping junk cars and other items off the bank has unofficially controlled erosion in other parts of Nenana"* (Nenana 2006).

The USACE Alaska Baseline Erosion Assessment, Erosion Information Paper for the City of Nenana dated September 30, 2007 further states,

> *"Factors causing or contributing to the ongoing erosion problems in Nenana are primarily riverine related processes occurring on the Tanana River, including natural river flow, changes in channel geomorphology, flooding, ice jams, and spring-breakup. The community was devastated by floods in 1961 and 1962, when the Tanana River cut a new channel, causing erosion and drainage problems. In the 1984 Alaska Task Force on Erosion Report, Alaska Department of Transportation and Public Facilities (DOT&PF) estimated that the erosion area of concern for Nenana was located between the Alaska Railroad bridge crossing the Tanana River and upstream approximately 5,000 linear feet to the airport. In this area, and farther upstream, the Tanana River makes a large bend. Sand and silt are eroding from the outside of this bend at a rapid rate, leaving the exposed bank 6 to 10 feet high at low stages. The river can overtop the bank as much as 2 to 3 feet when the river is at flood stage. Silt transport during high stages and sloughing of saturated bank materials as the river stage drops causes erosion during floods"* (USACE 2009b).

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

Location

Riverine erosion hazards have historically affected the City during flood events due to high water flow rates, spring break-up, ice scour, and melting permafrost. The City's riverbanks are essential to the lives of the residents and are susceptible to the effects of erosion.

Major Jason Mayrand stated, "The lower shipyard and fuel storage area on the Nenana River side of town is in danger from erosion. We are currently working with an engineer and hydrologist to design a strategy to rectify the issue. Funding will be needed to execute the project though…" There is also approximately 15,000 ft of road, and 2,000 ft of land embankment threatened by erosion indicated in red in the below photo.

Figure 5-4 is an aerial photo showing the City's proximity to the Tanana and Nenana River confluence and the identified erosion area. The Tanana River is the larger river upon which the majority of the City's infrastructure is located.

> *"[The] Alaska Department of Transportation and Public Facilities (DOT/PF) estimated that the erosion area of concern for Nenana was located between the Alaska Railroad bridge crossing the Tanana River and upstream approximately 5,000 linear feet to the airport [red line indicates this location]… Sand and silt are eroding from the outside of this bend at a rapid rate, leaving the exposed bank 6 to 10 feet high at low stages. The river can overtop the bank as much as 2 to 3 feet when the river is at flood stage. Silt transport during high stages and sloughing of saturated bank materials as the river stage drops causes erosion during floods"* (USACE 2009b).

> *"The City is threatened by erosion from the Tanana River. A study completed in 1986 assessed erosion control at the end of the airport runway—upstream from Nenana on the Tanana River. The river eroded several hundred feet of stream bank in this area (approximately 30 feet per year) and was threatening the end of the runway. Placing riprap in the affected area controlled erosion. For many years dumping junk cars and other items off the bank has unofficially controlled erosion in other parts of Nenana."* (TNH 2005).

Figure 5-4 Aerial Photo of the City of Nenana

Extent

A variety of natural and human-induced factors influence the erosion process within the community. River orientation and proximity to up and downstream river bends can influence erosion rates. Embankment composition also influences erosion rates, as sand and silt will erode easily, whereas boulders or large rocks are more erosion resistant. Other factors that may influence riverine erosion include:

- Geomorphology
- Amount of encroachment in the high hazard zone
- Proximity to erosion inducing structures
- Nature of the topography
- Density of development
- Structure types along the embankment
- Embankment elevation

Erosion in the City usually removes small areas at a time. Significant events can cause infrastructure and homes to fall into the river. Erosion sites have also been noted to be less than 100 ft from important structures and critical facilities. "According to the [USACE] survey, the community estimates that the present erosion area is about 2,000 feet in length and, ongoing erosion is occurring typically at the rate of 20 feet per year. If erosion continues at this rate, future development of Nenana Village land, as well as a new road, will be at risk" (USACE 2009b).

The USACE Alaska Baseline Erosion Assessment for the City gave a "Monitor Conditions" classification to the City's erosion threat.

> *"The community … has reported significant impacts related to erosion but the impacts are not likely to affect the viability of the community. The erosion issue may warrant Federal, State, or other intervention. A Monitor Conditions Community should be watched. Taking action in a Monitor Conditions Community to prevent a problem from becoming worse would be prudent…*
>
> *In a cooperative effort among the [Bureau of Indian Affairs]BIA, the Village of Nenana, and NRCS, NRCS designed a series of stream barbs to stabilize approximately 3,000 feet of the Tanana River bank at Nenana. This project was funded by the BIA. The NRCS contribution was technical design and assistance with construction inspection. Although the cost of this 2009 project is not available, NRCS reports the expense was much smaller than for the two examples above"* (USACE 2009a).

Based on past events, the 2009 USACE Alaska Erosion Assessment, and the criteria identified in Table 5-3, the magnitude and severity of erosion impacts in the City are considered limited with the potential for critical facilities to be shutdown for 24 hours or less, and less than 10 percent of property or critical infrastructure being severely damaged.

Impact

Impacts from erosion include loss of land and any development on that land. Erosion can cause increased sedimentation of river deltas and hinder channel navigation—affecting marine transport. Other impacts include reduction in water quality due to high sediment loads, loss of

native aquatic habitats, damage to public utilities (fuel headers and electric and water/wastewater utilities), and economic impacts associated with costs trying to prevent or control erosion sites.

The City of Nenana has experienced severe flood events which bring high river flow rates and subsequent flooding and embankment erosion. The USACE Alaska Baseline Erosion Assessment, Erosion Information Paper for the City states,

> *"In the past years the community has installed the following protective measures to help control damage from erosion: (a) riprap placed along the Tanana River near the northeast end of the airstrip, at a cost of $800,000; (b) stream barbs (six) installed along the river by the Bureau of Indians Affairs (BIA); and (c) junk car bodies and other debris installed along the bank.*
>
> *The community reported that of the measures tried so far, placing rip rap has had the most success. However, more riprap is needed along more of the bank. Stream barbs have had limited success; with the downstream portion of the bank being more protected by the barbs than the upstream portion, where the stream barbs have failed and about 15 feet of bank has been lost. The community reported that the BIA is planning to install another stream barb during winter, 2007. According to the community, the BIA favors the use of stream barbs, since rip rap is more expensive. Car bodies and other debris have not been effective"* (USACE 2009b).

Probability of Future Events

Based on the Planning Team's statements concerning previous occurrences, the USACE Baseline Erosion Assessment, and the criteria identified in Table 5-2, it is likely that erosion will occur in the next three years (event has up to 1 in 3 years chance of occurring) as the history of events is greater than 20 percent but less than or equal to 33 percent likely per year.

5.3.3 Flood

5.3.3.1 Nature

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

Four primary types of flooding occur in the City including: rainfall-runoff floods; snowmelt floods; ice jam floods.

Rainfall-runoff Flood

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. This type of flood event generally results from weather systems that have associated prolonged rainfall.

Snowmelt Flood

Snowmelt floods typically occur in spring or early summer. The depths of the snowpack and spring weather patterns influence the magnitude of flooding.

Ice Jam Flood

Ice jam floods occur after an ice jam develops; thus, this type of flood can occur any time of the year that a river has ice on it. Ice jams restrict water flow on a river or stream and form during the following three situations:

- fall freeze up
- midwinter when stream channels freeze forming anchor ice
- spring break-up (i.e., when the existing ice cover is broken into pieces that block flowing water at bridges or other constrictions)

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

Water levels increase upstream behind the location of the ice jam. The result is flooding of an area by creating a lake-like effect covering a large area. Little damage typically occurs from the water current upstream of the ice jam, but significant damage can result from flooding. However, the downstream effect is very different. As soon as the ice jam is breached there is usually rapid draining of the dammed water. Downstream water levels rise substantially after the ice jam is breached and strong water currents are created, which can cause erosion and other significant damages. Additionally, the rising water causes the ice to float while increased velocities of water move the ice further downstream. The motion of large solid ice blocks is often destructive to natural and material property in the vicinities. When ice jams cause flood events during spring break-up, snowmelt can contribute to the flood. Notable large floods in recent years on the Kenai, Susitna, Kuskokwim, and Yukon rivers were all caused by ice jams and snowmelt.

Ice Overflow (Aufeis) Flood

Aufeis is glaciation or icing of streams and rivers, affecting road surfaces and infrastructure. Aufeis forms during the winter when emerging ground water freezes. Stream glacial flooding occurs when ice forms from the bottom up not from the top down forcing water out of the stream channel. If aufeis occurs on a roadway, it makes travel difficult. For example, the Steese Highway frequently has an aufeis problem in the winter months. In the mid 1980s, several homes in Fox suffered from an aufeis event occurring at the wellhead. The homes flooded 6 ft deep, then froze.

Timing of events

Many floods are predictable based on rainfall patterns. Most of the annual precipitation is received from April through October with August being the wettest. This rainfall leads to flooding in early/late summer and/or fall. Spring snowmelt increases runoff, which can cause flooding. It also breaks the winter ice cover, which causes localized ice-jam floods.

The City's primary flood threat occurs during July through August from summer rainfall events as supported by the City's USGS streamflow gauges. There flood impacts are amazingly consistent. (See Figure 5-7 and 5-8)

5.3.3.2 History

The City is an active participant in the National Flood Insurance Program (NFIP) since 1972 due to repeated flooding impacts.

> *"Flooding in the City of Nenana occurs every few years when the stage of the Tanana River is high. The flood of record … was caused by excessive summer rainfall…in August 1967…This flood inundated the entire City and was directly attributed to a heavy rainstorm…"* (FEMA 1999).
>
> *"At the Railroad Bridge near Nenana, the bankfull stage is 350 feet above mean sea level (MSL) at which point the Tanana carries 75,000 cubic feet per second (cfs). Damaging floods have occurred in 1948, 1949, 1961, 1962, and 1967. The flood stage during August 1967 was 357 feet MSL"* (Nenana 2006).

The Tanana River flooded the City for ten days from the end of July through early August 1967 resulting in the City's flood of record (186,000 cubic feet per second [cfs]). The following flood gage flow charts (Figures 5-6 and 5-7) demonstrate the City's annually recurring July-August flood events (chart peaks) which are caused by rain fall and glacier melting events. It is important to note that peak events occur very regularly. The blue circle indicates the peak events for each chart.

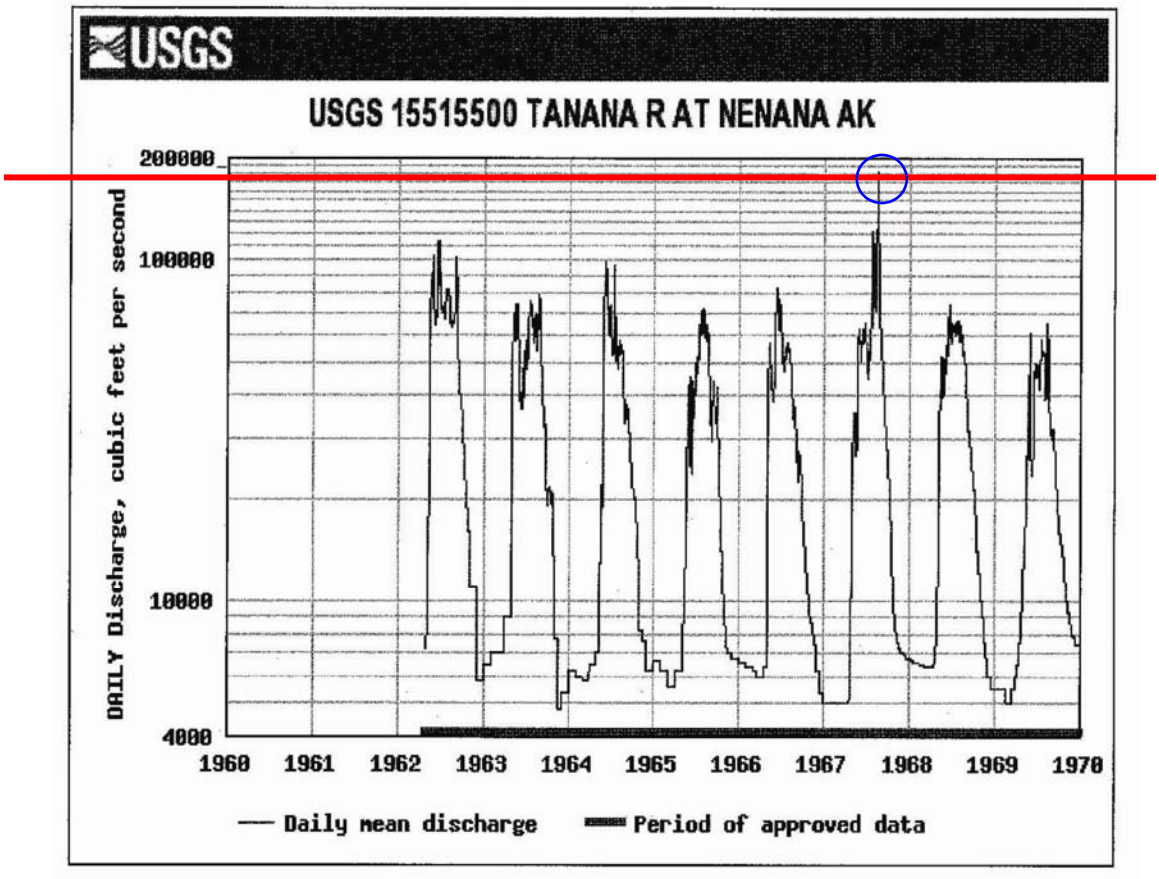

Figure 5-6 River Flow Rate, 1960 through 1978 (USGS 2010)

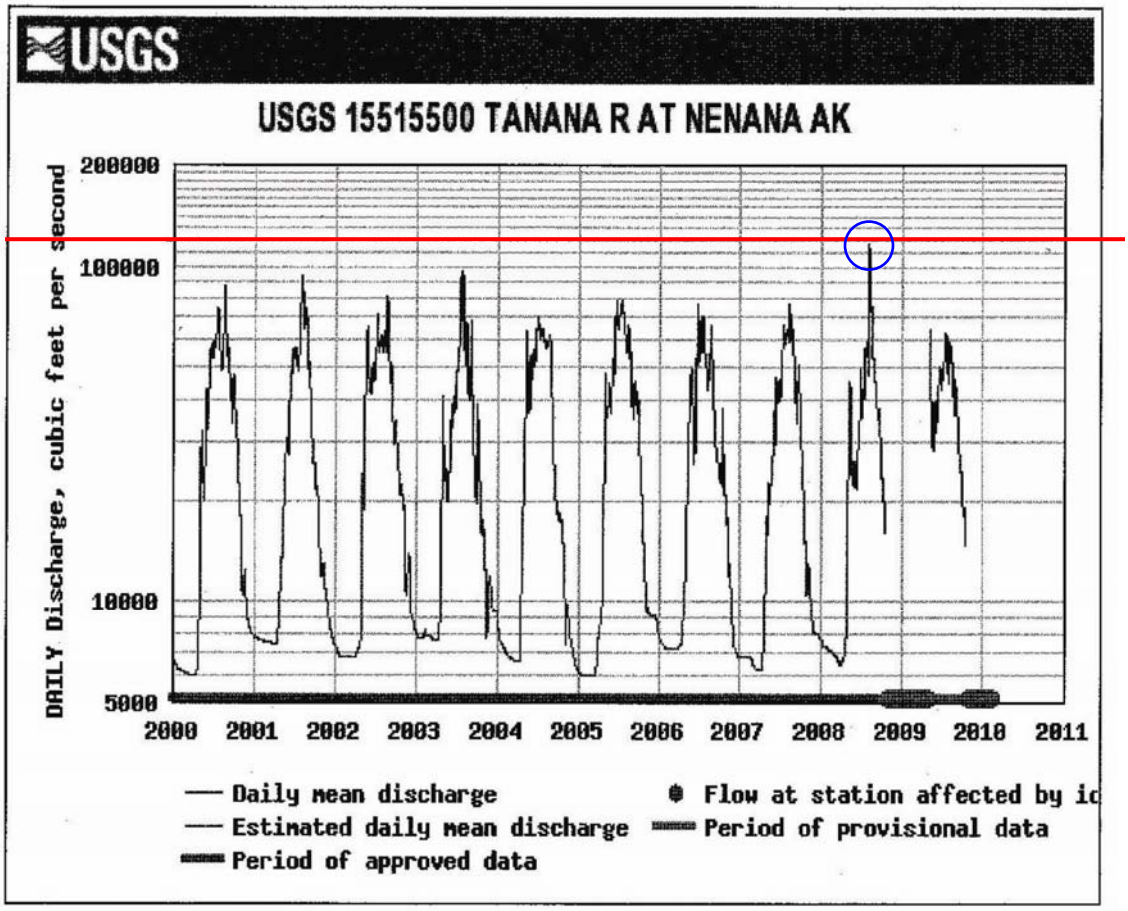

Figure 5-7 River Flow Rate, 2000 through 2009 (USGS 2010)

Table 5-6 lists historical flood events (where data was available) affecting the City of Nenana.

Table 5-6 Historical Flood Events

AK Zone(s)	Location(s)	Date(s)	Event	Description
	Nenana	07/67 to 08/67	Heavy Rain Induced Flood	The flood of record for the City of Nenana. Nearly 200,000 cfs water flow, exceeded bank capacity.
	Central Tanana Valley and Yukon/Tanana Uplands	6/15-18/1984	Heavy Rain Induced Flood	An unstable generated air mass brought scattered showers which stalled with rainfall becoming heavier over portions of the Tanana River Valley. Minor flooding occurred downstream on the Tanana River at Nenana; no homes were actually flooded, but water was high in some basements and on some roads near the river. The high water went done on 6/18.
007	Tanana	08/1-	Heavy Rain Induced	Rain of up to 8.5 inches of total rainfall occurred over the upper Valley. The Tanana

Table 5-6 Historical Flood Events

AK Zone(s)	Location(s)	Date(s)	Event	Description
	Valley	17/1997	Flood	crested at Rosie Creek...at Nenana, high river levels caused groundwater seepage.
221,222, 223, 224,	Tanana Valley	7/31-8/5/2008	Heavy Rain Induced Flood	The Tanana River went above flood stage on the evening of the 30th, flooded the City of Nenana from 7/31-8/5. Estimated damages for the entire affected area: $267,000,000. Damages of the City of Nenana: $2M: City of Nenana $34K: Nenana School District $28K: Native Village of Nenana $270K Alaska Railroad Corporation (ARRC) $330K Individual Assistance ($5K per person)

(Lingaas 2010)

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

Location

The entire City is inundated by summer rain induce flooding. The City continually seeks to bring their flood impacts to the attention of the USACE, and State agencies. Flood damages for the City are persistent as described in the City's request in March 1963 to the US Army Engineers (USAE - now the USACE) requesting the USAE develop a project to,

> *"…alter the river channel, stabilize the banks, and provide mitable drainage and flood protection… The entire townsite of Nenana was flooded in the early summer of 1961 and again in 1962. The water remained in the town and did not drain away for many weeks.*
>
> *The water seemed to enter from the southeast when the Tanana River was high. A number of years ago the Hartwell Slough was converted to a drainage ditch for the F.A.A. Airport. When the river is high, the water runs up this ditch and enters the town. Once, when the Nenana River was high, the water entered the town through a railroad bridge and culverts in the Nenana-Clear Highway. The railroad and highway form a dike around three sides of the town, holding the water inside.*
>
> *The river bank has bee cutting back upstream from the town and a sandbar has been developing in the Nenana Park area"* (Nenana 1963).

The Tryck-Nyman-Hayes Phase I Environmental Site Assessment for the Alaska Railroad Corporation states,

> *"The City of Nenana is located at the confluence of the Nenana and Tanana Rivers and is subject to flooding. Above Nenana the Tanana River drains an area approximately 27,500 square miles. Both rivers carry low capacities during winter when runoff is low and increase capacity in the spring after breakup. Rains during July and August create additional hydrograph peaks. At the Railroad Bridge near Nenana, the bankfull stage is 350 feet above mean sea level (MSL) at which point the Tanana carries 75,000 cubic feet per second (cfs). Damaging floods have occurred in 1948, 1949, 1961, 1962, and 1967. The flood stage during August 1967 was 357 feet MSL. It is estimated the 100-year flood*

> *has a stage of 359 feet MSL at the Railroad Bridge; an elevation which includes the City of Nenana (Lutes, 1968)"* (TNH 2005).

The 2005 Environmental Assessment for the Nenana area determined the entire community is susceptible to flood impacts due to its location on the southeast side of the confluence of the Nenana and Tanana Rivers with the majority of the City's built infrastructure located on relatively low lying, historical floodplain.

> *"Information on general site hydrology was interpreted from air photos and from FEMA floodplain maps of the area. Virtually all of the project area is within the 100-year floodplain of the Nenana and Tanana rivers (FEMA, 2003). Observations of old flood debris throughout much of the low lying portions of the project area, likely from the 1967 flood event, support the flooding designations on the FEMA map. Observations of wetland hydrology were primarily based on the presence of inundated or saturated soils, landscape position, oxidized or reduced root channels, or sediment and debris deposits from previous flooding…*
>
> *Forested wetlands can provide important hydrologic functions by storing floodwater and moderating water release back into the system. The Tanana and Nenana Rivers often reach flood stage. Evidence of historical flood events was observed from decayed woody debris patterns piled against mature tree stands in several forested wetland areas. The opportunity of the area to provide these functions is limited by the higher elevation of the project area compared with Tanana River and a shallow dike just south of the Nenana Loop, specifically installed during the mid 1940s to reduce flooding of this area. As a result, only the highest flood events, such as the 1967 flood, would bring floodwater into the … City of Nenana over the shallow dike... Overall the floodwater functions of these wetlands to protect the City of Nenana or the Nenana Airport would be considered low"* (ARRC 2005).

The Nenana Sanitation Plan states the upper section of the City is susceptible to river flood inundation and the lower section has an historical but a much reduced current flood threat.

> *"The upper portion of town is described as abandoned floodplain alluvium "Chiefly 10 to 20 feet of overbank sandy silt and silty sand overlying sandy riverbed gravel beneath surfaces subject to rare inundations by streams; overbank sequences contain organic-silt channel-fills 7 to 20 feet thick; generally frozen." The lower portion of town is described as stream terrace alluvium "Chiefly 4 to 20 feet of organic sandy silt and silty sand overlying well-sorted sand and gravel beneath stream terrace treads no longer subject to inundation by the stream that deposited the alluvium; locally subject to seasonal stream icings; continuously frozen"* (Nenana 2006).

The upper City comprises a compact layout adjacent to the south bank of the Tanana River. The majority of the upper City's infrastructure is located between the Alaska Railroad bridge embankment and Alaska Highway 3, and between Seventh Avenue and the River. The majority of the lower City is undeveloped woodland, with few outlying buildings. The airstrip is located in the lower City (FEMA 1999).

Figure 5-8 depicts the City's FEMA identified 100-year flood hazard area with the City's critical facilities identified to depict their potential threat.

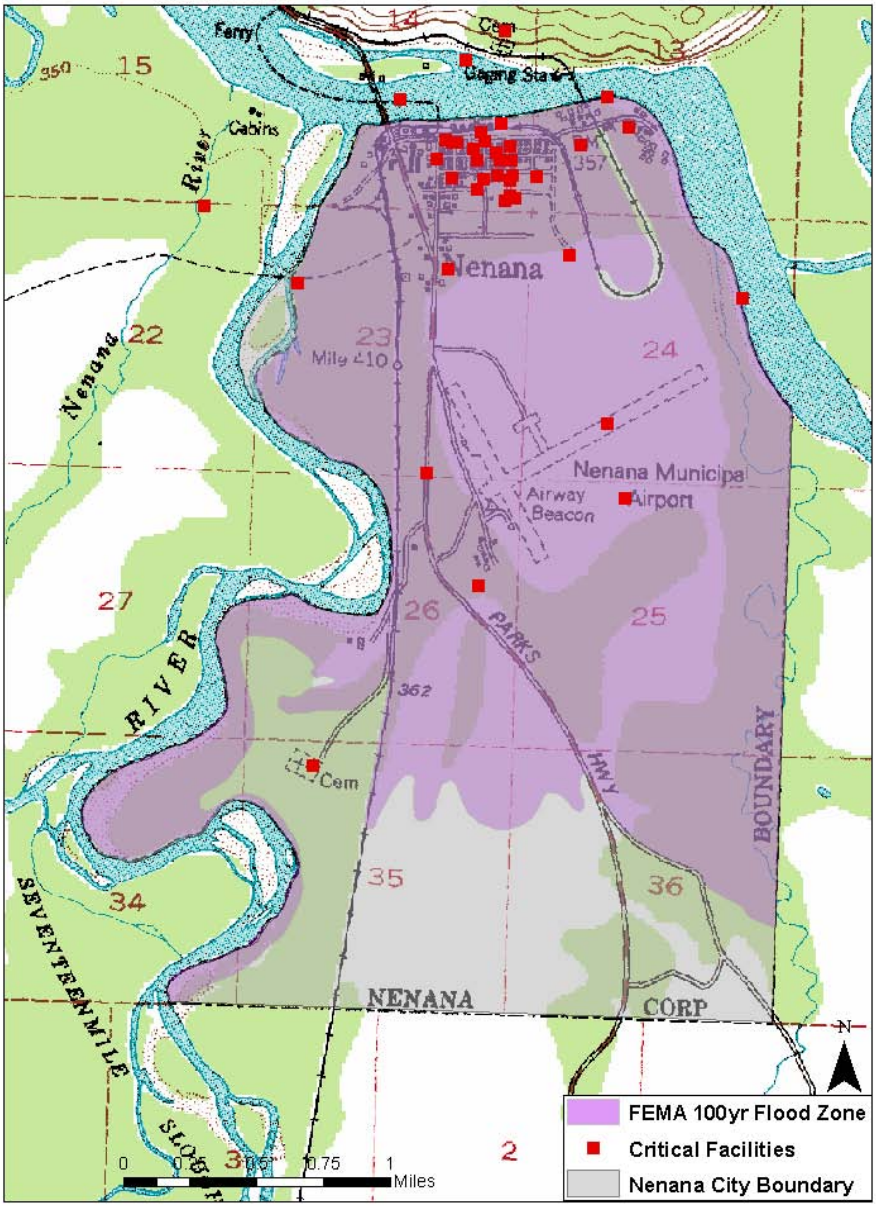

Figure 5-8 City of Nenana's Flood Hazard Area

Extent

Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence.

The following factors contribute to riverine flooding frequency and severity:

- Rainfall intensity and duration.
- Antecedent moisture conditions.
- Watershed conditions, including terrain steepness, soil types, amount, vegetation type, and development density.
- The attenuating feature existence in the watershed, including natural features such as swamps and lakes and human-built features such as dams.
- The flood control feature existence, such as levees and flood control channels.
- Flow velocity.
- Availability of sediment for transport, and the bed and embankment watercourse erodibility.
- City location related to the base flood elevation as indicated with their certified high water mark.

The 1999 FEMA Flood Insurance Study states,

> *"The flood of record on the Tanana River…in August 1967 [had a] peak flow [of] 186,000 cfs… This flood inundated the entire City…for 10 days to an average depth of 6 feet…The crest stage in the City of Nenana at the USGS gaging station on the Tanana River at the Alaska Railroad bridge was 357.4 feet National Geodetic Vertical Datum of 1929 (NGVD), 3 feet higher than the previous maximum stage that occurred in May 1948. The peak discharge for the May 1948 flood was 135,000 cfs.*
>
> *Some flood protection is provided by the railroad embankment, which lies between the river and most of the City of Nenana, and by a local low dike upstream from the City between the south end of the railroad loop and the carport runway. However, when these dikes are overtopped, the main part of the City in the depression between the dikes and the highway embankment can be inundated with 3 to 4 feet of water"* (FEMA 1999).

The following depicts the extent and impact of the July 31 to August 3 Nenana River flood event. Figure 5-9 and 5-10 are good depictions of Nenana's flood extent and impacts. The City stated the July-August 2008 event paralleled the 1967 flood of recorded where the entire community was covered by over 6 feet of flood waters. Even the slightly higher elevations experienced 2 feet of water coverage.

Figure 5-9 August 2008 Flood – Entire Community Flooded

Figure 5-10 August 2008 Flood

Based on past flood events and the criteria identified in Table 5-3, the extent of flood impacts in the City are considered critical where the City can expect that critical facilities would be completely shutdown for at least two weeks and more than 25 percent of property would be severely damaged.

Impact

Nationwide, floods result in more deaths than any other natural hazard. Physical damage from floods includes the following:

- Structure flood inundation, causing water damage to structural elements and contents.
- Erosion or scouring of stream banks, roadway embankments, foundations, footings for bridge piers, and other features.
- Damage to structures, roads, bridges, culverts, and other features from high-velocity flow and debris carried by floodwaters. Such debris may also accumulate on bridge piers and in culverts, increasing loads on these features or causing overtopping or backwater damages.
- Sewage and hazardous or toxic materials release as wastewater treatment plants or sewage lagoons are inundated, storage tanks are damaged, and pipelines are severed.

Floods also result in economic losses through business and government facility closure, communications, utility (such as water and sewer), and transportation services disruptions. Floods result in excessive expenditures for emergency response, and generally disrupt the normal function of a community.

Impacts and problems also related to flooding are deposition and stream bank erosion (erosion is discussed in detail in Section 5.2.3). 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 for navigational purposes. Deposition also reduces channel capacity, resulting in increased flooding or bank erosion. Stream bank erosion involves the removal of material from the stream bank. When bank erosion is excessive, it becomes a concern because it results in loss of streamside vegetation, loss of fish habitat, and loss of land and property (BKP 1988).

The City does not experience spring break-up flooding, or aufeis impacts. However, mid summer rainfall creates nearly 100 percent of the City's flood impacts and damages. During the 1967 rain induced flood event, "…[rain s]torm runoff caused numerous slides on headwater hillsides, washed out roads and tree-covered river terraces, and covered the floodplain in the City of Nenana for 10 days to an average depth of 6 feet. The entire City of Nenana was evacuated. Flood damages in the City… were estimated to be $1 million (FEMA 1999).

Probability of Future Events

Based on previous occurrences and applying the criteria identified in Table 5-2, it is highly likely a flood event could occur within the next year (event has up to 1 in 1 years chance of occurring) as the history of events is greater than 33 percent likely per year.

5.3.4 Permafrost

5.3.4.1 Nature

Permafrost is defined as soil, sand, gravel, or bedrock that has remained below 32°F for two or more years. Permafrost can exist as massive ice wedges and lenses in poorly drained soils or as 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 that is subject to annual freezing and thawing is referred to as the "active layer".

Permafrost melting (or degradation) occurs naturally as a result of climate change, although this is usually a very gradual process. Thermokarst is the process by which characteristic land forms result from the melting of ice-rich permafrost. As a result of thermokarst, subsidence often creates depressions that fill with melt water, producing water bodies referred to as thermokarst lakes or thaw lakes.

Human induced ground warming can often degrade permafrost much faster than natural degradation caused by a warming climate. Permafrost degradation can be caused by constructing warm structures on the ground surface allowing heat transfer to the underlying ground. Under this scenario, improperly designed and constructed structures can settle as the ground subsides, resulting in loss of the structure or expensive repairs. Permafrost is also degraded by damaging the insulating vegetative ground cover, allowing the summer thaw to extend deeper into the soil causing subsidence of ice-rich permafrost, often leading to creation of thermokarst water bodies. Evidence of this type of degradation can be seen where thermokarst water bodies are abundant in the ruts of an old trail used by heavy equipment (cat trails) or where roads or railroads constructed by clearing and grubbing have settled unevenly.

5.3.4.2 History

The City has extensive geotechnical and subsurface information obtained through various infrastructure improvement projects. Table 5-7 lists a representative sample of these soils studies.

Table 5-7 Existing Soils Studies

"Geotechnical & Subsurface Investigations"

Year	Consultant	Purpose
1978	Shannon & Wilson, Inc	Proposed Water and Sewer System
1981	Shannon & Wilson, Inc	Nenana High School Addition
1983	Shannon & Wilson, Inc	Nenana Airport
1984	Shannon & Wilson, Inc	Nenana Public Utilities
1986	EBA Engineering, Inc.	Erosion Control Project
1999	Clark Engineering	Student Life Center
2003	R & M Consultants, Inc.	Nenana Airport Resurfacing

(Nenana 2006)

These studies from a solid basis from which the City may draw from to locate and design future residential and infrastructure construction projects located in permafrost and wetlands locations.

The Nenana Sanitation Master Plan states that the soils within the City limits is

> *"…characterized by an upper layer of sandy silt, an intermediate layer of fine, clean to silty sand, and an underlying layer of clean to silty, sandy gravel…*
>
> *Frozen materials were encountered in boreholes from several areas in town. Permafrost was described as intermittent and seasonal frost may penetrate to depth in excess of 10 feet…the upper part of town is generally unfrozen…and the lower portion of town [is] described as discontinuously frozen (between 50 and 90 percent of the area is inferred to be underlain by permafrost with a low to moderate ice content, or 25 to 50 percent soil moisture relative to dry weight.*
>
> *It is likely that expansion of the utility system…may encounter a significant amount of frozen soils"* (Nenana 2006).

Although there is no written record defining permafrost impacts, the Planning Team Members stated the City has experienced very limited permafrost damage to buildings and roads constructed in discontinuous permafrost areas.

> *"The City primarily experiences ground settling due to permafrost melt. Infrastructure such as the airport requires extensive overburden removal. This exposes the ground surface to direct sun light and heat. This exposure causes the shallow permafrost layer to melt. The City has found that if they delay construction for one year while the shallow permafrost layer melts, the ground settles. This waiting period ensures that future infrastructure is no longer susceptible to settling or other impacts"* (Nenana 2010).

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

Location

The State's *Permafrost Risk Analysis Map*, completed by the Division of Geological and Geophysical Survey (DGGS) contained in the 2007 State Hazard Mitigation Plan, indicates the City is underlain by isolated and discontinuous permafrost areas (Figure 5-11).

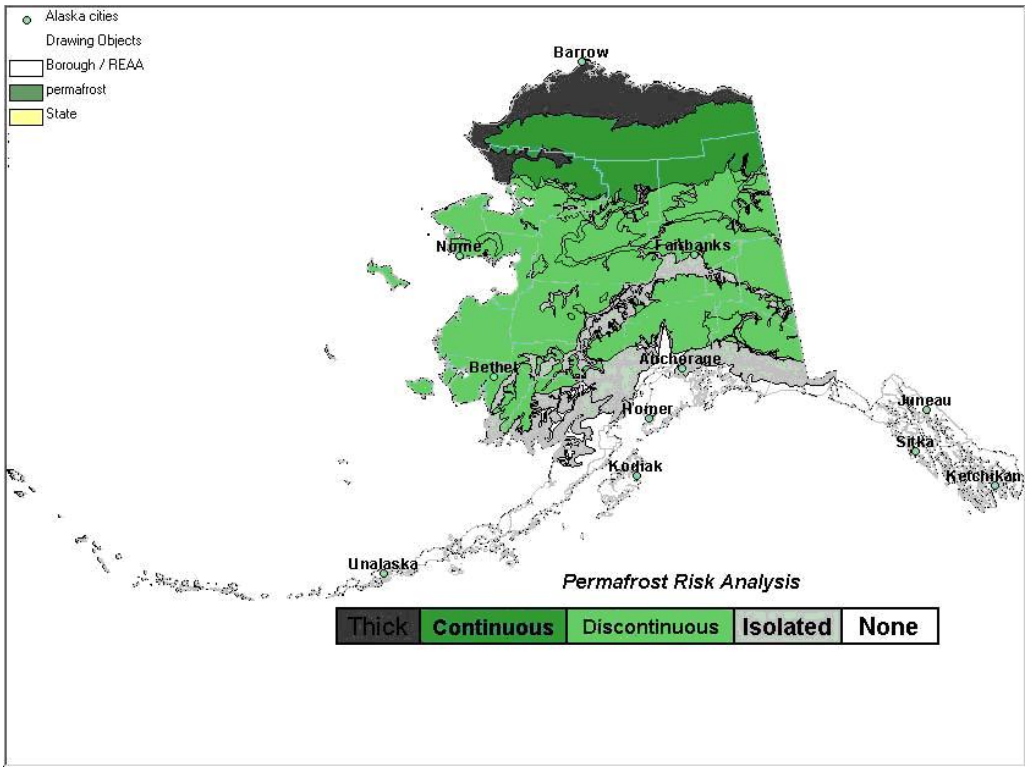

Figure 5-11 USGS Permafrost Map of Alaska (DHS&EM 2007)

Extent

The damage magnitude could range from minor with some repairs required and little to no damage to transportation, infrastructure, or the economy to major if a critical facility (such as the airport) were damaged and transportation was effected. Areas that are most likely impacted surround the airport as required vegetation removal has exposed soils. The airport runway was subsequently covered with asphalt through which radiant heat has melted the shallow permafrost layer (within one foot of the surface). This caused settling or sink holes which required periodic short runway closure for repairs.

Based on the City's soils surveys, the Planning Team's knowledge of past permafrost degradation events, and the criteria identified in Table 5-3, the extent of permafrost degradation impacts in the City are considered limited where critical facilities and services would unlikely be shutdown for 24 hours or less, with limited property or infrastructure damages.

Impact

Impacts associated with degrading permafrost within the City include surface subsidence. Permafrost does not pose a sudden and catastrophic hazard but improperly designed and constructed structures can settle as the ground subsides, resulting in loss of the structure or expensive repairs. Permafrost restricts use of the ground surface, and affects the location and design of roads, buildings, communities, pipelines, airfields, and bridges. To avoid costly damage to these facilities, careful planning and design in the location and construction of facilities is warranted.

The City experiences limited impacts from permafrost. There tried and true overburden removal and subsequent one-year delayed construction practices eliminates impacts. Only very deep permafrost exists in the City far below where existing or future construction projects will be constructed.

Probability of Future Events

There is no written record defining permafrost impacts for the City. However, the Planning Team stated the City experiences very limited permafrost impacts throughout the community. They further stated the probability for permafrost damage occurring follows the criteria in Table 5-2, the probability of future damage resulting from permafrost is unlikely where the history is less than or equal to 10 percent likely per year (Nenana 2010).

5.3.5 Weather (Severe)

5.3.5.1 Nature

Severe weather throughout Alaska that includes thunderstorms, lightning, hail, heavy and drifting snow, freezing rain/ice storm, extreme cold, and high winds. The City of Nenana experiences periodic severe weather events such as the following:

Heavy and Drifting Snow

Heavy snow generally means snowfall accumulating to four inches or more in depth in 12 hours or less or six inches or more in depth in 24 hours or less. Drifting is the uneven distribution of snowfall and snow depth caused by strong surface winds. Drifting snow may occur during or after a snowfall.

Freezing Rain/Ice Storm

Freezing rain and ice storms occur when rain or drizzle freezes on surfaces, accumulating 12 inches in less than 24 hours. Ice accumulations can damage trees, utility poles, and communication towers which disrupts transportation, power, and communications.

Extreme Cold

The definition of extreme cold varies according to the normal climate of a region. In areas unaccustomed to winter weather, near freezing temperatures are considered “extreme”. In Alaska, extreme cold usually involves temperatures between -20 to -50°F. Excessive cold may accompany winter storms, be left in their wake, or can occur without storm activity. Extreme cold accompanied by wind exacerbates exposure injuries such as frostbite and hypothermia.

High Winds

High winds occur in Alaska when there are winter low-pressure systems in the North Pacific Ocean and the Gulf of Alaska. Alaska’s high wind can equal hurricane force but fall under a different classification because they are not cyclonic nor possess other characteristics of hurricanes. In Alaska, high winds (winds in excess of 60 mph) occur rather frequently throughout Alaska.

Strong winds occasionally occur over the interior due to strong pressure differences, especially where influenced by mountainous terrain, but the windiest places in Alaska are generally along the coastlines.

(NWS 2001)

5.3.5.2 History

Table 5-7 lists the National Weather Service's major storm events for the City of Nenana's Weather Zone. Each weather event may not have specifically impacted the City but they were listed due to the Village's close proximity to listed communities or by location within the identified zone.

Table 5-8 Severe Weather Events

AK Zone(s)	Location(s)	Date(s)	Event	Description
	Central Tanana Valley and Yukon/Tanana Uplands	6/15-18/1984	Flooding	An unstable generated air mass brought scattered showers which stalled with rainfall becoming heavier over portions of the Tanana River Valley. Minor flooding occurred downstream on the Tanana River at Nenana; no homes were actually flooded, but water was high in some basements and on some roads near the river. The high water went done on 6/18.
	Statewide	1/2/89 to 5/10/89	Extreme cold	Omega Block Cold Spell, with record breaking temperatures as low as -85 degrees Fahrenheit (ºF). The State conducted a wide variety of emergency actions, which included: emergency repairs to maintain & prevent damage to water, sewer & electrical systems, emergency resupply of essential fuels & food, & DOT/PF support in maintaining access to isolated communities
	Fairbanks/ North Star Borough	8/1/1989	Flooding	Flash flooding along the Tanana River in the Borough caused damage to public and private property. The Governor's declaration authorized public and individual disaster assistance.
	Nenana	1991	Record Winter High Temperature	Previous high was 45ºF in 1991.
003, 004, 006, 007	Tanana Valley	2/16-18/1996	Winter Storm	A deepening storm with a strong front produced snow; producing approximately 12 inches in Nenana.
002, 004, 007	Tanana Valley	2/24-26/96	High Wind	A strong storm system brought blizzard conditions, heavy snow, and locally high winds.
007	Tanana Valley	08/1-17/1997	Flood	Rain of up to 8.5 inches of total rainfall occurred over the upper Valley. The Tanana crested at Rosie Creek...at

Table 5-8 Severe Weather Events

AK Zone(s)	Location(s)	Date(s)	Event	Description
				Nenana, high river levels caused groundwater seepage.
003, 004, 005, 007, 008	Upper Yukon Valley	2/1-12/1999	Extreme Wind Chill	While northern Alaska was under a relatively cold air mass, a large pool of colder air moved from the Russian high arctic and proceeded to Interior Alaska. Nenana reached -60ºF on 2/5.
207, 208, 209, 211, 212, 213, 222, 225	Northwest Coast and Central Range	11/21-22/2003	High Winds	Strong winds over the northwest coast through central Alaska Range… heavy snow accompanied high winds over portions of the Interior of Alaska. Winds reached 58 mph in Healy.
209, 210, 216, 221, 222	Tanana Valley	11/23-28/2003	Heavy Snow	Strong frontal system moved northeast across western Alaska Sunday and Interior Alaska Sunday night, producing blizzard conditions over western Alaska… at Nenana, State DOT Camp received 6-8 inches.
214, 221, 224	Tanana Valley	11/24-27/2003	Strong Wind	Weather fronts created strong easterly winds over channeled areas across northern Alaska. Nenana received 52 mph peak wind speeds destroyed a 70 ft by 120 ft Quonset Hut.
216, 219, 221, 224, 225	Western &, Upper Tanana Valley	1/2-5/2005	Heavy Snow and Freezing Rain	A small low-pressure system induced snow and ice storm accompanied by freezing rain. Nenana State DOT reported 6 inches of snow. DOT issued a travel advisory due to the difficult driving conditions.
221	Tanana Valley	10/15/2005	Heavy Snow	Heavy snow fall (8.6 inches) in Nenana.
221	Western Tanana & Western Yukon Valleys	6/08-22/2006	Wildfire	A wildfire began from an out-of-control burn pile on June 7. The Parks Hwy and portion of the AK Railroad, and power were down periodically. Voluntary evacuation was available to Nenana residents. Two homes, two cabins, and 10 outbuildings were destroyed by the fire. Damage estimated at $325.000. (562 personnel at the height of the fire suppression effort.)
221,222, 223, 224,	Tanana Valley	7/31-8/5/2008	Heavy Rain Induced Flood	The Tanana River went above flood stage on the evening of the 30th, flooded the City of Nenana from 7/31-8/5. Estimated damages for the entire affected area: $267,000,000. Damages for the City of Nenana: $2,000,000: City of Nenana $34,000: Nenana School District $28,000: Native Village of Nenana

Table 5-8 Severe Weather Events

AK Zone(s)	Location(s)	Date(s)	Event	Description
				$270,000 Alaska Railroad Corporation (ARRC) $330,000 Individual Assistance ($5K per person)
218, 219, 220, 221, 222, 223, 224, 225, 226	Yukon Flats	12/27-31/2008	Extreme Cold/Wind Chill	A significant cold snap developed across Interior Alaska on December 27th and continued into January. The coldest temperatures were observed on the Nenana where temperatures dropped to -44ºF on 12/31/08.
218, 219, 220, 221, 222, 223, 224, 225, 226	Yukon Flats	1/1-12/2009	Extreme Cold/Wind Chill	Continuing cold temperatures from above The coldest temperatures were observed on the Nenana where temperatures dropped to -61ºF on 1/4/09.
218, 219, 220, 221, 222, 223, 224, 225, 226	Yukon Flats	1/15-17/2009	Warm Chinook Winter Temperatures	The cold snap ended with extreme warm temperatures. Nenana reached 54ºF. Previous high was 45ºF in 1991.

(Lingaas 2009, DHS&EM 2006)

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

Location

The City of Nenana has experienced periodic severe weather impacts. The National Weather Service has continued to modify their system for assigning weather zones to facilitate and more accurately confine weather patterns to relevant geographic areas. Consequently the data in Table 5-7 reflects different zone numbering patterns and should be used to depict weather events that have historically impacted the area; some of which may not have impacted the City as severely as other areas within the same zone.

Extent

The entire City is equally vulnerable to the effects of severe weather. Blizzard conditions and heavy snow depths for the area can reach 12" per storm event. Since 1940, maximum wind speed reached 58.7 mph; extreme low temperatures reached -53 ºF on January 27, 2006 and high temperatures ranging from 78 to a high of 89 ºF (NWS 2010).

Based on past severe weather events and the criteria identified in Table 5-3, the extent of severe weather in the City are considered limited where injuries do not result in permanent disability, complete shutdown of critical facilities occurs for more than one week, and more than 10 percent of property is severely damaged.

Impact

The intensity, location, and the land's topography influence the impact of severe weather conditions on a community.

Heavy snow can immobilize a community by bringing transportation to a halt. Until the snow can be removed, airports and roadways are impacted, even closed completely, stopping the flow of supplies and disrupting emergency and medical services. Accumulations of snow can cause roofs to collapse and knock down trees and power lines. Heavy snow can also damage light aircraft and sink small boats. A quick thaw after a heavy snow can cause substantial flooding. The cost of snow removal, repairing damages, and the loss of business can have severe economic impacts on cities and towns.

Injuries and deaths related to heavy snow usually occur as a result of vehicle and or snow machine accidents. Casualties also occur due to overexertion while shoveling snow and hypothermia caused by overexposure to the cold weather.

Extreme cold can also bring transportation to a halt. Aircraft may be grounded due to extreme cold and ice fog conditions, cutting off access as well as the flow of supplies to communities. Long cold spells can cause rivers to freeze, disrupting shipping and increasing the likelihood of ice jams and associated flooding.

Extreme cold also interferes with the proper functioning of a community's infrastructure by causing fuel to congeal in storage tanks and supply lines, stopping electric generation. Without electricity, heaters and furnaces do not work, causing water and sewer pipes to freeze or rupture. If extreme cold conditions are combined with low or no snow cover, the ground's frost depth can increase, disturbing buried pipes. The greatest danger from extreme cold is its effect on people. Prolonged exposure to the cold can cause frostbite or hypothermia and become life-threatening. Infants and elderly people are most susceptible. The risk of hypothermia due to exposure greatly increases during episodes of extreme cold, and carbon monoxide poisoning is possible as people use supplemental heating devices.

Probability of Future Events

Based on previous occurrences and the criteria identified in Table 5-2, it is likely a severe storm event will occur in the next three years (event has up to 1 in 3 years chance of occurring) as the history of events is greater than 20 percent but less than or equal to 33 percent likely per year.

5.3.6 Wildland Fire

5.3.6.1 Nature

A wildland fire is a type of wildfire that spreads through consumption of vegetation. It often begins unnoticed, spreads quickly, and is usually signaled by dense smoke that may be visible from miles around. Wildland fires can be caused by human activities (such as arson or campfires) or by natural events such as lightning. Wildland fires often occur in forests or other areas with ample vegetation. In addition to wildland fires, wildfires can be classified as urban fires, interface or intermix fires, and prescribed fires.

The following three factors contribute significantly to wildland fire behavior and can be used to identify wildland fire hazard areas.

- **Topography:** As slope increases, the rate of wildland fire spread increases. South-facing slopes are also subject to more solar radiation, making them drier and thereby

intensifying wildland fire behavior. However, ridgetops may mark the end of wildland fire spread since fire spreads more slowly or may even be unable to spread downhill.

- **Fuel:** The type and condition of vegetation plays a significant role in the occurrence and spread of wildland fires. Certain types of plants are more susceptible to burning or will burn with greater intensity. Dense or overgrown vegetation increases the amount of combustible material available to fuel the fire (referred to as the "fuel load"). The ratio of living to dead plant matter is also important. The risk of fire is increased significantly during periods of prolonged drought as the moisture content of both living and dead plant matter decreases. The fuel load continuity, both horizontally and vertically, is also an important factor.
- **Weather:** The most variable factor affecting wildland fire behavior is weather. Temperature, humidity, wind, and lightning can affect chances for ignition and spread of fire. Extreme weather, such as high temperatures and low humidity, can lead to extreme wildland fire activity. By contrast, cooling and higher humidity often signal reduced wildland fire occurrence and easier containment.

The frequency and severity of wildland fires is also dependent on other hazards, such as lightning, drought, and infestations (such as the damage caused by spruce-bark beetle infestations). If not promptly controlled, wildland fires may grow into an emergency or disaster. Even small fires can threaten lives and resources and destroy improved properties. In addition to affecting people, wildland fires may severely affect livestock and pets. Such events may require emergency water/food, evacuation, and shelter.

The indirect effects of wildland fires can be catastrophic. In addition to stripping the land of vegetation and destroying forest resources, large, intense fires can harm the soil, waterways, and the land itself. Soil exposed to intense heat may lose its capability to absorb moisture and support life. Exposed soils erode quickly and enhance rivers and stream siltation, thereby enhancing flood potential, harming aquatic life, and degrading water quality. Lands stripped of vegetation are also subject to increased debris flow hazards.

5.3.6.2 History

Wildland fires have not been documented within the boundaries of the City; however, wildland fires have occurred in the City's vicinity. The Alaska Interagency Coordination Center (AICC) provided the City's wildland fire information contained in Table 5-8 and Figure 5-11.

Over 195 wildland fires occurred within 50 miles of the City. Table 5-9 lists 15 wildfires that exceeded 1,000 acres burned from 1939 to 2009.

Table 5-9 City of Nenana Historical Wildfire Events

Fire Name	Fire Year	Estimated Acres	Latitude	Longitude	Specific Cause
Lunch Lake	2009	12802	64.8588867	-149.283051	Lightning
Minto Flats South	2009	517078	64.746666	-149.504715	Lightning
Parks Hwy	2006	130186	64.36667	-149.0333	Human
Wood River	2004	6993	64.53333	-148.4667	Lightning
Clear	2000	2777	64.28333	-149.4833	Lightning
Minto Flats	1995	7500	64.7666702	-149.566666	Lightning

Table 5-9 City of Nenana Historical Wildfire Events

Fire Name	Fire Year	Estimated Acres	Latitude	Longitude	Specific Cause
Bear Lake	1990	1340	64.6999969	-149.699997	Lightning
Fai Sw 40	1978	2400	64.25	-148.783341	Lightning
Enn Sw 9	1977	1200	64.5	-149.350006	Lightning
Minto W-6	1958	1500	64.8166656	-149.083328	Recreation
Nenana W-20	1958	8960	64.7166672	-149.183334	Incendiary
Tolvana Se-5	1958	3400	64.7833328	-149.766663	Lightning
Wood River Buttes W-10	1957	15360	64.4499969	-148.46666	Lightning
Tanana River	1941	4000	64.5999985	-149.149994	Trapper
Mile 418.5	1940	1000	64.6166687	-149.083328	Railroad

(AICC 2009)

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

Location

Under certain conditions wildland fires may occur in any area with fuel surrounding the City. Since fuels data is not readily available, for the purposes of this plan, all areas outside City limits are considered to be vulnerable to wildland fire impacts. Since 1939, 195 wildland fire events have occurred within 50 miles of the City (Figure 5-12).

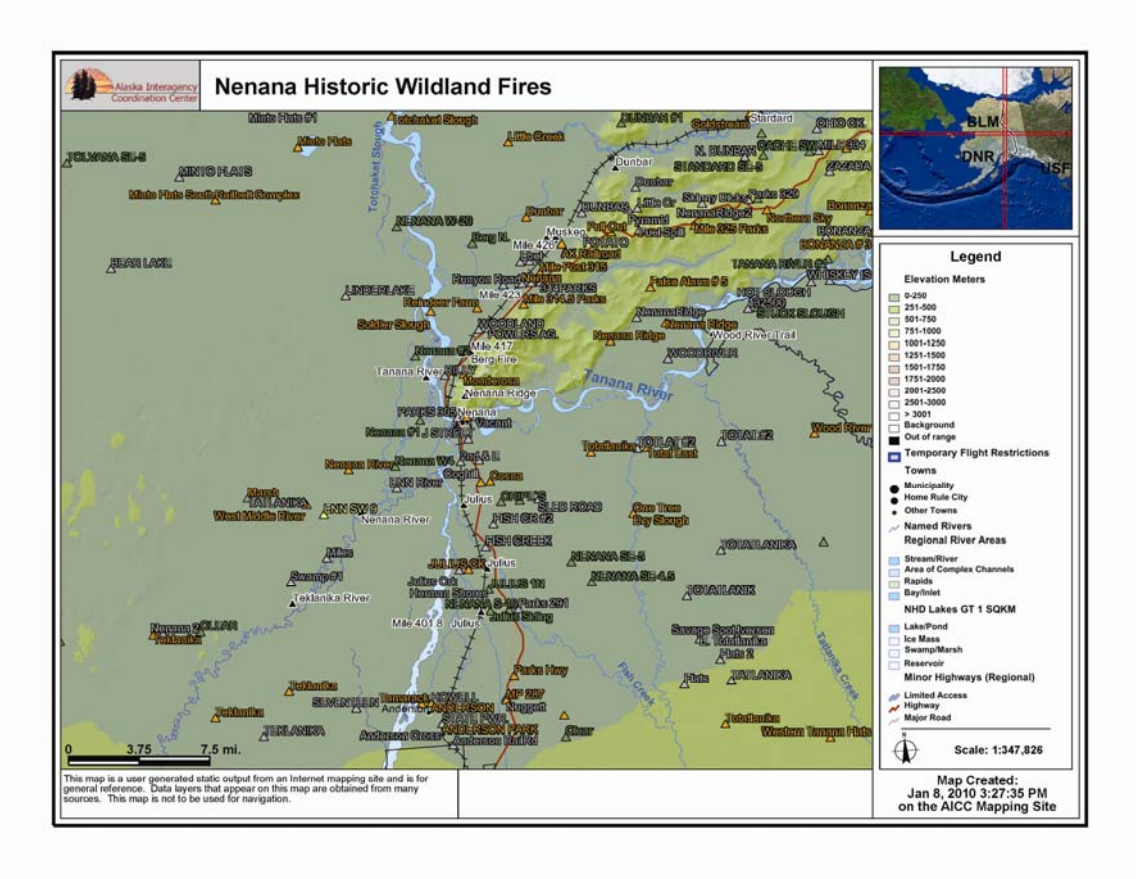

Figure 5-12 Nenana Wildfire History (AICC 2009)

Figure 5-13 depicts the City's critical facilities and their relation to the City's Wildland fire threat.

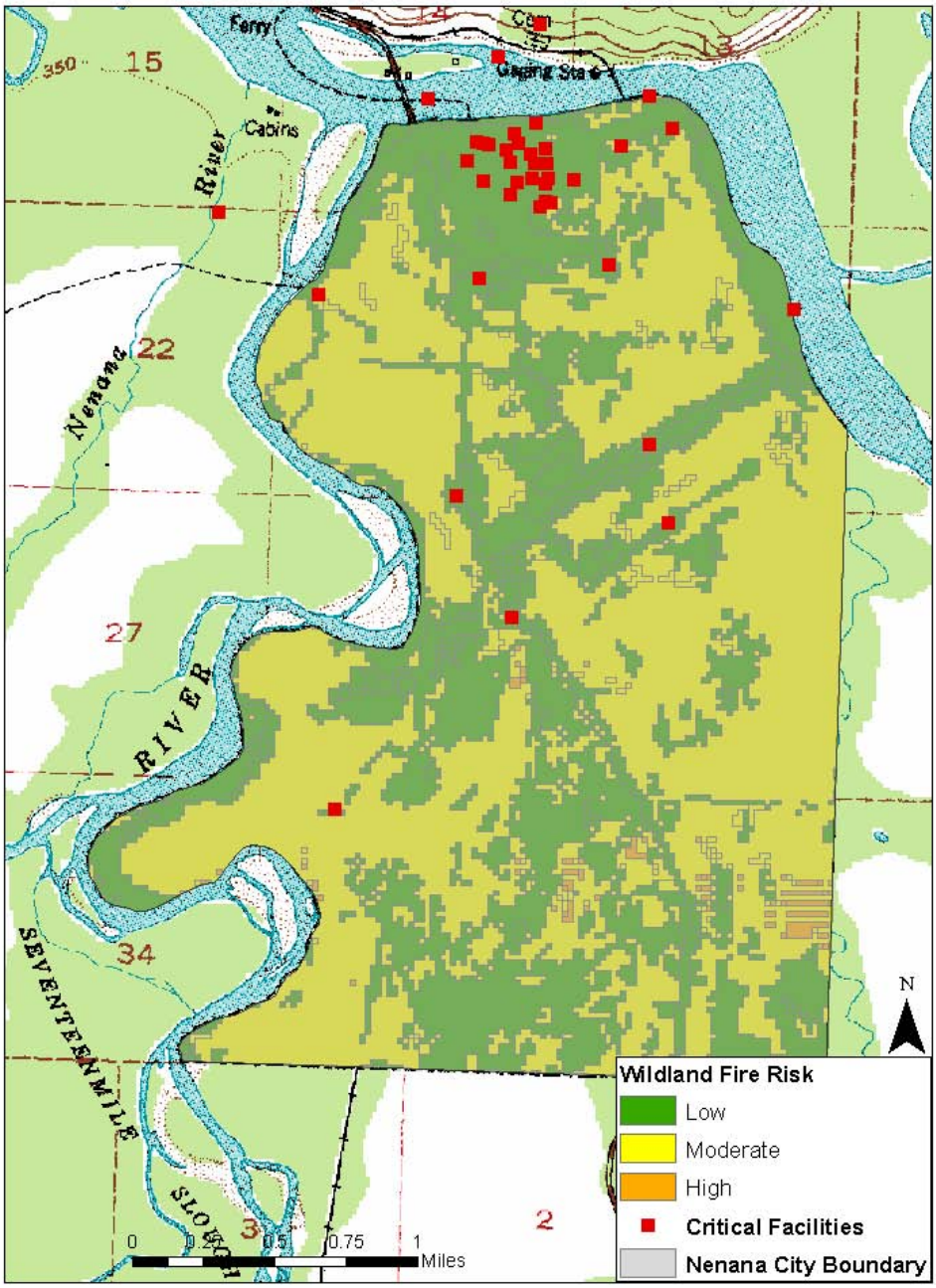

Figure 5-13 Nenana's Wildland Fire Risk

Extent

Generally, fire vulnerability dramatically increases in the late summer and early fall as vegetation dries out, decreasing plant moisture content and increasing the ratio of dead fuel to living fuel. However, various other factors, including humidity, wind speed and direction, fuel load and fuel type, and topography can contribute to the intensity and spread of wildland fires. The common causes of wildland fires in Alaska include lightening strikes and human negligence.

Fuel, weather, and topography influence wildland fire behavior. Fuel determines how much energy the fire releases, how quickly the fire spreads, and how much effort is needed to contain the fire. Weather is the most variable factor. High temperatures and low humidity encourage fire activity while low temperatures and high humidity retard fire spread. Wind affects the speed and direction of fire spread. Topography directs the movement of air, which also affects fire behavior. When the terrain funnels air, as happens in a canyon, it can lead to faster spreading. Fire also spreads up slope faster than down slope.

During the past 69 years an average of 3,761.6 acres burned during each of the 194 historical wildland fire events. Recent wildland fires appear to burn much smaller acreage per event. This may be due to the fact that the State's Division of Forestry (DOF) much more efficiently manage wildland fires using a four tiered suppression methodology based on infrastructure criticality while using more modern available resources as the respond to wildland fires which potentially threaten populated areas (DOF 2009).

Based on past wildland fire events and the criteria identified in Table 5-3, the magnitude and severity of potential impacts to the City are considered critical where injuries could result in permanent disability, complete shutdown of critical facilities could last for at least two weeks and more than 25 percent of property could potentially be severely damaged, which would severely impact infrastructure or the economy.

Impact

Impacts of a wildland fire that interfaces with the population center of the City could grow into an emergency or disaster if not properly controlled. A small fire can threaten lives and resources and destroy property. In addition to impacting people, wildland fires may severely impact livestock and pets. Such events may require emergency watering and feeding, evacuation, and alternative shelter.

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

Probability of Future Events

Fire is recognized as a critical feature of the natural history of many ecosystems. It is essential to maintain the biodiversity and long-term ecological health of the land. The role of wildland fire as an essential ecological process and natural change agent has been incorporated into the fire management planning process and the full range of fire management activities is exercised in Alaska, to help achieve ecosystem sustainability, including its interrelated ecological, economic, and social consequences on firefighters, public safety and welfare; natural and cultural resources

threatened; and the other values to be protected dictate the appropriate management response to the fire. In Alaska, the natural fire regime is characterized by a return interval of 50 to 200 years, depending on the vegetation type, topography, and location. Recorded wildland fires occurring within 50 miles of the City of Nenana have an average recurrence rate of approximately 1 to 2 years.

Based on the history of wildland fires in the Nenana area applying the criteria identified in Table 5-2, it is highly likely a wildland fire event will occur within the calendar year. The event has up to 1 in 1 years chance of occurring and the history of events is greater than 33 percent likely each year.

This section provides an overview of the vulnerability analysis and describes the five specific steps: asset inventory, methodology, data limitations, and exposure analysis for current assets, and areas of future development.

6.1 OVERVIEW OF A VULNERABILITY ANALYSIS

A vulnerability analysis predicts the extent of exposure that may result from a hazard event of a given intensity in a given area. The analysis provides quantitative data that may be used to identify and prioritize potential mitigation measures by allowing communities to focus attention on areas with the greatest risk of damage. A vulnerability analysis is divided into five steps:

1. Asset Inventory
2. Methodology
3. Data Limitations
4. Exposure Analysis For Current Assets
5. Areas of Future Development

The requirements for a vulnerability analysis as stipulated in DMA 2000 and its implementing regulations are described here.

- A summary of the community's vulnerability to each hazard that addresses the impact of each hazard on the community.

DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Overview

Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.

Element

- Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
- Does new or updated the plan address the impact of each hazard on the jurisdiction?

Source: FEMA, July 2008.

- Identification of the types and numbers of RL properties in the identified hazard areas.

DMA 2000 Requirements: Risk Assessment, Assessing Vulnerability, Addressing Repetitive Loss Properties

Assessing Vulnerability: Addressing Repetitive Loss Properties

Requirement §201.6(c)(2)(ii): [The risk assessment] **must** also address National Flood Insurance Program (NFIP) Insured structures that have been repetitively damaged floods.

Element

- Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties in the identified hazard areas?

Source: FEMA, July 2008.

- An identification of the types and numbers of existing vulnerable buildings, infrastructure, and critical facilities and, *if possible*, the types and numbers of vulnerable future development.

DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Identifying Structures

Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

Element

- Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?
- Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

Source: FEMA, July 2008.

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

DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Estimating Potential Losses

Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.

Element

- Does the new or updated plan estimate potential dollar losses to vulnerable structures?
- Does the new or updated plan describe the methodology used to prepare the estimate?

Source: FEMA, July 2008.

6.2 VULNERABILITY ANALYSIS: SPECIFIC STEPS

6.2.1 Asset Inventory

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

6.2.1.1 Population and Building Stock

Population data for the City were obtained from the 2000 U.S. Census. The City's total population for 2000 was 402 and 2009 DCCED/DCRA data reported a population of479 (Table 6-1).

Table 6-1 Estimated Population and Building Inventory

Population		Residential Buildings	
2000 Census	DCCED 2008 Data	Total Building Count	Total Value of Buildings[1]
402	479	210	$13,797,000

Sources: The City of Nenana, U.S. Census 2000, and 2008 DCCED/DCRA Certified population data.
[1] Average structural value of all single-family residential buildings is $65,700 per structure.

Estimated numbers of residential buildings and replacement values for those structures, as shown in Table 6-1, were obtained from the City, the 2000 U.S. Census, and DCCED/DCRA. A total of 190 single-family residential buildings were considered in this analysis.

6.2.1.2 Repetitive Loss Properties

The City has participated in the NFIP since June 9, 1972 with a flood hazard map dated April 21, 1999, The City has not developed an inventory of properties that meet the RL or SRL criteria. This has been identified as a potential mitigation action as a result of this hazard mitigation planning process. However, the NFIP Insurance Report states the City has a total of 26 insured properties 25 of which are located in the City's "A" zone. The remaining property's location in relation to the floodplain is not known as of this report date. The City's total NFIP coverage is $3,729,900.

The City's FIRM number 0250100005c, dated April 7, 1999 delineates the City's floodplain.

The City only lists the total repetitive property losses in Table 6-2.

Table 6-2 Repetitive Loss Properties

Type (RL/SRL) Year(s)	Town	Occupancy	No. of Claims	Flood Insurance (Yes/No)	Average Claim Value ($)[1]	Total Paid ($)[2]
RL	City of Nenana	Unknown	12	Y	$3,557	$42,683

Type includes: RL or SRL

[1]Insured structural value n/a.
[2]Content and building claims.

6.2.1.3 Existing Critical Facilities and Infrastructure

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

- Government facilities, such as city and tribal administrative offices, departments, or agencies
- Emergency response facilities, including police, and fire
- Educational facilities, including K-12

- Care facilities, such as medical clinics, congregate living health, residential and continuing care, and retirement facilities
- Community gathering places, such as community and youth centers
- Utilities, such as electric generation, communications, water and waste water treatment, sewage lagoons, landfills

The total number of critical facilities is listed in Table 6-2.

Table 6-3 Nenana Critical Facilities

Facility Type	Facility Name	Number of Occupants	Address	Replacement Value
Government Facilities	Nenana City Offices	3	City listed GPS Coordinates	$1,200,000
	Toghotthele Corporation Office	3	City listed GPS Coordinates	$155,000
	Nenana Native Council Office	5	City listed GPS Coordinates	$225,000
	Nenana Valley District Court System	5	City listed GPS Coordinates	$850,000
	US Post Office	2	City listed GPS Coordinates	$750,000
Emergency Response Facilities	Nenana Fire Dept	2	City listed GPS Coordinates	$2,000,000
	Nenana Police Services	0	City listed GPS Coordinates	$750,000
	State Troopers Office	1	City listed GPS Coordinates	$850,000
Educational Facilities	Nenana City Public School	19 teachers 203 Students	City listed GPS Coordinates	$14,000,000
	Nenana School District Offices	11	City listed GPS Coordinates	$225,000
Medical Facilities	Mary Demienteiff Health Clinic	4	City listed GPS Coordinates	$1,500,000
	Valley Family Health Services	4	City listed GPS Coordinates	
	Railbelt Mental Health & Addiction Services	0	City listed GPS Coordinates	$150,000
Community Facilities	George Hall Community Center	45	City listed GPS Coordinates	$1,900,000
	Meda Lord Senior Housing	34	City listed GPS Coordinates	$5,500,000

Table 6-3 Nenana Critical Facilities

Facility Type	Facility Name	Number of Occupants	Address	Replacement Value
	Nenana Inn Washeteria	2	City listed GPS Coordinates	$2,100,000
	Coghill's General Store	4	City listed GPS Coordinates	$475,000
	City Public Library	2	City listed GPS Coordinates	$2,100,000
	Golden Railroad Spike Historic Park and Interpretive Center	0	City listed GPS Coordinates	
	Alfred Starr Museum & Cultural Center	2	City listed GPS Coordinates	$300,000
	Alaska Railroad Museum	1	City listed GPS Coordinates	$650,000
	Nenana Student Living Facility	85	City listed GPS Coordinates	$4,500,000
	historical St. Mark's Episcopal Church	0	City listed GPS Coordinates	$100,000
	Nenana Assembly of God	5	City listed GPS Coordinates	$375,000
	Nenana Bible Church	0	City listed GPS Coordinates	$300,000
	St Theresa's Catholic Church	1	City listed GPS Coordinates	$250,000
	Voice for Christ Ministries	5	City listed GPS Coordinates	$450,000
	Cemetery (Pioneer)	0	City listed GPS Coordinates	
	Cemetery (Native)	0	City listed GPS Coordinates	
Transportation Facilities	Nenana Municipal Airport, Asphalt	0	City listed GPS Coordinates	
	Gravel runway,	0	City listed GPS Coordinates	
	Float pond and parking basins	0	City listed GPS Coordinates	
	Nenana Port Authority dry cargo loading and unloading facility	0	City listed GPS Coordinates	

Table 6-3 Nenana Critical Facilities

Facility Type	Facility Name	Number of Occupants	Address	Replacement Value
	Crowley Marine	25	City listed GPS Coordinates	$225,000
	Inland Barge Service	3	City listed GPS Coordinates	$155,000
	AK Railroad Depot	0	City listed GPS Coordinates	$475,000
	Public boat launch	0	City listed GPS Coordinates	
Hwys, Railroad (State & Local)	Hwy 3 (Parks Hwy)	0	City listed GPS Coordinates	
	Totchaket Road	0	City listed GPS Coordinates	
	AK Railroad	0	City listed GPS Coordinates	
Bridges	Highway Bridge (RR maintained- ‘ bridge	0	City listed GPS Coordinates	$20,000,000
	Mears RR Bridge (1923) (700’ steel bridge)	0	City listed GPS Coordinates	$20,000,000
	Little Nenana Bridge	0	City listed GPS Coordinates	$225,000
	Middle Fork Bridge	0	City listed GPS Coordinates	$225,000
	West Fork Bridge	0	City listed GPS Coordinates	$225,000
Utility Facilities	Golden Valley Electric Utility Company	3	City listed GPS Coordinates	$279,000
	Nenana Heating Service, Inc. (84,000 gallons)	4	City listed GPS Coordinates	$1,200,000
	US DOT/FAA (16,000 gallons)	3	City listed GPS Coordinates	$250,000
	Crowley Marine (600,000 gallons)	0	City listed GPS Coordinates	
	Yutana Barge Lines (Fuel Storage)	0	City listed GPS Coordinates	$4,700,000
	Potable Water Well (1984 @ 445 gpm) and Treatment Facility	0	City listed GPS Coordinates	$7,500,000

Table 6-3 Nenana Critical Facilities

Facility Type	Facility Name	Number of Occupants	Address	Replacement Value
	A - Frame Service Water Supply	0	City listed GPS Coordinates	
	Monroe's Moderosa Water Supply	2	City listed GPS Coordinates	
	Nenana Municipal Water-1 – 1979 (150,000 gallon tank)	0	City listed GPS Coordinates	
	Nenana Municipal Water-2-1991 (282,000 gallon tank)	0	City listed GPS Coordinates	
	Water Distribution System (including fire hydrants and valves)	0	City listed GPS Coordinates	
	Tamarack Inn (water storage tank)	0	City listed GPS Coordinates	
	KIAM 630 AM Radio	5	City listed GPS Coordinates	$1,000,000
	Secondary Wastewater Treatment Plant	0	City listed GPS Coordinates	$8,000,000
	Sewage Lift Stations (six)	0	City listed GPS Coordinates	

(Nenana 2009)

6.2.1.4 Future Critical Facilities and Infrastructure

Immediate plans for future development in the City includes airport rehabilitation, designing and constructing new water and sewer facilities, completing a Nenana River Hydrology Assessment, 9th and K streets reconstruction, and completing Nenana tug and barge port upgrades. No future buildings will be constructed in known hazard areas.

6.2.2 Methodology

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

The majority of rural communities lack Alaska DCRA community profile maps or geo-referenced data. Consequently, the City's Planning Team determined critical facility locations in relation to potential hazard threat exposure and vulnerability.

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

6.2.3 Data Limitations

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

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

6.2.4 Exposure Analysis

The results of the exposure analysis for loss estimations in the City are summarized in Table 6-3 and in the following discussion.

Table 6-4. Potential Hazard Exposure Analysis – Critical Infrastructure

			Government		Emergency Response		Educational		Care		Community	
Hazard Type	Hazard Area	Methodology	No.	Value ($)	No.	Value ($)	No.	Value ($)	No.	Value ($)	No.	Value ($)
Earthquake	Strong	9-20% (g)	--	--	--	--	--	--	--	--	--	--
	Very strong	20-40% (g)	--	--	--	--	--	--	--	--	--	--
	Severe	>40-60% (g)	5/18	3,180,000	3/3	4,100,000	3/245	13,925,000	2/8	1,500,000	17/186	19,150,000
Erosion		Within 300 ft of erosion areas	--	--	--	--	--	--	--	--	--	--
Flood	Moderate	500-year floodplain	--	--	--	--	--	--	--	--	--	--
	High	100-year floodplain	4/15	3,025,000	3/3	4,100,000	3/245	13,925,000	2/8	1,500,000	14/186	19,150,000
Permafrost		Descriptive	--	--	--	--	--	--	--	--	--	--
Weather, Severe		Descriptive	--	--	--	--	--	--	--	--	--	--
Wildland Fire	Low	Low fuel rank	4/15	3,025,000	3/3	4,100,000	3/245	13,925,000	2/8	1,500,000	15/186	19,150,000
	Moderate	Moderate fuel rank	1/5	225,000	--	--	--	--	--	--	1	--
	High	High fuel rank	--	--	--	--	--	--	--	--	--	--
	Extreme	Extreme fuel rank	--	--	--	--	--	--	--	--	--	--

* Number of Buildings /Number of Occupants

Table 6-5. Potential Hazard Exposure Analysis – Critical Infrastructure

			Highway		Bridges		Transportation Facilities		Utilities	
Hazard Type	Hazard Area	Methodology	Miles	Value ($)	* No.	Value ($)	* No	Value ($)	* No.	Value ($)
Earthquake	Strong	9-20% (g)	--	--	--	--	--	--	--	--
	Very strong	20-40% (g)	--	--	--	--	--	--	--	--
	Severe	>40-60% (g)	--	--	5/0	40, 675,000	8/28	855,000	12/17	22,929,000
Erosion		Within 300 ft of erosion areas	--	--	--	--	--	--	--	--
Flood	Moderate	500-year floodplain	--	--	--	--	--	--	--	--
	High	100-year floodplain	--	--	1/0	20,000,000	7/28	855,000	8/10	13,929,000
Permafrost		Descriptive	--	--						
Weather, Severe		Descriptive	--	--						
Wildland Fire	Low	Low fuel rank	--	--	3/0	40,225,000	6/28	855,000	8/10	13,929,000
	Moderate	Moderate fuel rank	--	--	3/0	40,225,000	2/0	--	--	--
	High	High fuel rank	--	--	--	--	--	--	--	--
	Extreme	Extreme fuel rank	--	--	--	--	--	--	--	--

* Number of Buildings / Number of Occupants

Earthquake

Based on earthquake probability (Peak ground acceleration [PGA]) maps produced by the USGS, the entire City area is at risk of experiencing severe earthquake impacts as a result of its proximity to the Denali Fault coupled with a high recurrence probability. (See Section 5.3.1.3). Impacts to the community such as significant ground movement that may result in infrastructure damage are to be expected. The entire existing and future City of Nenana population, residences, and critical facilities are exposed to the effects of an earthquake.

The City has critical facilities and infrastructure located within areas of severe shaking. Severe risk areas includes 479 people in 210 residences (worth $13,797,000), five government facilities (worth $3,180,000), three emergency response facilities (worth $4,100,000), two educational facilities (worth $13,925,000), two care facilities (worth $1,500,000), 17 community facilities (worth $19,150,000), five bridges (worth $40,675,000), eight transportation facilities (worth $855,000), and 12 utilities (worth $22,929,000).

Impacts to the community such as significant ground movement that may result in infrastructure damage are expected. Moderate to severe shaking may be seen or felt based on past events. Although all structures are exposed to earthquakes, buildings within the City constructed with wood have slightly less vulnerability to the effects of earthquakes than those with masonry.

Impacts to future populations, residences, critical facilities, and infrastructure are anticipated at the same moderate impact level as the City is located in an area with a high probability of strong shaking (i.e., >M 5.0).

Erosion

There are no residential properties located in the City's erosion areas, however, based on local knowledge, areas within the City affected by erosion are located on the Nenana River side of town, principally the "lower shipyard" and fuel storage area. The Tanana River is also eroding the embankment below the railroad bridge extending approximately 2000 ft downriver where no critical facilities are threatened. These two critical facilities (worth approximately $4,700,000) (see Section 5.3.2.3) are located in areas exposed and historically prone to erosion.

Impacts from erosion include loss of land and any development on that land. (See Section 5.3.2.3) Erosion can cause increased sedimentation of harbors and river deltas and hinder channel navigation, reduction in water quality due to high sediment loads, loss of native aquatic habitats, damage to public utilities (docks, harbors, electric and water/wastewater utilities), and economic impacts associated with costs trying to prevent or control erosion sites. In the City, only the location of a building can lessen its vulnerability to erosion.

Impacts to future populations, residences, critical facilities, and infrastructure are anticipated at the same impact level until the City institutes land use controls prohibiting new construction in erosion prone areas. Impacts could also be lessened if affected properties could be relocated.

Flood

According to the City's FEMA Flood Insurance Rate Map (FIRM), the Nenana Flood Insurance Study, and the Planning Team, the entire City can potentially experience impacts by high-water, high-flow flood events primarily during the summer months.

Impacts associated with flooding in the City include water damage to structures and contents, roadbed erosion and damage, boat strandings, areas of standing water in roadways, and damage or displacement of fuel tanks, power lines, or other infrastructure. (See Section 5.3.3.3) Buildings on slab foundations, not located on raised foundations, and/or not constructed with materials designed to withstand flooding events (e.g., cross vents to allow water to pass through an open area under the main floor of a building) are more vulnerable to the impacts of flooding.

The City is a NFIP participant; however, RL flood claim data is not available for this location. Impacts to future populations, residences, critical facilities, and infrastructure are anticipated at the same low impact level. Funding may be secured to elevate or relocate flood prone structures to mitigate future damages or losses.

FEMA FIRMs were used to outline the 100-year and 500-year floodplains for Nenana. (See Figure 5-8) The 100-year floodplain delineates an area of high risk, while the 500-year floodplain delineates an area of moderate risk. The City of Nenana does not have any facilities within the 500-year floodplain.

In City has 26 NFIP insured properties (worth $3,729,900) 25 of these properties, four government facilities (worth $3,025,000), three emergency response facilities (worth $4,100,000), two educational facilities (worth $13,925,000), two care facilities (worth $1,500,000), 14 community facilities (worth $19,150,000), one bridge (worth $20,000,000), seven transportation facilities (value $855,000), and eight utilities (worth $13,929,000) within the boundaries of the 100-year floodplain. There are no residential or critical facilities located within the 500-year floodplain.

Permafrost

According to mapping completed by the USGS, the entire City is underlain by isolated and discontinuous permafrost areas, with impacts from this hazard. (See Section 5.3.4.3) This includes 479 people in 210 residences (worth $13,797,000) and all 61 critical facilities (worth approximately $106,565,000).

Impacts associated with degrading permafrost include surface subsidence, infrastructure, structure, and/or road damage. Buildings that are built on slab foundations and/or not constructed with materials designed to accommodate the movement associated with building on permafrost land are more vulnerable to the impacts of permafrost.

Impacts to future populations, residences, critical facilities, and infrastructure are anticipated at the same impact level. To lessen future impacts the City could institute and enforce land use controls prohibiting new construction in permafrost zones and building codes to accommodate the effects of permafrost on structures.

Weather (Severe)

Using information provided by the City and the National Weather Service, the entire existing and future City's population, residences, and critical facilities are equally exposed to the effects of a severe weather event. This includes479 people in 210 residences (worth $13,797,000) and 61 critical facilities (worth approximately $106,565,000).

Impacts associated with severe weather events includes roof collapse, trees and power lines falling, damage to light aircraft and sinking small boats, injury and death resulting from snow machine or vehicle accidents, overexertion while shoveling all due to heavy snow. A quick thaw after a heavy snow can also cause substantial flooding. Impacts from extreme cold include hypothermia, halting transportation from fog and ice, congealed fuel, frozen pipes, disruption in utilities, and carbon monoxide poisoning. Section 5.3.5.3 provides additional detail regarding the impacts of severe weather. Buildings that are older and/or not constructed with materials designed to withstand heavy snow and wind (e.g., hurricane ties on crossbeams) are more vulnerable to the impacts of severe weather.

Impacts to future populations, residences, critical facilities, and infrastructure are anticipated at the same impact level. To lessen future impacts the City could institute and enforce building codes to accommodate the effects of severe weather on structures.

Wildland Fire

Impacts associated with a wildland fire event include the potential for loss of life and property. It can also impact livestock and pets and destroy forest resources and contaminate water supplies. Buildings closer to the outer edge of town, those with a lot of vegetation surrounding the structure, and those constructed with wood are some of the buildings that are more vulnerable to the impacts of wildland fire.

Impacts to future populations, residences, critical facilities, and infrastructure are anticipated at the same impact level. Community education, building materials, and prepared response personnel are some things that could lessen future impacts.

According to the Alaska Fire Service, there are no wildland fire areas within the City's boundaries. However, 193 wildland fires have occurred within a 50-mile radius of the City. (See Section 5.3.6.3) There is potential for wildland fire to interface with the population center of the City. Thus, for the purposes of this exposure and vulnerability assessment, it is assumed that all structures within the City are equally exposed to the impacts of a wildland fire event.

Wildland fire hazard areas were identified using a model incorporating slope, aspect, and fuel load. (See Figure 5-13) South-facing, steep, and heavily vegetated areas were assigned the highest fuel values while areas with little slope and natural vegetation were assigned the lowest fuel risk values. Risk levels of low, moderate, high, and extreme were assigned to the entire region based on the results of this modeling.

Nenana has 479 people in 210 residences (worth $13,797,000) and the following critical facilities and infrastructure located within areas of low and moderate wildland fire risk locations.

Low risk areas contain four government facilities (worth $3,025,000), three emergency response facilities (worth $4,100,000), two educational facilities (worth $13,925,000), two care facilities (worth $1,500,000), 15 community facilities (worth $19,150,000), three bridges (worth

$40,225,000), six transportation facilities (worth $855,000), and eight utilities (worth $13,929,000).

Moderate risk areas contain one government facilities (worth $225,000), one community facility (value unknown), three bridges (worth $40,225,000), and two transportation facilities (value unknown).

There are no residential properties or critical facilities located in High or Extreme wildfire hazard areas.

DMA 2000 Recommendations: Risk Assessment, Assessing Vulnerability, Analyzing Development Trends

Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): [The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Element

- Does the new or updated plan describe land uses and development trends?

Source: FEMA, July 2008.

6.3 LAND USE AND DEVELOPMENT TRENDS

Most of the city is connected to the piped water and sewer system – public infrastructure, businesses, homes, and the school are served. The remaining homes have individual wells and septic systems.

Potable water is supplied from a 100 ft. deep well developed in 1984 replacing the shallower well that was drilled in 1978. The water is treated, and then distributed throughout the community via 35,000 feet of 6-inch diameter circulating water main loops. The original water system used polyvinyl chloride (PVC) arctic pipe which is susceptible to cold temperature cracking. Newer system expansions used high-density polyethylene (HDPE) pipe.

The City's water system also connects with 54 fire hydrants throughout the community. Many were installed with PVC piping which are believed to leak and are the instigators of low pressure and potentially low flow rates. Many hydrants were also installed where grading restricts access – especially during the winter. Low water pressure and slow flow rates are potential hazards during fire incidents and also reduces the likelihood of enabling the City to expand its commercial building inventory.

The City's wastewater system consists of a mixture of PVC, HDPE, and insulated ductile iron pipe (DIP) piping approximately 22,200 feet of 8-inch gravity sewer and 3,100 feet of 4-inche and 6-inche force mains. As with the potable water system the earlier pipe installation used PVC pipe which is believed to be deteriorating and causing excess water infiltration that is causing an extra burden on the treatment equipment and systems.

Solid Waste is collected by a private firm, or self hauled to the Denali Borough Landfill located south of Anderson, the Esther transfer station, or the City of Fairbanks landfill. Many residents use burn barrels to reduce waste before disposal at the various transfer sites.

Property Ownership

Land use in Nenana is spread among the State (Alaska Railroad Corporation and Mental Health Trust), City, residents, and other private interests. The majority of the City center is owned by

the City and its residents, while the perimeter is mostly owned by the State's Mental Health Trust with the railroad maintaining a 100 foot right-of-way (ROW) along their tracks.

with limited area for commercial services and community (or institutional) facilities. Suitable developable vacant land is in short supply within the boundaries of the City, and open space and various hydrological bodies surround the community. One area of town is classified as airport land use.

Development Trends

The City is concerned that the condition of its water and wastewater systems are rapidly deteriorating, which limits infrastructure expansion. Low potable water, fire hydrant, and wastewater flow rates face catastrophic failure unless they can replace failing components and materials. These failing systems' capacity and capability limitations restrict the City's future growth and expansion.

The City has a high water table (six feet below grade) which further exacerbates their construction and expansion dilemmas. The high water table is particularly threatening during the spring thaw (when snow-melt increases river volume and flow rate) and during the summer (increased rainfall). Water from these seasonal sources cannot be absorbed creating severe flood inundation throughout the City's center impacting public, commercial, and residential structures. This is a particular concern area for the City as they feel the State has not helped them adequately address their flood threat needs.

Tables 6-6 and 6-7 list DCRA's identified infrastructure improvement projects for the City. They provide a depiction of the community's ongoing development trends. Subsequent development in the City will likely be relatively flat as the City has experienced limited population growth since 1980. Table 6-6 lists projects in various stages of completion:

Table 6-6 Projects Under Development

Lead Agency	Fiscal Year	Project Status	Project Description / Comments	Total Cost
FAA	2011	Planned	Nenana Municipal Airport: Construct Apron Federal Aviation Administration (FAA)	$1,050,000
AEA/AEEE	2010	Funded Preliminary	Nenana Hydrokinetic Construction Alaska Energy Authority/Alternative Energy and Energy Efficiency (AEA/AEEE)	$450,001
HUD	2009	Funded Contract	Indian Housing Block Grant/Native American Housing Assistance and Self Determination Act (IHBG/NAHASDA) administration, operating & construction fund Housing and Urban Development (HUD)	$133,622
AEA-AEEE	2009	Funded Contract	Nenana Run of the River Hydro Assess Healy	$80,625
Denali	2009	Funded Construction	9th and K Streets Reconstruction Phase II Major reconstruction of Ninth and K Streets (1.1 miles). The width will be 30 feet with a right of way of 60 feet. The road surface will be 4,707.74 feet on Ninth Street and 1,434.55 feet on K Street. There will be 20 each 24" corrugated polyethylene pipe culverts and 14 each 36" corrugate polyethylene pipe culverts Denali Commission (Denali)	$1,840,000
DEC/VSW	2009	Funded Preliminary	Design and Construction of Water and Sewer Facilities Department of Environmental Conservation/Village Safe Water (DEC/VSW)	$2,763,422

Table 6-6 Projects Under Development

Lead Agency	Fiscal Year	Project Status	Project Description / Comments	Total Cost
DCRA	2008	Funded Contract	Road Dust Control Legislative Grant - Grants to Municipalities Division of Community and Regional Affairs (DCRA)	$1,000,000
Denali	2008	Funded Construction	Nenana Tug and Barge Port Construction Project LOCAL FUNDING: Nenana Port Authority $150,000. The port upgrade project consists of placing approximately 900 feet of sheet piling along the Nenana River and creating a new slip on the Nenana River dock. The sheet piling project will provide a stabilized river bank allowing barge and tug mooring space for loading of cargo, safe equipment maintenance and ensure bulk petroleum storage facilities are protected from potential flooding and erosion	$1,000,000
DCRA	2008	Funded Construction	Solid Waste Transfer Station Legislative Grant - Grants to Municipalities	$180,000
HUD	2008	Funded Design	IHBG/NAHASDA administration, operating & construction funds	$121,672
FAA	2008	Planned	Nenana Municipal Airport: Rehabilitate Runway 04L/22R Construction	$997,500
FAA	2008	Planned	Nenana Municipal Airport: Install Perimeter Fencing Construction	$105,000
FAA	2007	Funded Contract	Nenana Municipal: Acquire Snow Removal Equipment	$257,775
HUD	2007	Funded Construction	IHBG/NAHASDA administration, operating & construction funds	$143,136
FAA	2007	Funded Contract	Nenana Municipal: Install Perimeter Fencing	$52,500
FAA	2007	Funded Contract	Nenana Municipal: Rehabilitate Runway	$52,500
ANTHC	2006	Funded Construction	Complete Reconstruction Design of Water and Sewer Service Lines, and Solid Waste Facilities Alaska Native Tribal Health Consortium (ANTHC)	$1,090,000
DEED	2006	Funded Preliminary	Nenana Major Maintenance Department of Education and Early Development (DEED)	$733,936
DEED	2006	Funded Preliminary	Nenana Fire Sprinkler Installation	$573,338
DEED	2005	Funded Construction	Nenana Boiler Replacement/Heating System Upgrade Fiscal Year (FY) 05 Capital Improvement Project (CIP)	$393,407
DEC/VSW	2005	Funded Preliminary	Water and Sewer Feasibility Study	$100,000
DOT/PF	2004	Planned	Bike Trail Construction Construct two miles of bike path to follow city streets and 9th Street Department of Transportation/Public Facilities (DOT/PF)	$75,000
DEED	2003	Funded Construction	Nenana Kitchen/Cafeteria Renovation Funded by State GO Bond	$341,355
DCRA	2003	Funded Contract	Cemetery Road Resurfacing and Community Projects and Improvements Legislative Grant - SLA 2007 added" and Community Projects and Improvements" to the description	$150,000
DEED	2003	Funded Preliminary	Nenana Vocational Education Building Renovation Funded by State GO Bond	$520,216
BIA	2001	Funded Design	Upgrade Streets Applied for special IRR HPP Funds for construction Bureau of Indian Affairs (BIA)	$450,000
DOT/PF	2000	Planned	Port Access	$1,051,000
DOT/PF	1998	Funded	Parks Hwy: MP 309 Monderosa Railroad Overpass	$4,230,000

Table 6-6 Projects Under Development

Lead Agency	Fiscal Year	Project Status	Project Description / Comments	Total Cost
		Construction		

(DCRA 2009)

The City has recently completed the Nenana Boarding School construction project (2008), solid waste recycling equipment installation (2007), a new teen/youth center construction project (2006), fire and snow removal equipment purchases (2002-2005), a new snow removal equipment building, water and waste water system upgrades and expansion projects. The Nenana airport underwent major airport reconstruction in 2003 (DCRA 2010).

Table 6-7 contains a comprehensive list of DCRA identified community capital improvement projects that spans back to 1990.

Table 6-7 Completed Projects

Lead Agency	Fiscal Year	Project Status	Project Description / Comments	Total Cost
DCRA	2008	Completed	Community Ambulance Legislative Grant - Grants to Municipalities	$150,000
DCRA	2007	Completed	Nenana Boarding School Construction and Maintenance Legislative Grant	$250,000
Denali	2007	Completed	Solid Waste Recycling Equipment Purchase Purchase and installation of one "Recycling Center in a Box" which will provide all the equipment needed to enable recycling of glass, household and lead acid batteries, aluminum, Freon, used oil, old computers, electronic waste, fluorescent light bulbs, aerosols, steel, refrigerators and freezers.	$61,560
DCRA	2007	Completed	Totchaket Access Project Update Legislative Grant	$25,000
DCRA	2007	Completed	Spirit Camp Legislative Grant	$9,000
DCRA	2006	Completed	Nenana Youth Education/Recreation Center Multi-Use Facility Program. OTHER FUNDING: Denali Commission $951,199; Community Development Block Grant (CDBG) $500,000; Indian CBDG (ICDBG) $500,000. LOCAL FUNDING: $71,670.	$2,022,868
HUD	2006	Completed	Indian Housing Block Grant/ Native American Housing Assistance and Self Determination Act IHBG/NAHASDA administration, operating & construction funds	$143,038
Denali	2006	Completed	Solid Waste Equipment Purchase. Purchase of a Waste Oil-to-Energy Converter (WOTEC).	$114,808
DHSS	2006	Completed	Nenana Tortella Council On Aging - Boiler and Furnace Purchase, Kitchen Renovations Department of Health and Social Services (DHSS)	$23,348
FAA	2005	Completed	Nenana Municipal: Acquire Snow Removal Equipment	$201,123
DCRA	2005	Completed	School Purposes Legislative Grant	$200,000
HUD	2005	Completed	IHBG/NAHASDA administration, operating & construction funds	$151,885
DCRA	2005	Completed	Feasibility Study/Business Plan for Motor Sport Park Mini-Grant. Funded through Denali Commission.	$13,174
FAA	2004	Completed	Construct Snow Removal Equipment Storage Building	$963,636
DCRA	2004	Completed	Nenana Student Living Center Legislative Grant	$500,000

Table 6-7 Completed Projects

Lead Agency	Fiscal Year	Project Status	Project Description / Comments	Total Cost
DOT&PF	2004	Completed	Parks Hwy: MP 305 to 351: Fairbanks - Nenana Scenic Waysides	$225,000
HUD	2004	Completed	IHBG/NAHASDA administration, operating & construction funds	$164,797
ANTHC	2004	Completed	Water and Sewer System Feasibility Study Water and Sewer System Feasibility Study	$100,000
DOT&PF	2004	Completed	City Streets Resurface - Phase I Upgrade drainage and chip seal city streets.	$60,000
Denali	2003	Completed	Nenana Airport Reconstruction LOCAL FUNDING: City of Nenana: $59,700. OTHER FUNDING: SOA DOT/PF: $119,400; FAA: $3,581,993.	$3,819,760
FAA	2003	Completed	Rehabilitate Runway OTHER FUNDING: Denali Commission $59,700; DOT $119,400	$3,579,872
FAA	2003	Completed	Improve Runway Safety Area	$796,875
HUD	2003	Completed	Teen Resource Center ICDBG Program.	$500,000
DCRA	2003	Completed	Teen/Youth Center CDBG	$500,000
FAA	2003	Completed	Airport Snow Removal Equipment	$410,516
HUD	2003	Completed	IHBG/NAHASDA administration, operating & construction funds	$95,197
DCRA	2003	Completed	Community Projects & Improvements: Community Center Rehabilitation Capital Matching	$26,316
DOT&PF	2002	Completed	Alaska Hwy: MP 1303 Tanana River Bridge #0505	$26,700,000
DEC/MGL	2002	Completed	Water/Sewer Extension, PH II Adding approx. 7000lf of sewer main and 13,500lf of water main to the City's utility systems. Will also add 27 new fire hydrants, 13 new manholes, and 2 new lift stations. A new drain line for the water treatment plants filter back flush system.	$2,241,800
HUD	2002	Completed	IHBG/NAHASDA administration, operating & construction funds	$84,989
DCRA	2002	Completed	Fire Truck Purchase Capital Matching	$26,316
DCRA	2002	Completed	Water & Sewer System Capital Matching	$26,316
ANTHC	2001	Completed	Water & Sewer Water and sewer main in support of new service connections.	$552,500
DEC/MGL	2001	Completed	Water/Sewer Extension, PH I Adding approx. 7000 lf of sewer main and 13,500lf of water main to the City's utility systems. Will also add 27 new fire hydrants, 13 new manholes, and 2 new lift stations. A new drain line for the water treatment plants filter back flush system.	$100,000
DHSS	2001	Completed	Railbelt Mental Health and Addictions - Purchase of 2 vehicles. Capital Grant. Also serves Healy area.	$30,310
DCRA	2001	Completed	Fire Truck Purchase Capital Matching	$26,316
ANTHC	2000	Completed	Water & Sewer Extension, Phase 1 OTHER FUNDING: Environmental Protection Agency (EPA) $1,304.3, Alaska Housing Finance Corporation (AHFC) $434.8	$2,045,882
HUD	2000	Completed	Road Rehabilitation ICDBG Program	$494,928
FAA	2000	Completed	Rehabilitate Runway	$357,641
HUD	2000	Completed	IHBG/NAHASDA administration, operating & construction funds	$79,011
DCRA	2000	Completed	Fire Truck Purchase Capital Matching	$26,316

Table 6-7 Completed Projects

Lead Agency	Fiscal Year	Project Status	Project Description / Comments	Total Cost
EDA	1999	Completed	Athabascan Heritage Park	$600,000
DEED	1999	Completed	Sprinkler System Renovation	$141,719
DEED	1999	Completed	Interior Lighting: Replace Fixtures & Install Suspended Ceiling	$90,754
DEED	1999	Completed	Handicap Access Repairs and Improvements	$89,924
HUD	1999	Completed	IHBG/NAHASDA administration, operating & construction funds	$79,011
DCRA	1999	Completed	Chip and Seal City Streets Capital Matching	$26,316
ANTHC	1998	Completed	Water & Sewer Extension, Design & Engineering DEC/MGL $95.0 Engineer sewer to remaining 14 homes, water to remaining 36 homes, riverfront services, 21 fire hydrants	$3,200,000
DOT&PF	1998	Completed	Parks Hwy: Nenana River Bridge Repair supports	$900,000
HUD	1998	Completed	IHBG/NAHASDA administration, operating & construction funds	$88,255
DCRA	1998	Completed	Water and Sewer Improvements Capital Matching	$26,316
AHFC	1998	Completed	Weatherize 5 Homes Weatherization	$11,915
AHFC	1998	Completed	Weatherize 1 Home Weatherization	$4,200
HUD	1997	Completed	Medical Center ICDBG Program	$500,000
DCRA	1997	Completed	Salmon Bake and Smoking Equipment RDA Grant	$230,000
AHFC	1997	Completed	Weatherize 9 homes Weatherization	$37,800
DCRA	1997	Completed	Road Stabilization Capital Matching	$26,316
HUD/CGP	1997	Completed	Housing Modernization Interior painting, doors, kitchen cabinets, plumbing, bath	$11,741
DCRA	1996	Completed	Salmon Bake CDBG	$373,810
DCRA	1996	Completed	Tourism Development and Marketing Plan RDA	$62,500
AHFC	1996	Completed	Major Rehab 2 homes to HUD standards (health and safety)	$40,000
DCRA	1996	Completed	Water & Sewer Improvements Capital Matching	$26,316
DCRA	1995	Completed	Chip & Seal City Streets as dust control measure Capital Matching. Local priority, from 1997 USDA/RD survey of villages US Department of Agriculture/Rural Development (USDA/RD)	$1,277,490
DCRA	1995	Completed	Construct Historic Interpretive Center CDBG	$400,000
DOT&PF	1995	Completed	Golden Railroad Spike Historic Park	$200,000
DOT&PF	1995	Completed	Streets Resurfacing	$70,000
DCRA	1995	Completed	Restore 1920 Alaska Railroad Cars RDA. Features artifacts with interactive technology	$55,000
DCRA	1995	Completed	Library Repairs RDA	$27,000
DCRA	1995	Completed	Feasibility Study for Sternwheeler RDA/USFS Mini-Grant	$24,500
DCRA	1995	Completed	Van for Elder Center RDA	$23,000
AHFC	1995	Completed	Weatherize 5 Homes Weatherization	$21,821
HUD/CGP	1995	Completed	Housing Modernization	$683

Table 6-7 Completed Projects

Lead Agency	Fiscal Year	Project Status	Project Description / Comments	Total Cost
DCRA	1994	Completed	Power Transmission Intertie Between Healy & Fairbanks Legislative Grant. For the benefit of all the utilities participating in the Intertie between Healy and Fairbanks. (See also Anderson and Healy.) Design and Construction of a Power Transmission Intertie of at Least 138 Kilovolts	$43,200,000
AHFC	1994	Completed	Meleda Lord Senior Apartments Construction Dept. - 15 Units Funded with Senior Housing Fund	$3,068,600
DCRA	1994	Completed	Dock Upgrades Legislative Grant. ED 34	$115,000
DOT&PF	1994	Completed	Golden Railroad Spike Historic Park Mark a walking trail, improve access to the site of the golden spike ceremony and construct park benches and interpretive signs. Construction Summer 94	$70,000
DCRA	1994	Completed	Water Treatment Plant Improvements Legislative Grant. ED 34	$69,000
DCRA	1994	Completed	Visitor Center Upgrade Restroom/Handicap Access Legislative Grant. ED 34	$50,000
DHSS	1994	Completed	Health Clinic Equipment & Repairs	$25,000
DHSS	1994	Completed	Mental Health Services Vehicle Purchase	$16,000
DCRA	1994	Completed	Pickup Truck Purchase & Delivery for City Utilities Capital Matching	$15,789
DCRA	1994	Completed	Tortilla Hill TV Transmitter Installation Capital Matching	$10,526
DCRA	1993	Completed	Civic Center, Final Phase Legislative Grant	$139,000
DCRA	1993	Completed	Health Clinic, Ph II Legislative Grant	$87,200
DEED	1993	Completed	School Restrooms Renovation and Code Upgrade Closed out.	$36,000
DCRA	1993	Completed	Heritage Park Feasibility/Marketing Study RDA	$30,000
DCRA	1993	Completed	Airport Grant Match Legislative Grant	$25,500
DHSS	1993	Completed	Health Clinic Maintenance	$25,000
DCRA	1993	Completed	Library Code Upgrade & Bathroom Repair Legislative Grant	$11,845
DHSS	1993	Completed	Nenena Senior Center - Upgrades	$8,000
HUD/CGP	1993	Completed	Housing Modernization Foundation repairs	$5,000
FAA	1992	Completed	Nenana Municipal: Acquire Security Equipment	$174,949
FAA	1992	Completed	Nenana Municipal: Acquire Security Equipment	$135,009
FAA	1992	Completed	Nenana Municipal: Acquire Snow Removal Equipment	$134,472
FAA	1992	Completed	Nenana Municipal: Install Runway Lighting	$119,816
FAA	1992	Completed	Nenana Municipal: Rehabilitate Runway	$73,846
FAA	1992	Completed	Nenana Municipal: Install Runway Lighting	$70,559
DCRA	1992	Completed	Water/Sewer Legislative Grant	$33,000
ANTHC	1991	Completed	Water & Sewer extension to 15-unit senior housing complex IHS funding	$525,000
DOT&PF	1990	Completed	Parks Hwy: Nenana North	$445,343

(DCRA 2009)

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

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

Within this section the Planning Team developed the mitigation goals and potential mitigation actions for the City of Nenana.

7.1 DEVELOPING MITIGATION GOALS

The requirements for the local hazard mitigation goals, as stipulated in DMA 2000 and its implementing regulations are described below.

DMA 2000 Requirements: Mitigation Strategy – Local Hazard Mitigation Goals

Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Element

- Does the new or updated plan include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards?

Source: FEMA, July 2008.

The exposure analysis results were used as a basis for developing the mitigation goals and actions. Mitigation goals are defined as general guidelines that describe what a community wants to achieve in terms of hazard and loss prevention. Goal statements are typically long-range, policy-oriented statements representing community-wide visions. As such, nine goals were developed to reduce or avoid long-term vulnerabilities to the identified hazards (Table 7-1).

Table 7-1 Mitigation Goals

No.	Goal Description
1	Promote recognition and mitigation of all natural hazards that affect the City of Nenana (City).
2	Cross-reference mitigation goals and actions with other City planning mechanisms and projects.
3	Reduce possibility of losses from all natural hazards that affect the City.
4	Reduce vulnerability of structures to earthquake damage.
5	Reduce possibility of damage and losses from erosion.
6	Reduce the possibility of damage and losses from flooding.
7	Reduce possibility of damage and losses from permafrost.
8	Reduce vulnerability of structures to severe winter storm damage.
9	Reduce possibility of damage and losses from wildland fires.

7.2 IDENTIFYING MITIGATION ACTIONS

The requirements for the identification and analysis of mitigation actions, as stipulated in DMA 2000 and its implementing regulations are described below.

DMA 2000 Requirements: Mitigation Strategy - Identification and Analysis of Mitigation Actions

Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Element

- Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?
- Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?
- Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?

Source: FEMA, July 2008.

DMA 2000 Requirements: Mitigation Strategy - Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance

Identification and Analysis of Mitigation Actions: NFIP Compliance

Requirement §201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

Element

- Does the new or updated plan describe the jurisdiction(s) participation in the NFIP?
- Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?

Source: FEMA, July 2008.

After mitigation goals and actions were developed, the planning team assessed the potential mitigation actions to carry forward into the mitigation strategy. Mitigation actions are activities, measures, or projects that help achieve the goals of a mitigation plan. Mitigation actions are usually grouped into four broad categories: prevention, property protection, public education and awareness, and structural projects. On April 5, 2010, the Planning Team considered 67 mitigation actions for potential implantation during the five-year life cycle of this HMP. The Planning Team placed particular emphasis on projects and programs that reduce the effects of hazards on both new and existing buildings and infrastructure. These potential projects are listed in Table 7-2 below.

Table 7-2 Mitigation Goals and Potential Actions
(Bold ID items were selected for implantation by the Planning Team)

Goals		Actions	
No.	Description	ID	Description
1	Promote recognizing and mitigating all natural hazards that affect the City of Nenana (City).	**A**	Establish a formal role for the jurisdictional Hazard Mitigation Planning Committees to develop a sustainable process to implement, monitor, and evaluate community wide mitigation actions.
		B	Develop, produce, and distribute information materials concerning mitigation, preparedness, and safety procedures for all jurisdictional identified natural hazards.
		C	Develop and implement strategies and educational outreach programs for debris management from natural hazard events.
		D	Disseminate FEMA pamphlets to educate and encourage homeowners concerning structural and non-structural retrofit benefits.
		E	Develop outreach program to educate residents concerning benefits of increased seismic resistance and modern building code compliance during rehabilitation or major repairs for residences or businesses.
		F	Develop outreach program with school district contests having students develop, display, and explain mitigation projects or initiatives.
		G	Update public emergency notification procedures and develop an outreach program for potential hazard impacts or events.
		H	Identify and pursue funding opportunities to implement mitigation actions.
		I	Maintain membership in the National Flood Insurance Program to reduce monetary losses to individuals and the community.
		J	Identify critical facilities and vulnerable populations based on mapped high hazard areas.
		K	Identify evacuation routes away from high hazard areas and develop outreach program to educate the public concerning warnings and evacuation procedures.
2	Reduce possibility of losses from all natural hazards that affect the City.	**A**	The City will aggressively manage their existing plans to ensure they incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, and land use plans, etc to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.
		B	Review ordinances and develop outreach programs to assure propane tanks are properly anchored and hazardous materials are properly stored and protected from known natural hazards such as flood or seismic events.
		C	Integrate the Mitigation Plan findings for enhanced emergency planning.

Table 7-2 Mitigation Goals and Potential Actions
(Bold ID items were selected for implantation by the Planning Team)

Goals		Actions	
No.	Description	ID	Description
		D	Develop and incorporate building ordinances commensurate with building codes to reflect survivability from flood, fire, wind, seismic, and other hazards to ensure occupant safety.
		E	Develop and incorporate mitigation provisions and recommendations into zoning ordinances and community development processes to maintain the floodway and protect critical infrastructure and private residences from other hazard areas.
		F	Update or develop, implement, and maintain jurisdictional debris management plans.
		G	Prohibit new construction in identified mitigatable hazard impact areas (avalanche, flood, erosion, etc.) or require building to applicable building codes for other hazard impacts (earthquake, volcanic ash, weather, etc.).
3	Cross reference Mitigation goals and actions with other City planning mechanisms and projects.	A	Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice load and wind storm power line failure during severe wind or winter ice storm events.
		B	Acquire (buy-out), demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.
		C	Harden utility headers located along river embankments to mitigate potential flood, debris, and erosion damages.
		D	Purchase and install generators with main power distribution disconnect switches for identified and prioritized critical facilities susceptible to short term power disruption. (i.e. first responder and medical facilities, schools, correctional facilities, and water and sewage treatment plants, etc.)
		E	Develop vegetation projects to restore clear-cut and riverine erosion damage and to increase landslide susceptible slope stability.
		F	Identify and list repetitively flooded structures and infrastructures, analyze the threat to these facilities, and prioritize mitigation actions to protect the threatened population.
		G	Perform hydrologic and hydraulic engineering, and drainage studies and analyses. Use information obtained for feasibility determination and project design. This information should be a key component, directly related to a proposed project.
4	Reduce vulnerability of structures to earthquake damage.	**A**	Retrofit important public facilities with significant seismic vulnerabilities.
		B	Inspect, prioritize, and retrofit any critical facility or public infrastructure that does not meet current State Adopted Building Codes.

Table 7-2 Mitigation Goals and Potential Actions
(Bold ID items were selected for implantation by the Planning Team)

Goals		Actions	
No.	Description	ID	Description
		C	Evaluate critical public facility seismic performance for fire stations, public works buildings, potable water systems, wastewater systems, electric power systems, and bridges within the jurisdiction.
		D	Encourage utility companies to evaluate and harden vulnerable infrastructure elements for sustainability.
		E	Install non-structural seismic restraints for large furniture such as bookcases, filing cabinets, and appliances to prevent toppling damage and resultant injuries.
5	Reduce possibility of damage and losses from erosion.	**A**	Maintain and update erosion hazard locations, identify critical facilities potentially impacted and develop mitigation initiatives such as bank stabilization or facility relocation to prevent or reduce the threat.
		B	Install bank protection such as rip-rap (large rocks), sheet pilings, gabion baskets, articulated matting, concrete, asphalt, vegetation, or other armoring or protective materials to provide river bank protection.
		C	Harden culvert entrance bottoms with asphalt, concrete, rock, or similar material to reduce erosion or scour.
		D	Install walls at the end of a drainage structure to prevent embankment erosion at its entrance or outlet. (end or wing walls).
6	Reduce the possibility of damage and losses from flooding.	A	Develop and maintain critical facility inventory for all structures located within 100-year and 500-year floodplains.
		B	Develop and maintain inventory of repetitive loss properties to include the types, numbers, and locations of properties.
		C	Establish flood mitigation priorities for critical facilities and residential and commercial buildings located within the 100- year floodplain using survey elevation data.
		D	Develop and maintain an inventory of locations subject to frequent storm water flooding based on most current USACOE flood data.
		E	Determine and implement most cost beneficial and feasible mitigation actions for locations with repetitive flooding and significant damages or road closures.
		F	Develop an outreach program to educate public concerning NFIP participation benefits, floodplain development, land use regulation, and NFIP flood insurance availability to facilitate continued compliance with the NFIP.
		G	Develop, implement, and enforce floodplain management ordinances.

Table 7-2 Mitigation Goals and Potential Actions
(Bold ID items were selected for implantation by the Planning Team)

Goals		Actions	
No.	Description	ID	Description
		H	Develop outreach program to educate residents concerning flood proofed well and sewer/septic facility installations.
		I	Install new streamflow and rainfall measuring gauges.
		J	Dry flood proof historical and or non-residential structures.
		K	Increase culvert size to increase its drainage efficiency.
		L	Construct debris basins to retain debris in order to prevent downstream drainage structure clogging.
		M	Install debris cribs over culvert inlets to prevent inflow of coarse bed-load and light floating debris.
		N	Create detention storage basins, ponds, reservoirs etc. to allow water to temporarily accumulate to reduce pressure on culverts and low water crossings allowing water to ultimately return to its watercourse at a reduced flow rate.
		O	Create relief drainage ditch openings using a culverts or bridges to relieve rapid water accumulation during high water flow events.
		P	Provide flood protection to mitigate damage and contamination of wastewater treatment systems (sewage lagoons).
		Q	Elevate roadbed to enable the road to act as a levee to protect flood threatened homes. This action will eliminate the need to elevate these threatened homes.
		R	Elevate road adjacent to the slough to enable the road to act as a levee to protect flood threatened homes.
7	Reduce possibility of damage and losses from permafrost.	A	Identify and map existing permafrost areas to assist in new critical facility siting and existing facility relocation siting
		B	Promote permafrost sensitive construction practices in permafrost areas.
8	Reduce vulnerability of structures to severe weather damage.	**A**	Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms.
		B	Develop critical facility list needing emergency back-up power systems, prioritize, seek funding, and implement mitigation actions.
		C	Develop and implement tree clearing mitigation programs to keep trees from threatening lives, property, and public infrastructure from severe weather events.

Table 7-2 Mitigation Goals and Potential Actions
(Bold ID items were selected for implantation by the Planning Team)

Goals		Actions	
No.	Description	ID	Description
		D	Develop personal use and educational outreach training for a "safe tree harvesting" program. Implement along utility and road corridors, preventing potential winter storm damage.
		E	Implement and enforce the most current State adopted building codes to ensure structures can withstand winter storm hazards such as high winds, rain, water, and snow.
		F	Increase power line wire size and incorporate quick disconnects (break away devices) to reduce ice load power line severe wind or winter ice storm event failure.
9	Reduce possibility of damage and losses from wildland fires.	**A**	Develop Community Wildland Fire Protection Plan.
		B	Hold FireWise workshop to educate residents and contractors concerning fire resistant landscaping.
		C	Promote FireWise building siting, design, and construction materials.
		D	Provide wildland fire information in an easily distributed format for all residents.
		E	Develop, adopt, and enforce burn ordinances that require burn permits, restrict campfires, and controls outdoor burning.
		F	Develop outreach program to educate and encourage fire-safe construction practices for existing and new construction in high risk areas.
		G	Identify, develop, implement, and enforce mitigation actions such as fuel breaks and reduction zones for potential wildland fire hazard areas.

7.3 EVALUATING AND PRIORITIZING MITIGATION ACTIONS

The requirements for the evaluation and implementation of mitigation actions, as stipulated in DMA 2000 and its implementing regulations are described below.

DMA 2000 Requirements: Mitigation Strategy - Implementation of Mitigation Actions

Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

Element

- Does the new or updated mitigation strategy include how the actions are prioritized?
- Does the new or updated mitigation strategy address how the actions will be implemented and administered?
- Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?
- *Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred? (Not applicable until 2014 update)*

Source: FEMA, July 2008.

The Planning Team evaluated and prioritized each of the mitigation actions on April 6, 2010 to determine which actions would be included in the Mitigation Action Plan. The Mitigation Action Plan represents mitigation projects and programs to be implemented through the cooperation of multiple entities in the City. To complete this task, the Planning Team first prioritized the hazards that were regarded as the most significant within the community (earthquake, erosion, flood, permafrost, severe weather, and wildland fire).

The Planning Team reviewed the simplified social, technical, administrative, political, legal, economic, and environmental (STAPLEE) evaluation criteria (shown in Table 7-3) and the Benefit-Cost Analysis Fact Sheet (Appendix D) to consider the opportunities and constraints of implementing each particular mitigation action. For each action considered for implementation, a qualitative statement is provided regarding the benefits and costs and, where available, the technical feasibility. A detailed cost-benefit analysis is anticipated as part of the application process for those projects the City chooses to implement.

Table 7-3 Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) Evaluation Criteria for Mitigation Actions

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

On April 6, 2010, the hazard mitigation Planning Team prioritized each mitigation action that was chosen to carry forward into the Mitigation Action Plan. The hazard mitigation Planning Team considered each hazard's history, extent, and probability to determine each potential actions priority. A rating system based on high, medium, or low was used. High priorities are associated with actions for hazards that impact the community on an annual or near annual basis and generate impacts to critical facilities and/or people. Medium priorities are associated with actions for hazards that impact the community less frequently, and do not typically generate impacts to critical facilities and/or people. Low priorities are associated with actions for hazards that rarely impact the community and have rarely generated documented impacts to critical facilities and/or people.

Prioritizing the mitigation actions in the Mitigation Action Plan Matrix was completed to provide the City with an approach to implementing the Mitigation Action Plan. Table 7-4 defines the mitigation action priorities.

7.4 IMPLEMENTING A MITIGATION ACTION PLAN

Table 7-4 shows the City of Nenana Mitigation Action Plan Matrix that shows how the mitigation actions were prioritized, how the overall benefit/costs were taken into consideration, and how each mitigation action will be implemented and administered by the Planning Team.

Table 7-4 City of Nenana's Mitigation Action Plan Matrix

(See acronym and abbreviations list for complete titles)

Action ID	Description	Priority	Responsible Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
1A	Establish a formal role for the jurisdictional Hazard Mitigation Planning Team to develop a continuous process to implement, monitor, and evaluate community wide mitigation actions.	Medium	City of Nenana, Nenana Native Council (The Native Council is included as a viable responsible entity in order to obtain Administration for Native Americans (ANA) funding, the Tribe would need to be the applicant for those projects)	City of Nenana, Nenana Native Council	1-3 years	B/C: The existing team has gained experienced throughout this process which can provide invaluable for ensuring a sustained effort toward mitigating natural hazard damages. TF: This is feasible to accomplish as no cost is associated with the action and only relies on member availability and willingness to serve their community.
1D	Disseminate FEMA pamphlets to educate and encourage homeowners concerning structural and non-structural retrofit benefits.	Medium	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council, Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance (HMA) programs, FEMA Assistance to Firefighters Grant (AFG) Program's Fire Prevention and Safety Grant (FP&S) Program, and Staffing for Adequate Fire and Emergency Response (SAFER) Program	1-3 years	B/C: Sustained mitigation outreach programs have minimal cost and will help build and support area-wide capacity. This type activity enables the public to prepare for, respond to, and recover from disasters. TF: This low cost activity can be combined with recurring community meetings where hazard specific information can be presented in small increments. This activity is ongoing demonstrating its feasibility.
1G	Update public emergency notification procedures and develop an outreach program for potential hazard impacts or events.	Medium	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council, AFG, FP&S, SAFER	3-5 years	B/C: Sustained emergency response planning and mitigation outreach programs have minimal cost and will help build and support community capacity enabling the public to prepare for, respond to, and recover from disasters. TF: This project is technically feasible using existing City staff

Table 7-4 City of Nenana's Mitigation Action Plan Matrix

(See acronym and abbreviations list for complete titles)

Action ID	Description	Priority	Responsible Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
1H	Identify and pursue funding opportunities to implement mitigation actions.	High	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council, HMA, AFG, FP&S, SAFER, ANA, EFSP, Denali Commission, DCCED/CDBG	Ongoing	B/C: This ongoing activity is essential for the City as there are limited funds available to accomplish effective mitigation actions. TF: This activity is ongoing demonstrating its feasibility.
1I	Maintain membership in the National Flood Insurance Program to reduce monetary losses to individuals and the community.	High	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council	1-3 years	B/C: NFIP participation while one of FEMA's highest priorities also enables communities with an effective program focus on repetitive flood loss properties and other priority flood locations and projects. TF: City is currently a member and residents enjoy lower cost insurance. Continuation is relatively simple.
2A	The City will aggressively manage their existing plans to ensure they incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, and land use plans, etc to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.	Medium	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council, Denali Commission, DCCED/CDBG	1-3 years	B/C: Coordinated planning ensures effective damage abatement and ensures proper attention is assigned to reduce losses and damage to structures and City residents. TF: This is feasible to accomplish as no cost is associated with the action and only relies on member availability and willingness to serve their community.
2C	Integrate the Mitigation Plan findings for enhanced emergency planning.	Medium	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council, Denali Commission, DCCED/CDBG	1-3 years	B/C: Coordinated planning ensures effective damage abatement and ensures proper attention is assigned to reduce losses and damage to structures and City residents. TF: This is feasible to accomplish as no cost is associated with the action and only relies on member

Table 7-4 City of Nenana's Mitigation Action Plan Matrix

(See acronym and abbreviations list for complete titles)

Action ID	Description	Priority	Responsible Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
						availability and willingness to serve their community.
2F	Update or develop, implement, and maintain jurisdictional debris management plans.	Low	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council, HMA, AFG, FP&S, SAFER, ANA, EFSP	1-4 years	B/C: Debris management plans are an essential disaster management tool. Focused and coordinated planning enables effective damage abatement and ensures proper attention is assigned to reduce losses, damage, and materials management. TF: This action is feasible with limited fund expenditures.
2G	Prohibit new construction in identified mitigatable hazard impact areas (flood, erosion, permafrost etc.) or require building to applicable building codes for other hazard impacts (earthquake, volcanic ash, weather, etc.).	High	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council	3-5 years	B/C: Building code development, implementation and enforcement can effectively reduce future losses to hazardous events. Building codes can actually assist bush communities through making maximum use of materials and shipping costs the first time. TF: This project is technically feasible as the community need only demonstrate cost savings by demonstrating losses from history utility impacts and down time.
3B	Acquire (buy-out), demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.	High	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council, HMA, Natural Resources Conservation Service (NRCS), ANA	1-5 years	B/C: This project would remove threatened structures from the floodplain, eliminating future damage while keeping land clear for perpetuity. F: This project is feasible using existing staff skills, equipment, and materials.

Table 7-4 City of Nenana's Mitigation Action Plan Matrix

(See acronym and abbreviations list for complete titles)

Action ID	Description	Priority	Responsible Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
4A	Retrofit important public facilities with significant seismic vulnerabilities.	Medium	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council, HMA, ANA, EFSP	2-4 years	B/C: Retrofit projects can be very cost effective. Project viability depends on the cost and extent of the modifications. A comprehensive BCA needs to be conducted to validate this activity. TF: The City will need phase funding to obtain engineering and design expertise to determine project viability.
4E	Install non-structural seismic restraints for large furniture such as bookcases, filing cabinets, and appliances to prevent toppling damage and resultant injuries.	Medium	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council, HMA, ANA, EFSP	2-4 years	B/C: Non-structural mitigation projects have minimal cost and will help the community reduce recurring earthquake impact damages from future events. TF: This project is technically feasible using existing Tribal Council staff
5A	Maintain and update erosion hazard locations, identify critical facilities potentially impacted and develop mitigation initiatives such as bank stabilization or facility relocation to prevent or reduce the threat.	Medium	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council	2-4 years	B/C: Identifying threatened infrastructure proximity to natural hazards is vital to their sustainability. There are no currently mapped hazard areas. This is a vital first step. This knowledge will help the community focus on activities to protect their vital infrastructure. TF: The project is technically feasible as the community has staff and resources they have used to relocate and elevate buildings.
6E	Determine and implement most cost beneficial and feasible mitigation actions for locations with repetitive flooding and significant	High	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council	1-3 years	B/C: Flood hazard mitigation is among FEMA's highest national priorities. FEMA desires communities

Table 7-4 City of Nenana's Mitigation Action Plan Matrix

(See acronym and abbreviations list for complete titles)

Action ID	Description	Priority	Responsible Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
	damages or road closures.					focus on repetitive flood loss properties. This activity will ensure the City and Tribal Councils focus on priority flood locations and projects. TF: Low to no cost makes this outreach activity very feasible.
6G	Develop, implement, and enforce floodplain management ordinances.	High	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council	1-3 years	B/C: Continued NFIP participation while one of FEMA's highest priorities also enables communities with an effective program focus on repetitive flood loss properties and other priority flood locations and projects. TF: Low to no cost makes this outreach activity very feasible.
6Q	Raise roadbed to enable the road to act as a levee to protect flood threatened homes. This action will eliminate the need to elevate these threatened homes.	Medium	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council	3-8 years	B/C: This project would protect threatened structures from future flood damage, dramatically reduce the expense of mitigating each structure individually. TF: This project is feasible using existing staff skills, equipment, and materials.
6R	Elevate road adjacent to the slough to enable the road to act as a levee to protect flood threatened homes.	Medium	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council, HMA, US DOT, AK DOT/PF	3-8 years	B/C: This project would protect threatened structures from future flood damage, dramatically reduce the expense of mitigating each structure individually. TF: This project is feasible using existing staff skills, equipment, and materials.
8A	Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe	Low	City of Nenana, Nenana Native Council	City of Nenana, Nenana Native Council, DCCED/CDBG, Denali Commission	3-5 years	B/C: Scheduling maintenance and implementing mitigation activities will potentially reduce severe winter storm damages caused by heavy

Table 7-4 City of Nenana's Mitigation Action Plan Matrix

(See acronym and abbreviations list for complete titles)

Action ID	Description	Priority	Responsible Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
	winter storms.					snow loads and icy rain. TF: This type activity is technically feasible within the community typically using existing labor, equipment, and materials. Specialized methods are not new to rural communities as they are used to importing required contractors.
9A	Develop Community Wildland Fire Protection Plan.	High	City of Nenana, Nenana Native Council, Alaska Fire Service, Division of Forestry, US Forest Service	City of Nenana, Nenana Native Council, DOF: VFAG, RAGP	3-5 years	B/C: This project will ensure the community looks closely at their wildland fire hazard to ensure they can safely address actions and needs during a wildland fire event. TF: This is technically feasible using existing city and tribal resources with existing State and Federal agency support and guidance.
9D	Provide wildland fire information in an easily distributed format for all residents.	Medium	City of Nenana, Nenana Native Council, Alaska Fire Service, US Forest Service	City of Nenana, Nenana Native Council, DOF FireWise Program	1-3 years	B/C: Sustained mitigation outreach program has minimal cost and will help build and support area-wide capacity. This type activity enables the public to prepare for, respond to, and recover from disasters. TF: This low cost activity can be combined with recurring community meetings where hazard specific information can be presented in small increments. This activity is ongoing demonstrating its feasibility.

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This section describes a formal plan maintenance process to ensure that the HMP remains an active and applicable document. It includes an explanation of how the City's Planning Team intends to organize their efforts to ensure that improvements and revisions to the HMP occur in a well-managed, efficient, and coordinated manner.

The following three process steps are addressed in detail here:

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

8.1 MONITORING, EVALUATING, AND UPDATING THE HMP

The requirements for monitoring, evaluating, and updating the HMP, as stipulated in the DMA 2000 and its implementing regulations are described below.

DMA 2000 Requirements: Plan Maintenance Process - Monitoring, Evaluating, and Updating the Plan

Monitoring, Evaluating and Updating the Plan

Requirement §201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Element

- Does the new or updated plan describe the method and schedule for monitoring the plan, including the responsible department?
- Does the new or updated plan describe the method and schedule for evaluating the plan, including how, when and by whom (i.e., the responsible department?
- Does the new or updated plan describe the method and schedule for updating the plan within the five-year cycle?

Source: FEMA, July 2008.

The HMP was prepared as a collaborative effort among the Planning Team and URS. To maintain momentum and build upon previous hazard mitigation planning efforts and successes, the City will use the Planning Team to monitor, evaluate, and update the HMP. Each authority identified in Table 7-4 will be responsible for implementing the Mitigation Action Plan. The City Mayor (Planning Team Leader or designee), will serve as the primary point of contact and will coordinate local efforts to monitor, evaluate, and revise the HMP.

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

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

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

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

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

8.2 IMPLEMENTATION THROUGH EXISTING PLANNING MECHANISMS

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

DMA 2000 Requirements: Plan Maintenance Process - Incorporation into Existing Planning Mechanisms

Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

Element

- Does the new or updated plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan?
- Does the new or updated plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate?
- *Does the updated plan explain how the local government incorporated the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate? (Not applicable until 2014 update)*

Source: FEMA, July 2008.

After the adoption of the HMP, each Planning Team Member will ensure that the HMP, in particular each Mitigation Action Project, is incorporated into existing planning mechanisms. Each member of the Planning Team will achieve this incorporation by undertaking the following activities.

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

8.3 CITY OF NENANA CAPABILITY ASSESSMENT

The City's capability assessment reviews the technical and fiscal resources available to the community. This section outlines the resources available to the City for mitigation and mitigation related funding and training.

Table 8-1 City of Nenana Regulatory Tools

Regulatory Tools (ordinances, codes, plans)	Existing Yes/No	Comments (Year of most recent update; problems administering it, etc)
Comprehensive Plan	No	Under development in 2010
City Charter	Yes	Defines the City's governance, staffing, and financial capabilities
Building code		The City can exercise this authority.
Zoning ordinances		The City can exercise this authority.
Subdivision ordinances or regulations		The City can exercise this authority.
Land Use, Planning, and Platting	Yes	Chapter 7, Article 1
Erosion Study	Yes	U.S. Army Corps of Engineers, Alaska Baseline Erosion Assessment, Erosion Information Paper – Nenana, Alaska.

Table 8-1 City of Nenana Regulatory Tools

Regulatory Tools (ordinances, codes, plans)	Existing Yes/No	Comments (Year of most recent update; problems administering it, etc)
		September 20, 2007 defined the City's erosion threat
Flood Insurance Study	Yes	City of Nenana, Alaska, Unorganized Borough, Revised April 7, 1999
Flood Insurance Rate Map	Yes	City of Nenana FIRM, April 1999
Floodplain Regulations	Yes	Chapter 7, Article 2 contains NFIP required floodplain regulation.
Wildfire Protection Plan	Yes	Community Wildfire Protection Plan, For At-Risk Communities in the Fairbanks North Star Borough, Alaska, Phase I, 10/30/2006, defines their wildfire threat
Emergency Response Plans	No	Under Development (2010)
Sanitation Plan	Yes	City of Nenana Sanitation Master Plan, October 2006 defined the City's soils and Vegetation composition, and the flood, erosion, permafrost, and seismic threats
Cultural Resource Plan	Yes	Cultural Resource Background, Water and Sewer Master Plan, Nenana, Alaska, March 2005. Prepared by Northern Land Use Research, Inc. provided cultural background and historic site information
Railroad Plans or Surveys	Yes	Alaska Railroad Nenana Rail Realignment, Environmental Filed Survey and Preliminary Jurisdictional Determination of Wetlands, Prepared for ARRC by URS Corp, July 2005 provided City topographic, floodplain, and wetlands information
Community Profile	Yes	State of Alaska, Department of Commerce, Community and Economic Development Community Profile Map provided historical and demographic information

Federal Resources

The Federal government requires local governments to have a HMP in place to be eligible for mitigation funding opportunities through FEMA such as the UHMA Programs and the HMGP. The Mitigation Technical Assistance Programs available to local governments are also a valuable resource. FEMA may also provide temporary housing assistance through rental assistance, mobile homes, furniture rental, mortgage assistance, and emergency home repairs. The Disaster Preparedness Improvement Grant also promotes educational opportunities with respect to hazard awareness and mitigation.

- FEMA, through its Emergency Management Institute, offers training in many aspects of emergency management, including hazard mitigation. FEMA has also developed a large number of documents that address implementing hazard mitigation at the local level. Five key resource documents are available from FEMA Publication Warehouse (1-800-480-2520) and are briefly described here:
  - How-to Guides. FEMA has developed a series of how-to guides to assist states, communities, and tribes in enhancing their hazard mitigation planning capabilities. The first four guides describe the four major phases of hazard mitigation planning. The last five how-to guides address special topics that arise in hazard mitigation planning such as conducting cost-benefit analysis and preparing multi-jurisdictional

plans. The use of worksheets, checklists, and tables make these guides a practical source of guidance to address all stages of the hazard mitigation planning process. They also include special tips on meeting DMA 2000 requirements (http://www.fema.gov/fima/planhowto.shtm).

- Post-Disaster Hazard Mitigation Planning Guidance for State and Local Governments. FEMA DAP-12, September 1990. This handbook explains the basic concepts of hazard mitigation and shows state and local governments how they can develop and achieve mitigation goals within the context of FEMA's post-disaster hazard mitigation planning requirements. The handbook focuses on approaches to mitigation, with an emphasis on multi-objective planning.
- Mitigation Resources for Success compact disc (CD). FEMA 372, September 2001. This CD contains a wealth of information about mitigation and is useful for state and local government planners and other stakeholders in the mitigation process. It provides mitigation case studies, success stories, information about Federal mitigation programs, suggestions for mitigation measures to homes and businesses, appropriate relevant mitigation publications, and contact information.
- A Guide to Federal Aid in Disasters. FEMA 262, April 1995. When disasters exceed the capabilities of state and local governments, the President's disaster assistance programs (administered by FEMA) is the primary source of Federal assistance. This handbook discusses the procedures and process for obtaining this assistance, and provides a brief overview of each program.
- The Emergency Management Guide for Business and Industry. FEMA 141, October 1993. This guide provides a step-by-step approach to emergency management planning, response, and recovery. It also details a planning process that businesses can follow to better prepare for a wide range of hazards and emergency events. This effort can enhance a business's ability to recover from financial losses, loss of market share, damages to equipment, and product or business interruptions. This guide could be of great assistance to a community's industries and businesses located in hazard prone areas.
- The FEMA Hazard Mitigation Assistance (HMA Unified Guidance, June 1, 2009. The guidance introduces the five HMA grant programs, funding opportunities, award information, eligibility, application and submission information, application review process, administering the grant, contracts, additional program guidance, additional project guidance, and contains information and resource appendices (FEMA 2009).

- Department of Agriculture (USDA). Assistance provided includes: Emergency Conservation Program, Non-Insured Assistance, Emergency Watershed Protection, Rural Housing Service, Rural Utilities Service, and Rural Business and Cooperative Service.
- Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy, Weatherization Assistance Program. This program minimizes the adverse effects of high energy costs on low-income, elderly, and handicapped citizens through client education activities and weatherization services such as an all-around safety check of major energy systems, including heating system modifications and insulation checks.

- Department of Health and Human Services, Administration of Children & Families, Administration for Native Americans (ANA). The ANA awards funds through grants to American Indians, Native Americans, Native Alaskans, Native Hawaiians, and Pacific Islanders. These grants are awarded to individual organizations that successfully apply for discretionary funds. ANA publishes in the Federal Register an announcement of funds available, the primary areas of focus, review criteria, and the method of application. (http://www.acf.hhs.gov/programs/ana/)
- Department of Housing and Urban Development (HUD), Office of Homes and Communities, Section 108 Loan Guarantee Programs. This program provides loan guarantees as security for Federal loans for acquisition, rehabilitation, relocation, clearance, site preparation, special economic development activities, and construction of certain public facilities and housing.
- Department of Housing and Urban Development, Community Development Block Grants (HUD/CDBG). Provides grant assistance and technical assistance to aid communities in planning activities that address issues detrimental to the health and safety of local residents, such as housing rehabilitation, public services, community facilities, and infrastructure improvements that would primarily benefit low-and moderate-income persons.
- Department of Labor (DOL), Employment and Training Administration, Disaster Unemployment Assistance. Provides weekly unemployment subsistence grants for those who become unemployed because of a major disaster or emergency. Applicants must have exhausted all benefits for which they would normally be eligible.
- Federal Financial Institutions. Member banks of Federal Deposit Insurance Corporation, Financial Reporting Standards or Federal Home Loan Bank Board may be permitted to waive early withdrawal penalties for Certificates of Deposit and Individual Retirement Accounts.
- Internal Revenue Service (IRS), Tax Relief. Provides extensions to current year's tax return, allows deductions for disaster losses, and allows amendment of previous tax returns to reflect loss back to three years.
- U.S. Small Business Administration (SBA). May provide low-interest disaster loans to individuals and businesses that have suffered a loss due to a disaster. Requests for SBA loan assistance should be submitted to DHS&EM.
- USACE Alaska District's Civil Works Branch studies potential water resource projects in Alaska. These studies analyze and solve water resource issues of concern to the local communities. These issues may involve navigational improvements, flood control or ecosystem restoration. The agency also tracks flood hazard data for over 300 Alaskan communities on floodplains or the sea coast. These data help local communities assess the risk of floods to their communities and prepare for potential future floods. The USACE is a member and co-chair of the Alaska Climate Change Sub-Cabinet.

State Resources

- DHS&EM is responsible for improving hazard mitigation technical assistance for local governments for the State of Alaska. Providing hazard mitigation training, current hazard

information, and communication facilitation with other agencies will enhance local hazard mitigation efforts. DHS&EM administers FEMA mitigation grants to mitigate future disaster damages such as those that may affect infrastructure including the elevation, relocation, or acquisition of hazard-prone properties. DHS&EM also provides mitigation funding resources for mitigation planning on their Web site at http://www.ak-prepared.com/plans/mitigation/mitigati.htm.

- Division of Senior Services (DSS): Provides special outreach services for seniors, including food, shelter and clothing.
- Division of Insurance (DOI): Provides assistance in obtaining copies of policies and provides information regarding filing claims.
- Department of Military and Veterans Affairs (DMVA): Provides damage appraisals and settlements for VA-insured homes, and assists with filing of survivor benefits.
- The Community Health and Emergency Medical Services (CHEMS) is a section within Division of Public Health within the Department of Health and Social Services (DHSS). DHSS is charged with promoting and protecting the public health and one of CHEMS' responsibilities is developing, implementing, and maintaining a statewide comprehensive emergency medical services system. The department's statutory mandate (Alaska Statute 18.08.010) requires it to:
  - Coordinate public and private agencies engaged in the planning and delivery of emergency medical services, including trauma care, to plan an emergency medical services system
  - Assist public and private agencies to deliver emergency medical services, including trauma care, through the award of grants in aid
  - Conduct, encourage, and approve programs of education and training designed to upgrade the knowledge and skills of health personnel involved in emergency medical services, including trauma care
  - Establish and maintain a process under which hospitals and clinics can represent themselves to be trauma centers because they voluntarily meet criteria adopted by the department which are based on an applicable national evaluation system
- DCRA within the DCCED. DCRA administers the HUD/CDBG, FMA Program, and the Climate Change Sub-Cabinet's Interagency Working Group's program funds and administers various flood and erosion mitigation projects, including the elevation, relocation, or acquisition of flood-prone homes and businesses throughout the State. This department also administers programs for State "distressed" and "targeted" communities.
- Division of Environmental Conservation (DEC). The DEC primary roles and responsibilities concerning hazards mitigation are ensuring safe food and safe water, and pollution prevention and pollution response. DEC ensures water treatment plants, landfills, and bulk fuel storage tank farms are safely constructed and operated in communities. Agency and facility response plans include hazards identification and pollution prevention and response strategies.

- Department of Transportation and Public Facilities (DOT/PF) personnel provide technical assistance to the various emergency management programs, to include mitigation. This assistance is addressed in the DHS&EM-DOT/PF Memorandum of Agreement and includes but is not limited to: environmental reviews, archaeological surveys, and historic preservation reviews.

  In addition, DOT/PF and DHS&EM coordinate buy-out projects to ensure that there are no potential right-of-way conflicts with future use of land for bridge and highway projects, and collaborate on earthquake mitigation.

  Additionally, DOT/PF provides safe, efficient, economical, and effective operation of the State's highways, harbors, and airports. DOT/PF uses it's Planning, Design and Engineering, Maintenance and Operations, and Intelligent Transportation Systems resources to identify the hazard, plan and initiate mitigation activities to meet the transportation needs of Alaskans and make Alaska a better place to live and work. DOT/PF budgets for the temporary replacement bridges and materials necessary to make the multi-model transportation system operational following a natural disaster.

- DNR administers various projects designed to reduce stream bank erosion, reduce localized flooding, improve drainage, and improve discharge water quality through the stormwater grant program funds. Within DNR, the Division of Geological and Geophysical Survey (DGGS) is responsible for the use and development of Alaska's mineral, land, and water resources, and collaboration on earthquake mitigation.
  - DNR's Division of Geological and Geophysical Survey (DGGS). DGGS collects and distributes information about the State's geologic resources and hazards. Their geologists and support staff are leaders in researching Alaska's geology and implementing technological tools to most efficiently collect, interpret, publish, archive, and disseminate that information to the public
  - The DNR's DOF participates in a statewide wildfire control program in cooperation with the forest industry, rural fire departments and other agencies. Prescribed burning may increase the risks of fire hazards; however, prescribed burning reduces the availability of fire fuels and therefore the potential for future, more serious fires.
  - DOF also manages various wildland fire programs, activities, and grant programs such as the FireWise Program, the Community Forestry Program and the Volunteer Fire Assistance and Rural Fire Assistance Grant programs. Information can be found at http://forestry.alaska.gov/fire/current.htm.

Other Funding Sources and Resources

The following provide focused access to valuable planning resources for communities interested in sustainable development activities.

- FEMA, http://www.fema.gov - includes links to information, resources, and grants that communities can use in planning and implementation of sustainable measures.
- American Planning Association (APA), http://www.planning.org - a non-profit professional association that serves as a resource for planners, elected officials, and citizens concerned with planning and growth initiatives.

- Institute for Business and Home Safety (IBHS), http://ibhs.org - an initiative of the insurance industry to reduce deaths, injuries, property damage, economic losses, and human suffering caused by natural disasters.
- American Red Cross (ARC). Provides for the critical needs of individuals such as food, clothing, shelter, and supplemental medical needs. Provides recovery needs such as furniture, home repair, home purchasing, essential tools, and some bill payment may be provided.
- Crisis Counseling Program. Provides grants to State and Borough Mental Health Departments, which in turn provide training for screening, diagnosing and counseling techniques. Also provides funds for counseling, outreach, and consultation for those affected by disaster.

Local Resources

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

Table 8-2 City of Nenana Staff Resources

Staff/Personnel Resources	Y/N	Department/Agency and Position
Planner or engineer with knowledge of land development and land management practices	Yes	City Major
Engineer or professional trained in construction practices related to buildings and/or infrastructure	No	Contract out as needed
Planner or engineer with an understanding of natural and/or human-caused hazards	Yes	City Mayor
Floodplain Manager	Yes	City Mayor
Surveyors	No	Contract out as needed
Staff with education or expertise to assess the jurisdiction's vulnerability to hazards	Yes	Gene Jensen, Fire Chief
Personnel skilled in Geographic Information System (GIS) and/or HAZUSUS-MH	No	
Scientists familiar with the hazards of the jurisdiction	No	University of Alaska Fairbanks
Emergency Manager	Yes	Gene Jensen, Fire Chief
Finance (Grant writers)	Yes	City Mayor
Public Information Officer	Yes	City Mayor

Table 8-3 City Financial Resources for Hazard Mitigation

Financial Resources	Y/N	Effect on Hazard Mitigation
General funds	Yes	Limited funding available, appropriated by assembly vote
Authority to levy taxes for specific purposes	Yes	Ratified by public vote
Incur debt through general obligation bonds	Yes	Ratified by public vote
Incur debt through special tax and revenue	Yes	Ratified by public vote

Table 8-3 City Financial Resources for Hazard Mitigation

Financial Resources	Y / N	Effect on Hazard Mitigation
bonds		
Incur debt through private activity bonds	Yes	Ratified by public vote
Community Development Block Grants	Yes	Ratified by public vote
Capital Improvement Projects Funding	Yes	Ratified by public vote
Hazard Mitigation Grant Program (HMGP)	Yes	FEMA funding which is available to local communities after a Presidentially-declared disaster. It can be used to fund both pre- and post-disaster mitigation plans and projects.
Pre-Disaster Mitigation (PDM) grant program	Yes	FEMA funding which available on an annual basis. This grant can only be used to fund pre-disaster mitigation plans and projects only
Flood Mitigation Assistance (FMA) grant program	Yes	FEMA funding which is available on an annual basis. This grant can be used to mitigate repetitively flooded structures and infrastructure to protect repetitive flood structures.
United State Fire Administration (USFA) Grants	Yes	The purpose of these grants is to assist state, regional, national or local organizations to address fire prevention and safety. The primary goal is to reach high-risk target groups including children, seniors and firefighters.
Fire Mitigation Fees	Yes	Finance future fire protection facilities and fire capital expenditures required because of new development within Special Districts.

8.4 CONTINUED PUBLIC INVOLVEMENT

The requirements for continued public involvement, as stipulated in the DMA 2000 and its implementing regulations are described below.

DMA 2000 Requirements: Plan Maintenance Process - Continued Public Involvement

Continued Public Involvement

Requirement §201.6(c)(4)(iii): [The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

Element

- Does the new or updated plan explain how continued public participation will be obtained?

Source: FEMA, July 2008.

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

The Planning Team will also identify opportunities to raise community awareness about the HMP and the hazards that affect the area. This effort could include attendance and provision of materials at City-sponsored events, outreach programs, and public mailings. Any public comments received regarding the HMP will be collected by the Planning Team Leader, included in the annual report, and considered during future HMP updates.

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Appendix A
Crosswalk

LOCAL MITIGATION PLAN REVIEW SUMMARY

The plan cannot be approved if the plan has not been formally adopted. Each requirement includes separate elements. All elements of the requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a score of "Satisfactory." Elements of each requirement are listed on the following pages of the Plan Review Crosswalk. A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing. Reviewer's comments must be provided for requirements receiving a **"Needs Improvement"** score.

Prerequisite(s) (Check Applicable Box)	**NOT MET**	**MET**
1. Adoption by the Local Governing Body: §201.6(c)(5) OR		**X**
2. Multi-Jurisdictional Plan Adoption: §201.6(c)(5) **AND**		**N/A**
3. Multi-Jurisdictional Planning Participation: §201.6(a)(3)		**N/A**

Planning Process	**N**	**S**
4. Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)		**X**

Risk Assessment	**N**	**S**
5. Identifying Hazards: §201.6(c)(2)(i)		**X**
6. Profiling Hazards: §201.6(c)(2)(i)		**X**
7. Assessing Vulnerability: Overview: §201.6(c)(2)(ii)		**X**
8. Assessing Vulnerability: Addressing Repetitive Loss Properties. §201.6(c)(2)(ii)		**X**
9. Assessing Vulnerability: Identifying Structures, Infrastructure, and Critical Facilities: §201.6(c)(2)(ii)(B)		**X**
10. Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)		**X**
11. Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)		**X**
12. Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(iii)		**N/A**

*States that have additional requirements can add them in the appropriate sections of the *Local Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

SCORING SYSTEM

Please check one of the following for each requirement.

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Mitigation Strategy	**N**	**S**
13. Local Hazard Mitigation Goals: §201.6(c)(3)(i)		**X**
14. Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)		**X**
15. Identification and Analysis of Mitigation Actions: NFIP Compliance. §201.6(c)(3)(ii)		**X**
16. Implementation of Mitigation Actions: §201.6(c)(3)(iii)		**X**
17. Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)		**N/A**

Plan Maintenance Process	**N**	**S**
18. Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(ii)		**X**
19. Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)		**X**
20. Continued Public Involvement: §201.6(c)(4)(iii)		**X**

Additional State Requirements*	**N**	**S**
Insert State Requirement		
Insert State Requirement		
Insert State Requirement		

LOCAL MITIGATION PLAN APPROVAL STATUS

PLAN NOT APPROVED	
See Reviewer's Comments	
PLAN APPROVED	**X**

LOCAL MITIGATION PLAN REVIEW CROSSWALK

Local Mitigation Plan Review and Approval Status

Jurisdiction: City of Nenana	**Title of Plan:** City of Nenana Hazard Mitigation Plan	**Date of Plan:** May 2010
Local Point of Contact: Jason Mayrand	**Address:** City of Nenana P.O. Box 70 Nenana, AK 99760	
Title: Mayor		
Agency: City of Nenana		
Phone Number: 907. 832.5501	**E-Mail:** nenana1@nenana.net	

State Reviewer:	**Title:**	**Date:**

FEMA Reviewer: Brett Holt	**Title: Mitigation Planner**	**Date: July 20, 2010**
Date Received in FEMA Region	**June 28, 2010**	
Plan Not Approved		
Plan Approved	**X**	
Date Approved	**September 21, 2010**	

Jurisdiction:	**NFIP Status***			
	Y	**N**	**N/A**	**CRS Class**
1. City of Nenana	X			
2.				
3.				
4.				
5.				

*** Notes:** **Y = Participating** **N = Not Participating** **N/A = Not Mapped**

LOCAL MITIGATION PLAN REVIEW CROSSWALK

PREREQUISITE(S)

1. Adoption by the Local Governing Body

***Requirement §201.6(c)(5)*:** *[The local hazard mitigation plan **shall** include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Has the local governing body adopted **new** or updated plan?	p. 2-1	The plan is adopted by the local jurisdiction.		X
B. Is supporting documentation, such as a resolution, included?	Appendix B	The resolution has been submitted to FEMA.		X
		SUMMARY SCORE		X

2. Multi-Jurisdictional Plan Adoption

***Requirement §201.6(c)(5)*:** *For multi-jurisdictional plans, each jurisdiction requesting approval of the plan **must** document that it has been formally adopted.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Does the **new** or updated plan indicate the specific jurisdictions represented in the plan?	N/A			N/A
B. For each jurisdiction, has the local governing body adopted the **new or updated** plan?	N/A			N/A
C. Is supporting documentation, such as a resolution, included for each participating jurisdiction?	N/A			N/A
		SUMMARY SCORE		N/A

3. Multi-Jurisdictional Planning Participation

***Requirement §201.6(a)(3)*:** *Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process … Statewide plans will not be accepted as multi-jurisdictional plans.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE NOT MET	SCORE MET
A. Does the **new or updated** plan describe **how** each jurisdiction participated in the plan's development?	N/A			N/A
B. Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?	N/A			N/A
		SUMMARY SCORE		N/A

PLANNING PROCESS: *§201.6(b): An open public involvement process is essential to the development of an effective plan.*

4. Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:*
(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Requirement §201.6(c)(1): *[The plan **shall** document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the plan provide a narrative description of the process followed to prepare the **new** or updated plan?	pp. 4.1 to 4.2	The planning process is provided in the plan.		X
B. Does the **new** or updated plan indicate who was involved in the **current** planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, *etc*.?)	pp. 4-2 to 4-3	The plan indicates who was involved in the current planning process.		X
C. Does the **new** or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)	p. 4-3	The public was distributed two newsletters to encourage their participation in the project.		X
D. Does the **new** or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?	p. 4-3	The plan discusses the opportunity for other organizations, businesses, and interested parties to be involved in the planning process.		X
E. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?	p. 4-4	The plan describes the existing plans and relevant information used.		X
F. Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?	N/A			N/A
		SUMMARY SCORE		X

RISK ASSESSMENT: *§201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

5. Identifying Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the type … of all natural hazards that can affect the jurisdiction.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new** or updated plan include a description of the types of all natural hazards that affect the jurisdiction?	p. 5-2; pp. 5-4 to 5-6; pp. 5-10 to 5-11; pp. 5-14 – 5-15; p. 5-24; pp. 5-27 – 5-28; pp. 5-31 – 5-32	Six hazards are identified as a potential threat.		X
		SUMMARY SCORE		X

6. Profiling Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan **shall** include information on previous occurrences of hazard events and on the probability of future hazard events.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the risk assessment identify the **location** (*i.e.*, geographic area affected) of each natural hazard addressed in the **new** or updated plan?	Section 5.3	The risk assessment identifies the location of each natural hazard.		X
B. Does the risk assessment identify the **extent** (*i.e.*, magnitude or severity) of each hazard addressed in the **new** or updated plan?	Section 5.3	The risk assessment identifies the extent of each hazard.		X
C. Does the plan provide information on **previous occurrences** of each hazard addressed in the **new** or updated plan?	Section 5.3	The plan provides information on previous occurrences of each natural hazard.		X
D. Does the plan include the **probability of future events** (*i.e.*, chance of occurrence) for each hazard addressed in the **new** plan?	Section 5.3	The plan includes the probability of future events for each natural hazard.		X
		SUMMARY SCORE		X

7. Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): *[The risk assessment **shall** include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new** or updated plan include an **overall summary** description of the jurisdiction's **vulnerability** to each hazard?	pp. 6-11 to 6-14	The plan includes an overall summary of the jurisdiction's vulnerability to each hazard.		X
B. Does the **new** or updated plan address the **impact** of each hazard on the jurisdiction?	Section 5.3	The impact of each hazard is described in each hazard profile.		X
		SUMMARY SCORE		X

8. Assessing Vulnerability: Addressing Repetitive Loss Properties

Requirement §201.6(c)(2)(ii): *[The risk assessment] **must** also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new** or updated plan describe vulnerability in terms of the types and numbers of *repetitive loss properties* located in the identified hazard areas?	p. 6-3	The plan includes repetitive loss information.		X
		SUMMARY SCORE		X

9. Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): *The plan **should** describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area … .*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new** or updated plan describe vulnerability in terms of the **types and numbers** of **existing** buildings, infrastructure, and critical facilities located in the identified hazard areas?	pp. 6-9 to 6-14	The plan describes vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities.		X
B. Does the **new** or updated plan describe vulnerability in terms of the **types and numbers** of **future** buildings, infrastructure, and critical facilities located in the identified hazard areas?	pp. 6-7, 6-15 to 6-16	The plan describes vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities.		X
		SUMMARY SCORE		X

LOCAL MITIGATION PLAN REVIEW CROSSWALK

10. Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): *[The plan **should** describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate … .*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new** or updated plan estimate **potential dollar losses** to vulnerable structures?	pp. 6-9 to 6-14	The plan provides an estimate of potential dollar losses to vulnerable structures.		X
B. Does the **new** or updated plan describe the **methodology** used to prepare the estimate?	pp. 6-6 to 6-7	The plan describes the methodology to prepare the estimates.		X
		SUMMARY SCORE		X

11. Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): *[The plan **should** describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new** or updated plan describe land uses and development trends?	pp. 6-14 to 6-16	The plan describes land uses and development trends.		X
		SUMMARY SCORE		X

12. Multi-Jurisdictional Risk Assessment

Requirement §201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new** or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?	N/A			N/A
		SUMMARY SCORE		N/A

LOCAL MITIGATION PLAN REVIEW CROSSWALK

MITIGATION STRATEGY: *§201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

13. Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(i): *[The hazard mitigation strategy **shall** include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A Does the **new** or updated plan include a description of mitigation **goals** to reduce or avoid long-term vulnerabilities to the identified hazards?	p. 7-1	Nine goals were developed.		X
		SUMMARY SCORE		X

14. Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): *[The mitigation strategy **shall** include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new** or updated plan identify and analyze a **comprehensive range** of specific mitigation actions and projects for each hazard?	pp. 7-2 to 7-7	67 mitigation actions were identified.		X
B Do the identified actions and projects address reducing the effects of hazards on **new** buildings and infrastructure?	pp. 7-2 to 7-7	The plan identifies actions and projects to reduce the effects of hazards on new buildings and infrastructure.		X
C. Do the identified actions and projects address reducing the effects of hazards on **existing** buildings and infrastructure?	pp. 7-2 to 7-7	The plan identifies actions and projects to reduce the effects of hazards on existing buildings and infrastructure.		X
		SUMMARY SCORE		X

LOCAL MITIGATION PLAN REVIEW CROSSWALK

15. Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance

Requirement: §201.6(c)(3)(ii): *[The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new** or updated plan describe the jurisdiction (s) participation in the NFIP?	p. 6-3	The plan describes how the jurisdiction participates in the NFIP.		X
B. Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?	pp. 7-5 to 7-6	The plan includes a number of strategies to demonstrate continued compliance with the NFIP.		X
		SUMMARY SCORE		X

16. Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): *[The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new** or updated mitigation strategy include how the actions are **prioritized**? (For example, is there a discussion of the process and criteria used?)	pp. 7-8 to 7-9	The STAPLE/E was used to prioritize mitigation actions.		X
B. Does the **new** or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources and the timeframe to complete each action?	pp. 7-9 to 7-15	Each action includes the priority, responsible department, potential funding, timeframe, and benefit-cost.		X
C. Does the **new** or updated prioritization process include an emphasis on the use of a **cost-benefit review** to maximize benefits?	pp. 7-9 to 7-15	Each action includes the priority, responsible department, potential funding, timeframe, and benefit-cost.		X
D. Does the **updated** plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (*i.e.*, deferred), does the updated plan describe why no changes occurred?	N/A			N/A
		SUMMARY SCORE		X

LOCAL MITIGATION PLAN REVIEW CROSSWALK

17. Multi-Jurisdictional Mitigation Actions

Requirement §201.6(c)(3)(iv): *For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A Does the **new** or updated plan include identifiable **action items** for each jurisdiction requesting FEMA approval of the plan?	N/A			N/A
B. Does the **updated** plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (*i.e.*, deferred), does the updated plan describe why no changes occurred?	N/A			N/A
		SUMMARY SCORE		N/A

PLAN MAINTENANCE PROCESS

18. Monitoring, Evaluating, and Updating the Plan

Requirement §201.6(c)(4)(i): *[The plan maintenance process **shall** include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new** or updated plan describe the method and schedule for **monitoring** the plan, including the responsible department?	pp. 8-1 to 8-2	The plan will be monitored annually.		X
B. Does the **new** or updated plan describe the method and schedule for **evaluating** the plan, including how, when and by whom (*i.e.* the responsible department)?	pp. 8-1 to 8-2	The plan describes how it will be evaluated annually.		X
C. Does the **new** or updated plan describe the method and schedule for **updating** the plan within the five-year cycle?	pp. 8-1 to 8-2	The plan describes the updating process.		X
		SUMMARY SCORE		X

LOCAL MITIGATION PLAN REVIEW CROSSWALK

19. Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(ii): *[The plan **shall** include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new** or updated plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan?	pp. 8-2 to 8-4	The local planning mechanisms are identified.		X
B. Does the **new** or updated plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (*e.g.*, risk assessment) into other planning mechanisms, when appropriate?	p. 8-3	The plan includes a process to incorporate the mitigation strategy in the plan.		X
C. Does the **updated** plan explain how the local government incorporated the mitigation strategy and other information contained in the plan (*e.g.*, risk assessment) into other planning mechanisms, when appropriate?	N/A			N/A
		SUMMARY SCORE		X

Continued Public Involvement

Requirement §201.6(c)(4)(iii): *[The plan maintenance process **shall** include a] discussion on how the community will continue public participation in the plan maintenance process.*

Element	**Location in the Plan** (section or annex and page #)	Reviewer's Comments	SCORE N	SCORE S
A. Does the **new** or updated plan explain how **continued public participation** will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)	p. 8-10	Continued public participation is described.		X
		SUMMARY SCORE		X

LOCAL MITIGATION PLAN REVIEW CROSSWALK

MATRIX A: PROFILING HAZARDS

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that their plan addresses each natural hazard that can affect the jurisdiction. **Completing the matrix is not required**.

Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each *applicable* ***hazard. An "N" for any element of any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.***

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Location		B. Extent		C. Previous Occurrences		D. Probability of Future Events	
	Yes	N	S	N	S	N	S	N	S
Avalanche	☐	☐	☐	☐	☐	☐	☐	☐	☐
Coastal Erosion	☐	☐	☐	☐	☐	☐	☐	☐	☐
Coastal Storm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Dam Failure	☐	☐	☐	☐	☐	☐	☐	☐	☐
Drought	☐	☐	☐	☐	☐	☐	☐	☐	☐
Earthquake	☒	☐	☒	☐	☒	☐	☒	☐	☒
Expansive Soils	☐	☐	☐	☐	☐	☐	☐	☐	☐
Levee Failure	☐	☐	☐	☐	☐	☐	☐	☐	☐
Flood	☒	☐	☒	☐	☒	☐	☒	☐	☒
Hailstorm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Hurricane	☐	☐	☐	☐	☐	☐	☐	☐	☐
Land Subsidence	☐	☐	☐	☐	☐	☐	☐	☐	☐
Landslide	☐	☐	☐	☐	☐	☐	☐	☐	☐
Severe Winter Storm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tornado	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tsunami	☐	☐	☐	☐	☐	☐	☐	☐	☐
Volcano	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wildfire	☒	☐	☒	☐	☒	☐	☒	☐	☒
Windstorm	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other Erosion	☒	☐	☒	☐	☒	☐	☒	☐	☒
Other Permafrost	☒	☐	☒	☐	☒	☐	☒	☐	☒
Other Weather, Severe	☒	☐	☒	☐	☒	☐	☒	☐	☒

To check boxes, double click on the box and change the default value to "checked."

Legend:

§201.6(c)(2)(i) Profiling Hazards
A. Does the risk assessment identify the location (*i.e.*, geographic area affected) of each hazard addressed in the **new or updated** plan?
B. Does the risk assessment identify the extent (*i.e.*, magnitude or severity) of each hazard addressed in the **new or updated** plan?
C. Does the plan provide information on previous occurrences of each natural hazard addressed in the **new or updated** plan?
D. Does the plan include the probability of future events (*i.e.*, chance of occurrence) for each hazard addressed in the plan?

MATRIX B: ASSESSING VULNERABILITY

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that the new or updated plan addresses each requirement. **Completing the matrix is not required**.

*Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each **applicable** hazard. An "N" for any element of any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk. Note: Receiving an N in the shaded columns will not preclude the plan from passing.*

To check boxes, double click on the box and change the default value to "checked."

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	§201.6(c)(2)(ii) Assessing Vulnerability: Overview					§201.6(c)(2)(ii) Assessing Vulnerability: Identifying Structures				§201.6(c)(2)(ii) Assessing Vulnerability: Estimating Potential Losses							
		A. Overall Summary Description of Vulnerability		B. Hazard Impact			A. Types and Number of Existing Structures in Hazard Area (Estimate)		B. Types and Number of Future Structures in Hazard Area (Estimate)		A. Loss Estimate		B. Methodology					
	Yes	N	S	N	S		N	S	N	S	N	S	N	S				
Avalanche	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Coastal Erosion	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Coastal Storm	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Dam Failure	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Drought	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☒				
Earthquake	☒	☐	☒	☐	☒		☐	☒	☐	☒	☐	☒	☐	☒				
Expansive Soils	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Levee Failure	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Flood	☒	☐	☒	☐	☒		☐	☒	☐	☒	☐	☒	☐	☒				
Hailstorm	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Hurricane	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Land Subsidence	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Landslide	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Severe Winter Storm	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Tornado	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Tsunami	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Volcano	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Wildfire	☒	☐	☒	☐	☒		☐	☒	☐	☒	☐	☒	☐	☒				
Windstorm	☐	☐	☐	☐	☐		☐	☐	☐	☐	☐	☐	☐	☐				
Other Erosion	☒	☐	☒	☐	☒		☐	☒	☐	☒	☐	☒	☐	☒				
Other Permafrost	☒	☐	☒	☐	☒		☐	☒	☐	☒	☐	☒	☐	☒				
Other Weather, Severe	☒	☐	☒	☐	☒		☐	☒	☐	☒	☐	☒	☐	☒				

Legend:

§201.6(c)(2)(ii) Assessing Vulnerability: Overview

A. Does the **new or updated** plan include an overall summary description of the jurisdiction's vulnerability to each hazard?

B. Does the **new or updated** plan address the impact of each hazard on the jurisdiction?

§201.6(c)(2)(ii)(A) Assessing Vulnerability: Identifying Structures

A. Does the **new or updated** plan describe vulnerability in terms of the types and numbers of

B. Does the **new or updated** plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

§201.6(c)(2)(ii)(B) Assessing Vulnerability: Estimating Potential Losses

A. Does the **new or updated** plan estimate potential dollar losses to vulnerable structures?

B. Does the **new or updated** plan describe the methodology used to prepare the estimate?

existing buildings, infrastructure, and critical facilities located in the identified hazard areas?

MATRIX C: IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIONS

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure consideration of a range of actions for each hazard. **Completing the matrix is not required.**

*Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each **applicable** hazard. An "N" for any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.*

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Comprehensive Range of Actions and Projects	
	Yes	N	S
Avalanche	☐	☐	☐
Coastal Erosion	☐	☐	☐
Coastal Storm	☐	☐	☐
Dam Failure	☐	☐	☐
Drought	☐	☐	☐
Earthquake	☒	☐	☒
Expansive Soils	☐	☐	☐
Levee Failure	☐	☐	☐
Flood	☒	☐	☒
Hailstorm	☐	☐	☐
Hurricane	☐	☐	☐
Land Subsidence	☐	☐	☐
Landslide	☐	☐	☐
Severe Winter Storm	☐	☐	☐
Tornado	☐	☐	☐
Tsunami	☐	☐	☐
Volcano	☐	☐	☐
Wildfire	☒	☐	☒
Windstorm	☐	☐	☐
Other Erosion	☒	☐	☒
Other Permafrost	☒	☐	☒
Other Weather, Severe	☒	☐	☒

To check boxes, double click on the box and change the default value to "checked."

Legend:
§201.6(c)(3)(ii) Identification and Analysis of Mitigation Actions
A. Does the **new or updated** plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?

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Appendix B
Adoption Resolution

CITY OF NENANA

RESOLUTION 2010-09

A Resolution Approving the Nenana Hazard Mitigation Plan

WHEREAS the City of Nenana 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; and

WHEREAS a Hazard Mitigation Plan (the Plan) has been developed through the work of the City of Nenana Planning Team and interested parties within Nenana; and
WHEREAS the Plan recommends hazard mitigation actions that will protect people and property affected by natural hazards that face the Nenana, that will reduce future public, private, community, and personal costs of disaster response and recovery; and that will reinforce the City's leadership in emergency preparedness efforts; and

WHEREAS the Disaster Mitigation Act of 2000 (P.L. 106-390) (DMA 2000) and associated Federal regulations published under 44 CFR Part 201 require the City of Nenana to formally adopt a Hazard Mitigation Plan subject to the approval of the Federal Emergency Management Agency to be eligible for federal hazard mitigation projects and activities funds
NOW THEREFORE be it resolved by the Nenana City Assembly that;

1. The Plan is hereby adopted as an official plan of the City of Nenana.

2. The officials identified in the Mitigation Action Plan (Section 8) are hereby directed to implement the recommended actions assigned to them. These officials will report quarterly on their activities, accomplishments, and progress to the city council.

3. The Hazard Mitigation Planning Team will provide annual progress reports on the status of the implemented Mitigation Action Plan's projects to the Planning Team Leader. This report shall be submitted to the City Council annually by the Plan's adoption anniversary date.

4. The Planning Team, will complete periodic updates of the Plan as indicated in the Plan Maintenance Section (Section 8), but no less frequently than every five years.

5. The City of Nenana adopts the Hazard Mitigation Plan as the primary jurisdiction plan and resolves to execute the actions in the Plan.

Passed, approved and adopted by the Assembly of the City of Nenana this 12th day of August 2010.

Jason P. Mayrand, Mayor

Attested:
Sharon Ridlington
Municipal Clerk

Appendix C
Public Outreach

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Memorandum

560 East 34th Avenue, Suite 100
Anchorage, AK 99503
Phone: 907.261.9706
Fax: 907.562.1297

SUBJECT: DHSEM HMP – City of Nenana Project Kick-off Meeting

Community: Nenana, AK

Date/Time: a. m. / p. m.

Chairperson: R. Scott Simmons

Attendees:

- Mark Roberts, DHS&EM
- Ervin Petty, DHS&EM
- City of Nenana, Jason Mayrand, Mayor
-

Subjects covered included:

- City of Nenana Hazard Mitigation Planning Initiative

- **Participant Introduction**

- **Project Description:**
  - URS - DHS&EM's Contractor
  - The Mayor asked when URS planning staff could visit the community and talk directly with the residents. I stated this project did not include funding for travel but I am available to talk with the community at any time during the planning process to answer questions, address concerns, and to help them complete the data sheets.
  - Local Mitigation Plan Development
    - FEMA requirements
    - FEMA/State compliance
    - Hazard identification
    - Community knowledge
    - Project development
    - Funding opportunities

Planning Steps Explained

- Team Member Selection
  - Residents who have experience with hazard impacts within the City
  - Can collect historic data and collect GPS coordinates for City facilities
- Data Gathering
  - Hazard Identification
  - Critical Facilities
  - Planning Team and Process
    - Described how a planning team can share the workload by dividing up the data sheets or assigning tasks separately
  - Capability Assessment
- Plan Writing
  - URS will write the plan to ensure all FEMA requirements are addressed and provide the community opportunities to review it in draft form before State and FEMA submittal.
- Public Involvement
  - Two opportunities required
    - Public Meeting during development
    - Public comment period to review plan before plan adoption and FEMA approval
- FEMA/State Review Described

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CITY OF NENANA HAZARD MITIGATION PLAN

March 2010 **Newsletter 1**

This newsletter discusses the preparation of the Nenana Hazard Mitigation Plan. It has been prepared to inform interested agencies, stakeholders, and the public about the project and to solicit comments. This newsletter can also be viewed on the State of Alaska Division of Homeland Security and Emergency Management Website at http://www.ready.alaska.gov.

The State of Alaska, Department of Military and Veterans Affairs, Division of Homeland Security and Emergency Management (DHS&EM) was awarded a Pre-Disaster Mitigation Program grant from the Federal Emergency Management Agency (FEMA) to prepare Hazard Mitigation Plans (HMP) for fourteen Alaskan Communities. Nenana was selected for participation in this effort.

The Nenana Hazard Mitigation Plan will identify all natural hazards, such as flood, earthquake, erosion, wildland fire, weather related hazards and others. The plan will also identify the people and facilities potentially at risk and ways to mitigate damage from hazards. The public participation and planning process will be documented as part of the project.

What is Hazard Mitigation?

Across the United States, natural and human-caused disasters have increasingly caused injury, death, property damage, and interruption of business and government services. The toll on individuals, families, and businesses can be very high. The time, money, and emotional effort required to respond to and recover from these disasters take public resources and attention away from other important programs and problems.

The people and property in the State of Alaska are at risk from a variety of natural hazards that can potentially cause human injury, property damage, or environmental harm.

Hazard mitigation projects eliminate the risk or reduce the severity of hazards on people and property. Projects may include short- or long-term activities to reduce exposure to or the effects of known hazards. Hazard mitigation activities include relocating or elevating buildings, developing, implementing, or enforcing building codes, and education.

Why Do We Need A Hazard Mitigation Plan?

Communities must have a State, FEMA approved, and community adopted mitigation plan to receive a project grant from FEMA's Unified Hazard Mitigation Assistance programs. The City of Nenana plans to apply for mitigation funds after our plan is complete.

The rules have changed. The Local government and Flood Hazard Mitigation Plans' requirements were consolidated into one planning mechanism. Additionally the Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), Repetitive Flood Loss (RL) and Severe Repetitive Flood Loss (SRL), and the Pre-Disaster Mitigation Grant Program were consolidated under the newly developed Hazard Mitigation Assistance (HMA) program.

The Planning Process

There are very specific federal requirements that must be met when preparing a Hazard Mitigation Plan. These requirements are commonly referred to as the Disaster Mitigation Act of 2000, or DMA2000. Information about the requirements may be found on the Internet at: http://www.fema.gov/plan/mitplanning/guidance.shtm under Laws, Regulations, and Guidance.

The DMA2000 requires the plan to document the following topics:

- Planning process
- Hazard identification
- Risk assessment
- Mitigation Strategy: Goals, actions, and projects
- A plan adoption resolution from the community
- State and FEMA approval

FEMA has prepared Planning Guidance which is available at: http://www.fema.gov/library/viewRecord.do?id=3336; and "How to" Guides that explain in detail how each of the DMA2000 requirements is met. These guides are available at http://www.fema.gov/plan/mitplanning/resources.shtm. The Portland Hazard Mitigation Plan will follow those guidelines.

We are currently in the very beginning stages of preparing the plan. We will be conducting a public meeting to introduce the project and planning team, and to gather comments from our community residents. Specifically we will complete the hazard identification task, and collect data to conduct the risk assessment.

Our community is located in the Yukon-Koyukuk Census Area, and DHS&EM has previously identified natural hazards that occur in this area that may also occur specifically in Nenana.

The Planning Team

The planning team is being lead by Mayor Jason Mayrand, with team members Gene Jensen, Jim Sackett, and Edna Hancock. URS Corporation has been contracted by DHS&EM to provide assistance and guidance to the planning team throughout the planning process.

Public Participation

PUBLIC MEETINGS – Project Presentation & Data Gathering	
Location	
Date	
Time	
Toll Free call-In number:	

Public involvement will continue throughout the project. The goal is to receive comments, identify key issues or concerns, and improve ideas for mitigation. When the Draft Nenana Hazard Mitigation Plan is complete, the results will be presented to the community before DHS&EM and FEMA approval, and community adoption.

We Need Your Help

Please use the following table to identify any hazards you have observed in Nenana that DHS&EM is not aware of AND any additional natural hazards that may not be on the list.

Nenana Hazard Worksheet		
Hazard	Yukon-Koyukuk Census Area*	Nenana
Avalanche (Snow)	Yes	No
Earthquake	Yes	Yes
Erosion (Riverine)	Yes	Yes
Flood	Yes	Yes
Ground Failure (Landslide)	Unknown	No
Permafrost	Yes	Yes
Tsunami & Seiche	No	No
Volcano	No	No
Weather	Yes	Yes
Wildland Fire	Yes	Yes
**Hazard Matrix from the State of Alaska Hazard Mitigation Plan for the Yukon-Koyukuk Census Area (Key: Yes, No, or Unknown)*		

DHS&EM identified critical facilities within Nenana as part of the Alaska Critical Facilities Inventory, but the list of critical facilities needs to be updated and the estimated value and location (latitude/longitude) determined. In addition, the number and value of structures, and the number of people living in each structure will need to be documented. Once this information is collected we will determine which critical facilities, residences, and populations are vulnerable to specific hazards in Nenana. Please add additional facilities if needed.

Nenana Critical Facilities	
Facility Type	Facility Name
Airport	EW
Airport	Intersect
Bridge	Highway Bridge
Bridge	Mears RR Bridge
Cemetery	NA
Church	St Marks Parish
Community Hall	George Hall Community Center
Fire Station	Nenana Fire Dept
Fuel Storage Tanks (>500gal)	Nenana Heating Service, Inc.
Fuel Storage Tanks (>500gal)	US DOT/FAA
Fuel Storage Tanks (>500gal)	Yutana Barge Lines
Harbor/Dock/Port	
Hospital/Clinic/ER	Nenana Native Clinic
Library	City Public Library
Offices	City Offices
Park	
Police Station	Nenana Police Svc
U.S. Post Office	
Potable Water Production and Treatment Facility	
Radio Transmitter	KIAM 630
Reservoir/Water Supply	A - Frame Service
Reservoir/Water Supply	Monroes Moderosa
Reservoir/Water Supply	Nenana Municipal Water-1
Reservoir/Water Supply	Nenana Municipal Water-2
Reservoir/Water Supply	Tamarack Inn
School	Nenana City Public School
Senior Center	Meda Lord Senior Housing
Store	
Waste Water Treatment Facility	Secondary Treatment Plant
**AK Critical Facilities Inventory*	

Please email or fax updated hazard and critical facility information directly to URS or provide it to your community planning team leader

We encourage you to take an active part in preparing the Nenana hazard mitigation planning effort. The purpose of this newsletter is to keep you informed and to allow you every opportunity to voice your opinion regarding this important project. Please contact your community representative, DHS&EM, or URS planning coordinators if you have any questions, comments, or requests for more information:

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nenana1@nenana.net

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CITY OF NENANA HAZARD MITIGATION PLAN

April 2010 **Newsletter 2**

This newsletter discusses the preparation of the City of Nenana Hazard Mitigation Plan. It has been prepared to inform interested agencies, stakeholders, and the public about the project and to solicit comments. This newsletter can also be viewed on the State of Alaska Division of Homeland Security and Emergency Management Website at http://www.ready.alaska.gov.

The City of Nenana was one of eleven communities selected by the State of Alaska, Division of Homeland Security and Emergency Management (DHS&EM) for a Hazard Mitigation Planning development project. The plan identifies natural hazards that affect the community including earthquake, erosion, drought, flood, permafrost, severe weather, and wildland fire. The plan also identifies the people and facilities potentially at risk and ways to mitigate hazards. The public participation and planning process has been documented as part of the project. URS Corporation (URS) was hired as consultants to assist in preparing the plan.

What is Hazard Mitigation?

Across the United States, natural disasters have increasingly caused injury, death, property damage, and business and government service interruptions. The toll on individuals, families, and businesses can be very high. The time, money, and emotional effort required to respond to and recover from these disasters take public resources and attention away from other important programs and problems.

The people and property in the State of Alaska are at risk from a variety of hazards that have the potential for causing human injury, property damage, or environmental harm.

The purpose of hazard mitigation is to implement projects that eliminate the risk or reduce the severity of hazards on people and property. Mitigation programs may include short-term and long-term activities to reduce the hazards, reduce exposure to hazards, or reduce the effects of hazards. Mitigation could include education, and construction projects. Hazard mitigation activity examples include relocating buildings, developing or strengthening building codes, and educating residents and building owners.

Why Do We Need A Hazard Mitigation Plan?

A community is only eligible to receive grant money for mitigation programs by preparing and adopting a hazard mitigation plan. Communities must have an approved mitigation plan to receive grant funding from the Federal Emergency Management Agency (FEMA) for eligible mitigation projects. The City of Nenana plans to apply for grant funding after the plan is approved by DHS&EM and FEMA and adopted by the City.

The Planning Process

There are very specific federal requirements that must be met when preparing a hazard mitigation plan. These requirements are commonly referred to as the Disaster Mitigation Act of 2000, or DMA2000 criteria. Information about the criteria may be found on the Internet at: http://www.fema.gov/plan/mitplanning/guidance.shtm.

The DMA2000 requires the plan to document the following topics:

- Planning process
- Hazard identification
- Risk assessment
- Goals
- Mitigation programs, actions, and projects
- A resolution from the community adopting the plan

FEMA has prepared Planning Guidance which is available at: http://www.fema.gov/library/viewRecord.do?id=3336; and "How to" Guides that explain in detail how each of the DMA2000 requirements is met. These guides are available at http://www.fema.gov/plan/mitplanning/resources.shtm. The Nenana Hazard Mitigation Plan will follow those guidelines.

In January 2010 the planning process kicked-off by establishing a local planning committee and holding a public meeting. During the meeting the planning committee examined the full spectrum of hazards listed in the State Hazard Mitigation Plan and identified seven hazards that the Nenana plan would address including earthquake, erosion, flood, permafrost, severe weather, and wildland fire.

After the first public meeting, City staff and URS began identifying critical facilities, compiling the hazard profiles, assessing capabilities, and conducting the risk assessment for the identified hazards. Critical facilities are facilities that are critical to the recovery of a community in the event of a disaster. After collection of this information, URS helped to determine which critical facilities and estimated populations are vulnerable to the identified hazards in Nenana.

A mitigation strategy was the next component of the plan to be developed. Understanding the community's local

capabilities and using information gathered from the public and the local planning committee and the expertise of the consultants and agency staff, a mitigation strategy was developed. The mitigation strategy is based on an evaluation of the hazards, and the assets at risk from those hazards. Goals and actions/projects were developed as the foundation of the mitigation strategy. Mitigation goals are defined as general guidelines that explain what a community wants to achieve in terms of hazard and loss prevention. Goals are positively stated future situations that are typically long-range, policy-oriented statements representing community-wide visions. Mitigation actions/projects are undertaken in order to achieve your stated objectives. In early April 2010, the local planning committee identified projects/actions for each hazard that focus on six categories: prevention, property protection, public education and awareness, natural resource protection, emergency services, and structural projects. The mitigation actions identified as a high priority by the planning team are listed below, and explained in more detail in the plan.

The selected projects/actions will be implemented over the next five years. A maintenance plan has also been developed for the hazard mitigation plan. It outlines how the community will monitor progress on achievement of the projects/actions that will help meet the stated goals and objectives, as well as an outline for continued public involvement.

The draft plan is available in the City office and on the State website (http://www.ready.alaska.gov) for public review and comment. Comments should be made via email, fax, or phone to the contact person below and be received no later than April 23, 2010. The plan will be provided to DHS&EM and FEMA for their approval prior to formal adoption by the Nenana City Council.

The Planning Committee

The plan was developed with the assistance from a Planning Team consisting of a cross section of the community. Planning Team members who helped develop the plan include Mayor Mayrand, Gene Jensen, Edna Hancock, Jim Sackett, and Erick Gebhart.. URS Corporation and DHS&EM are also providing assistance to the Planning Team.

Sample of the City of Nenana's Mitigation Actions.
(Review the draft HMP for a complete list.)

Establish a formal role for the jurisdictional Hazard Mitigation Planning Committees to develop a sustainable process to implement, monitor, and evaluate community wide mitigation actions.	Prohibit new construction in identified mitigatable hazard impact areas (avalanche, flood, erosion, etc.) or require building to applicable building codes for other hazard impacts (earthquake, volcanic ash, weather, etc.).	Acquire (buy-out), demolish, or relocate structures from hazard prone area. Property deeds shall be restricted for open space uses in perpetuity to keep people from rebuilding in hazard areas.
Disseminate FEMA pamphlets to educate and encourage homeowners concerning structural and non-structural retrofit benefits.	The City will aggressively manage their existing plans to ensure they incorporate mitigation planning provisions into all community planning processes such as comprehensive, capital improvement, and land use plans, etc to demonstrate multi-benefit considerations and facilitate using multiple funding source consideration.	Elevate roadbed to enable the road to act as a levee to protect flood threatened homes. This action will eliminate the need to elevate these threatened homes.
Update public emergency notification procedures and develop an outreach program for potential hazard impacts or events.	Maintain membership in the National Flood Insurance Program to reduce monetary losses to individuals and the community.	Determine and implement most cost beneficial and feasible mitigation actions for locations with repetitive flooding and significant damages or road closures.
Identify and pursue funding opportunities to implement mitigation actions.	Maintain and update erosion hazard locations, identify critical facilities potentially impacted and develop mitigation initiatives such as bank stabilization or facility relocation to prevent or reduce the threat.	Install non-structural seismic restraints for large furniture such as bookcases, filing cabinets, and appliances to prevent toppling damage and resultant injuries.
Integrate the Mitigation Plan findings for enhanced emergency planning.	Update or develop, implement, and maintain jurisdictional debris management plans.	Retrofit important public facilities with significant seismic vulnerabilities.

We encourage you to learn more about the City of Nenana's Hazard Mitigation Plan. The purpose of this newsletter is to keep you informed and to allow you every opportunity to voice your opinion regarding this important project. If you have any questions, comments, or requests for more information, please contact:

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Appendix D
Benefit–Cost Analysis Fact Sheet

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Benefit-Cost Analysis Fact Sheet

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

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

All Benefit-Costs must be:

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

General Data Requirements:

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

Damage and Benefit Data

- Well documented for each damage event.
- Include estimated frequency and method of determination per damage event.
- Data used in place of FEMA standard or default values MUST be documented and justified.

- The Level of Protection MUST be documented and readily apparent.
- When using the Limited Data (LD) BCA module, users cannot extrapolate data for higher frequency events for unknown lower frequency events.

Building Data

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

Use Correct Occupancy Data

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

Questions to Be Answered

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

Common Shortcomings

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

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Appendix E

Plan Maintenance Documents

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Annual Review Questionnaire

PLAN SECTION	QUESTIONS	YES	NO	COMMENTS
PLANNING PROCESS	Are there internal or external organizations and agencies that have been invaluable to the planning process or to mitigation action			
	Are there procedures (e.g., meeting announcements, plan updates) that can be done more efficiently?			
	Has the Task Force undertaken any public outreach activities regarding the MHMP or implementation of mitigation actions?			
HAZARD PROFILES	Has a natural and/or human-caused disaster occurred in this reporting period?			
	Are there natural and/or human-caused hazards that have not been addressed in this HMP and should be?			
	Are additional maps or new hazard studies available? If so, what have they revealed?			
VULNERABILITY ANALYSIS	Do any new critical facilities or infrastructure need to be added to the asset lists?			
	Have there been changes in development patterns that could influence the effects of hazards or create additional risks?			
MITIGATION STRATEGY	Are there different or additional resources (financial, technical, and human) that are now available for mitigation planning within the			
	Are the goals still applicable?			
	Should new mitigation actions be added to the a community's Mitigation Action Plan?			
	Do existing mitigation actions listed in a community's Mitigation Action Plan need to be reprioritized?			
	Are the mitigation actions listed in a community's Mitigation Action Plan appropriate for available resources?			

Mitigation Action Progress Report

Progress Report Period: _____ (date) to _____ (date)

Project Title: _____ Project ID# _____

Responsible Agency: _____

Address: _____

City: _____

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): _____

_____

_____

_____

Milestones	Complete	Projected Date of Completion

Plan Goal (s) Addressed:

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?

Other Comments: