City of Ruby, Alaska

Local Hazard Mitigation Plan Update

Photo Credit: Department of Commerce, Community and Economic Development; Division of Community and Regional Affairs' Community Photo Library.

October 2017

Prepared by:
City of Ruby

LeMay Engineering & Consulting, Inc.

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Tables

Figures

Appendices

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
ARCS	Alaska Rural Communication Service
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CD	Compact Disc
CDBG	Community Development Block Grant
CHEMS	Community Health and Emergency Medical Services
CFR	Code of Federal Regulations
DCCED	Department of Commerce, Community, and Economic Development
DCRA	Division of Community and Regional Affairs
DEC	Department of Environmental Conservation
DHSS	Department of Health and Social Services
DHS	United States Department of Homeland Security
DHS&EM	Division of Homeland Security and Emergency Management
DMA 2000	Disaster Mitigation Act of 2000
DMVA	Department of Military and Veterans Affairs
DNR	Department of Natural Resources
DOF	Division of Forestry
DOT/PF	Department of Transportation and Public Facilities
FEMA	Federal Emergency Management Agency
FMA	Flood Mitigation Assistance
FP&S	Fire Prevention and Safety
ft	feet
FY	Fiscal Year
g	gravity as a measure of peak ground acceleration
HAZUS-MH	Hazards U.S-Multi-Hazard
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan

HUD	Housing and Urban Development
IBHS	Institute for Business and Home Safety
IHBG	Indian Housing Block Grant
IHS	Indian Health Service
IRS	Internal Revenue Service
M	Magnitude
MHHW	mean high high water
MMI	Modified Mercalli Intensity
mph	miles per hour
NAHASDA	Native American Housing Assistance and Self Determination Act
NFIP	National Flood Insurance Program
PDM	Pre-Disaster Mitigation
PGA	peak ground acceleration
RD	Rural Development
RL	repetitive loss
RFC	repetitive flood claims
SAFER	Staffing for Adequate Fire and Emergency Response
SBA	Small Business Administration
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
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
VPSO	Village Public Safety Officer

Letter of Commitment

CITY OF RUBY
P.O BOX 90
Ruby, Alaska 99768
PH# (907) 468-4401
FAX# (907) 468-4443

June 14, 2017

George Grady
State of Alaska
DMVA DHS&EM
P.O. Box 5750
Joint Base Elmendorf-Richardson, Alaska 99505-5750

Mr. Grady:

This letter serves as the City of Ruby's Letter of Commitment to support DMVA DHS&EM and LeMay Engineering & Consulting, Inc. in their Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation (PDM) planning grant to update the 2010 hazard mitigation plan for the City of Ruby. The end goal of this grant is a State- and FEMA- approved hazard mitigation plan that the City of Ruby will adopt.

Sincerely,

Elizabeth Captain

Mayor Elizabeth Captain

City Adoption

A RESOLUTION OF THE RUBY CITY COUNCIL TO ADOPT THE CITY OF RUBY LOCAL HAZARD MITIGATION PLAN UPDATE

RES. 02-17

WHEREAS, the community of City of Ruby recognizes the threat from natural disasters posed to residents and property; and

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

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

WHEREAS, the City of Ruby Local Hazard Mitigation Plan has been sent to the Alaska Division of Homeland Security and Emergency Management Agency for their approval; and

NOW THEREFORE BE IT RESOLVED, that the City of Ruby hereby adopts the City of Ruby Local Hazard Mitigation Plan Update as an official plan; and

BE IT FURTHER RESOLVED, that the community of Ruby will submit the adopted Local Hazard Mitigation Plan Update to the Alaska Division of Homeland Security and Emergency Management Agency officials for final review and approval.

CERTIFICATION

We, the undersigned members of the City of Ruby Council do hereby certify that the foregoing joint resolution was adopted at a meeting held on 11th October 2017 by a vote of 7 members.

YES 6 NO 0 ABSTAIN 0 ABSENT 1

ATTEST:

Isabella Captain

City of Ruby Mayor

FEMA Approval

U.S. Department of Homeland Security
FEMA Region 10
130 – 228th Street, SW
Bothell, Washington 98021-8627

FEMA

March 29, 2018

Honorable Elizabeth Captain
Mayor, City of Ruby
PO Box 90
Ruby, Alaska 99768

Dear Mayor Captain:

On March 29, 2018, the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA), Region 10, approved the City of Ruby Mitigation Plan as a local plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the jurisdiction eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's, Hazard Mitigation Assistance (HMA) grants projects through March 28, 2023, through your state.

FEMA individually evaluates all application requests for funding according to the specific eligibility requirements of the applicable program. Though a specific mitigation activity or project identified in the plan may meet the eligibility requirements, it may not automatically receive approval for FEMA funding under any of the aforementioned programs.

Over the next five years, we encourage your communities to follow the plan's schedule for monitoring and updating, and to develop further mitigation actions. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Mike Johnson, Emergency Management Specialist with Alaska Division of Homeland Security and Emergency Management, at (907) 428-7055 who locally coordinates and administers these efforts.

Sincerely,

Mark Carey, Director
Mitigation Division

cc: Brent Nichols, Alaska Division of Homeland Security and Emergency Management

Enclosure

BH:vl

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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). All hazard mitigation assistance program planning requirements for the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), Flood Mitigation Assistance (FMA), Severe Repetitive Loss (SRL), and potentially Repetitive Flood Claim (RFC) programs were combined eliminating duplicated mitigation plan requirements. It also required participating NFIP communities' risk assessments and mitigation strategies to identify and address repetitively flood damaged properties. However, the Biggert-Waters Flood Insurance Reform Act of 2012 eliminated the Repetitive Flood Claims and Severe Repetitive Loss programs. Local hazard mitigation plans now qualify communities for the following Federal Hazard Mitigation Assistance grant programs:

- *Hazard Mitigation Grant Program*
- *Pre-Disaster Mitigation*
- *Flood Mitigation Assistance*

1.3 GRANT PROGRAMS WITH MITIGATION PLAN REQUIREMENTS

All three FEMA 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, and one is 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 and FMA 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 is authorized by the National Flood Insurance Act and focuses 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) 2016, PDM program funding totaled approximately $90 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 2016, FMA funding totaled $199 million. The cost-share for this grant is 75 percent Federal/25 percent non-Federal. However, 100 percent Federal to mitigate SRL properties is available in certain situations as well as 90 percent Federal/10 percent non-Federal to mitigate RL properties.

The City of Ruby does not currently participate in the NFIP and is therefore ineligible for National Flood Insurance Act Grant Programs until they become a NFIP participant.

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 Ruby (City). The adoption resolution is included on page vii of this HMP.

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 LeMay Engineering & Consulting, Inc. planner, and the key stakeholders within the City and the surrounding area. In addition, this section documents public outreach activities (Appendix A) 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 public outreach information, including newsletters.

Appendix B

Appendix B provides a land use map for Ruby.

Appendix C

Appendix C provides the FEMA Local Mitigation Plan Review Tool, which documents compliance with FEMA criteria.

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.

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 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 October 12, 2017. A scanned copy of the resolution is included on page vii of this HMP.

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

3.1 LOCATION, GEOGRAPHY, AND HISTORY

"Ruby is a second class city located in the unorganized Borough within the Yukon-Koyukuk Census Area. The City is situated on the south bank of the Yukon River, in the Kilbuck-Kuskokwim Mountains. It is about 50 air miles east of Galena and 230 air miles west of Fairbanks. Ruby lies adjacent to the Nowitna National Wildlife Refuge. It lies at approximately 64.739440 North Latitude and -155.486940 West Longitude (Sec. 04, T009S, R017E, Kateel River Meridian.)" Department of Community and Regional Advocacy (DCRA 2009).

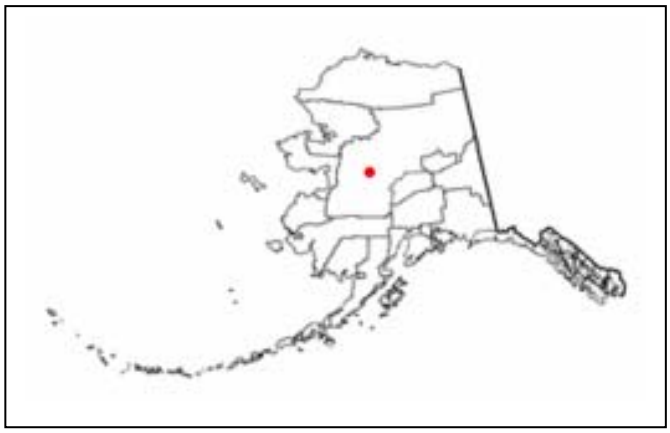

Figure 3-1 Ruby Location Map

The City covers approximately 7.6 square (sq.) land miles. Extreme temperature changes occur throughout Alaska's interior. The City's temperatures range from a winter low of -53 degrees Fahrenheit (ºF) to above 98 ºF during summer. The area receives approximately 17 inches of rain and 66 inches of snow.

The Koyukon Athabascans (Nowitna-Koyukuk band) were a nomadic people; migrating throughout the year between 12 seasonal camps on the Yukon, Koyukuk, and Nowitna Rivers where they harvested wild game and fish and gathered berries and other food sources to support their subsistence life style.

Several key events occurred throughout the City developmental history:

The City has a rich heritage as depicted with the following bulleted historical events:

- Ruby developed as a supply point for gold prospectors.
- The City was named for the ruby-colored riverbank stones.
- The Ruby Creek Gold Strike in 1907.
- The Long Creek Gold Strike in 1911.
- Placerville, Poorman, Sulatna Crossing, Kokrines and Long Creek were some of the area's boom settlements.
- The post office was opened in 1912.
- The City became incorporated in 1913.
- The City was originally governed by miner's meetings, then later by Pioneer Igloo Number 5.
- The population ebbed for a time after the gold rush to only 139 residents.

- After World War II, residents from Kokrines relocated to Ruby, and the population began to increase.
- The City incorporated as a second class city in 1973.
- The health clinic, watering point, and schools were built in the 1970s.
- The 1980s brought telephones and television services to the City.

(DCRA 2009)

3.2 DEMOGRAPHICS

The 2010 census recorded 166 residents, of which the median age was 38.0 indicating a relatively young population. The population of Ruby is expected to grow at the same or accelerated rate because nearly half of the population is between 18 and 44 years of age. Ruby is blended Koyukon Athabascans of the Nowitna-Koyukuk band and non-native community, and about 88.5 percent of residents recognize themselves as Alaska Native. The male and female composition is approximately 56.0 and 44.0 percent respectively. The 2010 census revealed that there are 62 occupied households with the average household having approximately three individuals. The most recent 2016 DCRA certified population is 178, based on the 2016 Department of Labor Estimate. The following graph illustrates the historic population of the City.

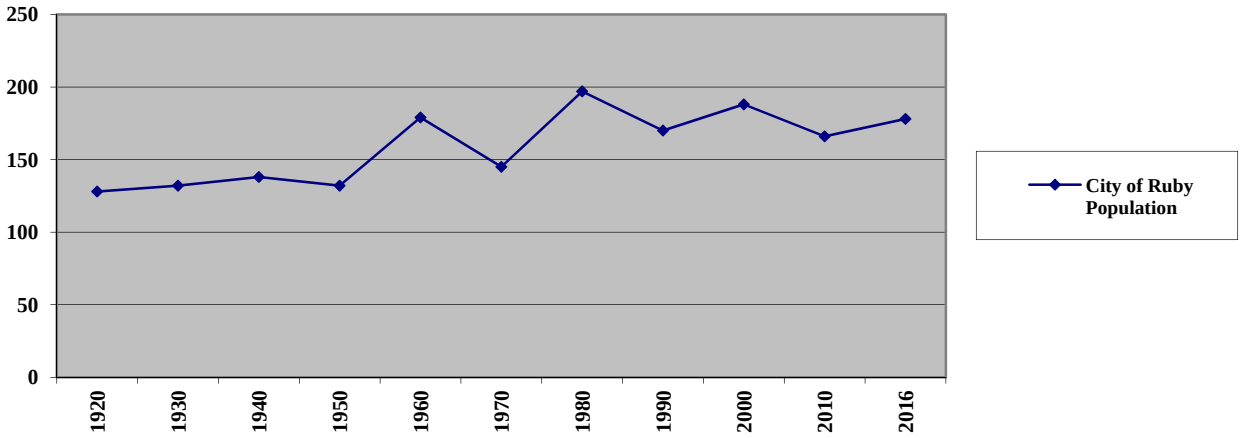

Figure 3-2 Ruby Historic Population

3.3 ECONOMY

Established government provides the bulk of the employment opportunities such as the City and Tribal Council, Dineega Corporation, the health clinic, and the school district. Small family businesses, Bureau of Land Management (BLM) fire fighting, construction work, native handicrafts, and trapping provide additional income. Six residents hold commercial fishing permits. However, subsistence is the primary mechanisms by which the residents survive (DCRA 2009).

According to the 2010 census, the median household income in Ruby was $24,464. Approximately 54 individuals (32.5 percent) were reported to be living below the poverty level.

The potential work force (those aged 16 years or older) in Ruby was estimated to be 133, of which 86 were actively employed. In 2013 the unemployment rate was 23.6 percent; however, this rate included part-time and seasonal jobs, and practical unemployment or underemployment is likely to be significantly higher.

Figure 3-3 depicts an aerial photograph of the City obtained from the Department of Community, Commerce, and Economic Development/Division of Community and Regional Affairs as part of their community mapping effort conducted in conjunction with this hazard mitigation planning project.

Figure 3-3 Aerial photograph of the City of Ruby (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 A.

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?

Source: FEMA, July 2008.

4.1 OVERVIEW OF PLANNING PROCESS

The first step in the planning process began with the City Clerk, Jennie Peter, being appointed the community point of contact in April 2017. On May 5, 2017, Jennie Peter and Mayor Elizabeth Captain determined that the Planning Team would meet during the June 27, 2017, regularly scheduled City Council meeting at 7 pm as one of the agenda ideas.

Newsletter #1 was posted at the Store, Post Office, and City office on May 24, 2017, providing an overview of the HMP updating process, announcing the June 27, 2017 meeting, and inviting community members to join the Planning Team. On June 14, 2017, Newsletter #2 was posted at the same locations as Newsletter #1 announcing the availability of the working draft copy of the updated HMP in the City Office for public review and inviting the community to comment by either calling or emailing Jennifer LeMay with LeMay Engineering & Consulting, Inc. or by bringing comments to the City Council meeting on June 27. No comments were received.

The Planning Team held a public meeting on June 27, 2017. Jennifer LeMay, PE and PMP with LeMay Engineering & Consulting, Inc. attended the meeting to assist the Planning Team with updating hazards, mitigation actions, and projects.

In summary, the following five-step process took place from April 2017 through June 2017.

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 update of the 2010 hazard mitigation plan.
2. Assess risks: The Planning Team reviewed the hazards specific to Ruby, added climate change as a hazard, and with the assistance of a hazard mitigation planning consultant (LeMay Engineering & Consulting, Inc.), and updated the risk assessment for the identified hazards. The Planning Team reviewed the risk assessment, including the vulnerability analysis, prior to and during the update 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 reviewed and confirmed the comprehensive range of potential mitigation goals and actions developed in 2010 were still applicable at the present time. Subsequently, the Planning Team concluded that no new actions are required and that reprioritization of the actions from 2010 to be implemented is unnecessary.
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 plan's five year update.

4.2 HAZARD MITIGATION PLANNING TEAM

The Planning Team members are listed in Table 4-1. The State of Alaska, Division of Homeland Security and Emergency Management (DHS&EM) provided funding and project oversight. LeMay Engineering & Consulting, Inc., DHS&EM's contractor, provided assistance to the Planning Team.

Table 4-1 Hazard Mitigation Planning Team

NAME	TITLE	ORGANIZATION	PHONE
Elizabeth Captain	Mayor	City of Ruby	468.1025
Jennie Peter	City Clerk	City of Ruby	468.4401
Ed Sarten	Vice Mayor	City of Ruby	468.4499
Dale Honea	City Council Member	City of Ruby	468-1090
Patrick McCarty	City Council Member, First Chief	City of Ruby, Tribe	468-1016
Martha Wright	City Council Member	City of Ruby	468-1017

Table 4-1 Hazard Mitigation Planning Team

NAME	TITLE	ORGANIZATION	PHONE
Elaine Wright	City Council Member, TCC Member	City of Ruby, Tanana Chiefs Conference	468-1087
Jennifer LeMay	Planner/Consultant	LeMay Engineering & Consulting, Inc.	350-6061
Rick Dembroski	State Hazard Planner	DHS&EM	428-7015
Brent Nichols, CFM	State Hazard Mitigation Officer	DHS&EM	428-7085

4.3 PUBLIC INVOLVEMENT AND OPPORTUNITIES 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 (May 24, 2017)	In May 2017, the jurisdiction 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 Store, Post Office, and City Office to ensure everyone was aware of the meeting.
Newsletter #2 Distribution (June 14, 2017)	In June 2017, the jurisdiction distributed a newsletter announcing the availability of the working draft copy of the updated 2010 hazard mitigation plan. Everyone was encouraged to participate in reviewing the plan and providing comments via phone or email to Jennifer LeMay or by bringing comments to the June 27, 2017 meeting. It was posted at the Store, Post Office, and City Office to ensure everyone was aware of the meeting.

An invitation was extended to all individuals and entities via two project newsletters describing the planning update process and announcing the upcoming public meeting and availability of the draft working copy plan for review. Newsletters were developed and posted at the Store, Post Office, and City Office on April 12 and June 14, 2017.

The Planning Team held a public meeting during their regularly scheduled City Council meeting on June 27, 2017. During the meeting, the Planning Team led the attending public through a hazard identification update and screening exercise. The attendees confirmed the hazards identified in development of the 2010 hazard mitigation plan: earthquake, erosion, flood, permafrost, severe weather, and wildland fire which periodically impact the City.

Following the hazard screening process, the Planning Team led the attendees through the process of confirming critical facilities in the community. The Tribe has completed building the Multi-Purpose Building since the 2010 adoption of the original plan; no other critical facilities have been built. LeMay Engineering & Consulting, Inc. also described the specific information needed from the Planning Team and public to complete the risk assessment including the locations and values of critical facilities in the community.

After the community asset data was collected by the Planning Team over the spring of 2017, an updated risk assessment was completed that illustrated the assets that are exposed and vulnerable to specific hazards. Mitigation actions were also reviewed. The Planning Team concluded there was no need to prioritize the mitigation actions identified in 2010 based on the results of the risk assessment. Hazards, risks, and vulnerabilities remain the same as in 2010.

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 update for the City:

- *DCRA (Department of Community and Commerce and Economic Development/Division of Community and Regional Affairs)*, 2017. Community Profile: https://www.commerce.alaska.gov/dcra/DCRAExternal/community (Accessed April 2017)
- *Alaska State Hazard Mitigation Plan*, 2013. Accessed April 2017.
- *Ruby Community Plan*, 2015 provided general information about Ruby.

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

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

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 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, the Planning Team reviewed eleven possible hazards that could affect the City. Ten of the eleven were evaluated in 2010 during development of the plan. Climate change was added in this plan update as a possible hazard. They then evaluated and screened the comprehensive list of potential hazards based on a range of factors, including prior knowledge or perception of 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 seven hazards pose the greatest threat to the City: earthquake, erosion, flood, permafrost, severe weather, wildland fire, and climate change. 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	The City is located along the Kaltag Fault. 697 earthquakes have occurred since 1977 within a 100 mile radius of the Village. Earthquakes have unpredictable occurrence intervals. Two exceeded M 5.0.
Erosion	Yes	During high water events and results from ice jam scouring. Ruby Creek is covered with a culvert then covered with dirt. Roads washed out by surface runoff. The river frontage 1 mile with facilities within 1/8 mile.
Flood	Yes	Snowmelt and ice jam flooding occur during spring thaw. Surface water overflows within City limits. Fall flooding events occur from soil saturation.
Landslide	No	This hazard does not exist for the City.
Permafrost	Yes	Discontinuous permafrost is present throughout the community and most commonly occurs in the wetland area and the close surrounding area to the wetlands.
Tsunami & Seiche	No	This hazard does not exist for the City.
Volcano	No	This hazard does not exist for the City.
Weather, Severe	Yes	Annual weather patterns, severe cold, freezing rain, and snow accumulations are predominant threats. The snowfall amount directly determines winter weather damages. Less snow causes the frost line to deepen, resulting in frozen water and sewer pipes. More snow provides better ground insulation. Severe cold usually occurs during December-January. High winds typically occur from February-March and August-September. August experiences the most rain. Too much rain causes wild game to move to more distant dry ground away from the City, increasing resident travel to harvest subsistence foods. Heavy rain and spring thaw causes high river water which reduces the City's residents' capability to harvest King salmon for subsistence needs.
Wildland Fires	Yes	Wildland fire is the City's greatest natural hazard. Historic wildfire occurrences during summer dry season (April-October). Fuels loading adjacent to the community, flammable debris around structures, and abandoned buildings could heighten fire danger.
Climate Change	Yes	The community is experiencing an increase in severity and frequency of severe weather.

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 the City's 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).

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

Probability is determined based on historic events, using the criteria identified above, to provide the likelihood of a future event.

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 2 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

Similar to estimating probability, magnitude, and severity are determined based on historic events using the criteria identified above.

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 feet [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 feet, 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 (MM) Intensity 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 (percent *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 2009)

5.3.1.2 History

The City has only had two earthquake events since 1971 that have occurred within 100 miles of the City that exceeded M 5.0 (Table 5-5), which did not cause any damages. Therefore, the City chose to limit how they address this hazard to M 5.0 events or greater.

Table 5-5 Historical Earthquakes for the City of Ruby

(Highlight is earthquake of record)

CAT	YEAR	MO	DAY	ORIG TIME	LAT	LONG	DEPTH (miles)	MAGNITUDE	DISTANCE (miles)
PDE	2000	02	03	102459.03	65.01	-154.25	4.3	5.7	41
PDE	2001	06	04	184234.12	64.74	-152.43	6.2	5.1	90

(USGS 2007)

The City has no history of damaging earthquakes. From 1977 to 2010, 511 earthquakes were recorded within a 100 mile radius of Ruby. There has been a noticeable increase within the past few years of almost 200 earthquakes recorded within the same 100 mile radius. From 1977 to 2017, 697 earthquakes have been recorded within a 100 mile radius of the City. The average magnitude of these earthquakes is M 1.9. This is a decrease from the M 3.0 reported in the 2010 plan since most of the earthquakes in the last two years have been +/- M 1. The largest recorded earthquake within 100 miles of the City measured M 5.7 on February 3, 2000, and caused no damage to critical facilities, residences, non-residential buildings, or infrastructure. Subsequently, due to their limited historical impacts, the City determined to limit listing only historical earthquakes which exceeded M 5.0.

North America's strongest recorded earthquake occurred in Prince William Sound on March 27, 1964, measuring M 9.2 and was felt by many residents throughout Alaska. The City 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, as well as the City of Ruby, is prone to the effects of an earthquake. Peter Haeussler, Alaska Region USGS explained during a telephone conversation held during development of the 2010 plan, the Kaltag Fault follows the Yukon River and is relatively centered on the Koyukuk/Yukon River confluence.

The Kobuk Fault Zone comprises a fault system of smaller faults; located north of Alatna Village running east to west along the border of the Brooks Range (GSA 1998).

Of the 697 recorded earthquakes since 1977, two exceeded M5.0 (U.S. Geological Survey [USGS] 2017). The record event occurred on February 3, 2000, measured at M5.7, at a depth of 4.3 miles. The epicenter was located approximately 41 miles from the City.

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

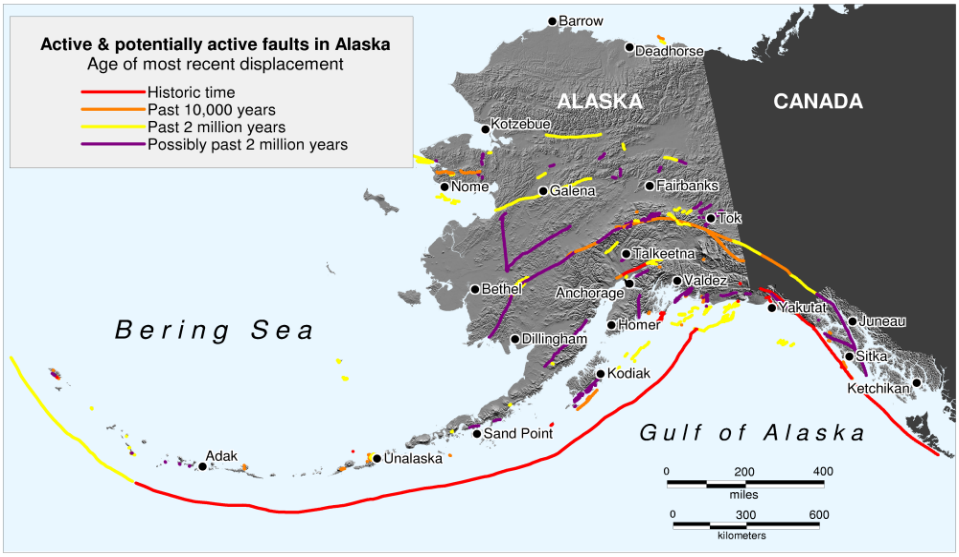

Figure 5-1 Active and Potentially Active Faults in Alaska

Extent

The Kaltag fault and Kobuk fault zone produce intraplate earthquakes, which occur within a tectonic plate sometimes at great distance from the plate boundaries. These types of earthquakes can have magnitudes of 7.0 and greater. Shallow earthquakes in the Fairbanks area are an example of intraplate earthquakes. (GSA 1998)

Earthquakes felt in the City area have not exceeded M 5.7 in the past 40 years, and damage has never been reported due to an earthquake event.

Based on historic earthquake events and the criteria identified in Table 5-3, the magnitude and severity of earthquake impacts in the City are considered negligible with minor injuries, the potential for critical facilities to be shutdown for less than 24 hours, less than 10 percent of property or critical infrastructure being severely damaged, and little to no permanent damage to transportation or infrastructure or the economy.

Impact

The City is located in an area that is less active than others in the State, although the effects of earthquakes centered elsewhere are expected to be felt in the City. Impacts to the community such as significant ground movement that may result in infrastructure damage are not expected. Minor 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 no official record of significant earthquake activity resulting in damage or injuries. While it is not possible to predict an earthquake, the USGS has developed Earthquake

Probability Maps that use the most recent earthquake rate and probability models. These models are derived from earthquake rate, location, and magnitude data from the USGS National Seismic Hazard Mapping Project. Map 7 indicates that the USGS earthquake probability model places the probability of an earthquake with a likelihood of experiencing strong shaking (0.2g to 0.3g peak ground acceleration) at a 2% probability in 50 years, based on the USGS Alaska hazard model.

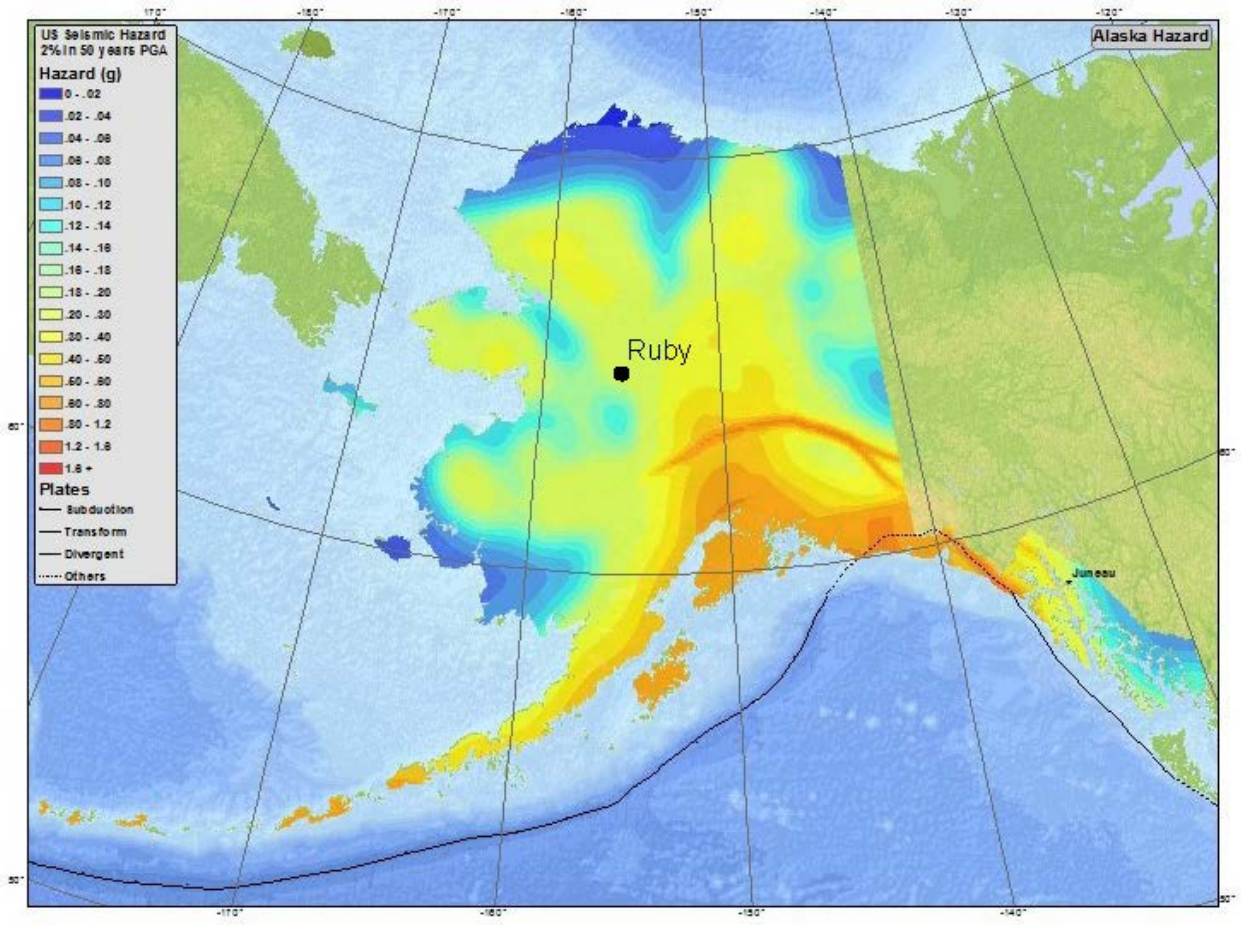

Figure 5-2 Ruby Earthquake Probability (USGS 2017)

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 [earthquake that the City of Fort Yukon to the east of Ruby experienced with moderate to severe ground shaking] 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 Ruby], 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. It 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.

Riverine erosion is a problem in developed areas where disappearing land threatens development and infrastructure. 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.

Riverine erosion is not a major threat, but it does threaten the embankment and subsistence livelihood of the City.

5.3.2.2 History

The City Mitigation Planning committee determined the average riverine erosion rate is only a few inches a year. The river embankment is slowly deteriorating and receding but not an immediate threat to village infrastructure.

The City experiences extensive annual damage to all of its roads from snowmelt runoff erosion.

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

Location

Riverine erosion generally occurs along the City's Yukon River embankment but riverine erosion damage is negligible compared to snowmelt high water flows. The majority of the City's streets consist of steep inclines. The City's typical heavy snow load melts fairly rapidly; however, the snow is not readily absorbed into the ground as the ground is still heavily frozen. The melt water seeks level ground, but the majority of the community is situated on steep slopes with roads steeply inclined. The snow uses the roads as a path of least resistance as it flows towards the river and level ground. Fast flowing water erodes the roads' surfaces, requiring extensive repairs.

The Planning Team stated 2008-2009 winter season had an unusually heavy snow load which resulted in severe road damage from heavy runoff erosion. This hazard creates a heavy damage toll on road repair equipment requiring high maintenance expenditures. (Figure 5-3) (Ruby 2009). The Planning Team stated that the 2016-2017 winter season surpassed the 2008-2009 winter season. Ice in the river melted as early as February, causing a snowmachiner to fall into the river and need to be treated for hypothermia.

Figure 5-3 depicts an aerial photograph of the City obtained from DCRA community profiles database (used with permission). The City's proximity to the Koyukuk River is easily evident. However, this is not the source of the City's erosion problems. Erosion occurs from rain and

snow melt run-off as the City is located on a hillside and their numerous roads are natural paths of least resistance for high volume water run-off (Ruby 2009).

Figure 5-3 Aerial Photograph of the City of Ruby (DCRA 2009)

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

Surface infrastructure experiences snowmelt runoff erosion, not riverine erosion. The community's roads are most at risk, however, minor structure flooding is possible if snowmelt cannot flow downhill away from structures.

Based on the Planning Team's knowledge and the criteria identified in Table 5-3, the magnitude and severity of riverine erosion impacts in the City are considered negligible with injuries and/or illnesses that are treatable with first aid, the potential for critical facilities and services to be shutdown for less than 24 hours, and less than 10 percent of property is severely damaged.

However, snowmelt runoff erosion damage magnitude and severity is limited where injuries and/or illnesses do not result in permanent disability, complete shutdown of the road system is likely for more than one week, with more than 10 percent of roadways are severely damaged.

Impact

Impacts from erosion in the City primarily include road surface damage. Snowmelt runoff can cause increased sedimentation of river deltas and potentially becoming a hindrance to channel navigation—affecting marine transport. Other impacts include reduction in water quality due to high sediment loads, loss of native aquatic habitat, and damage to public utilities (fuel headers and electric and water/wastewater utilities). The City experiences severe economic impacts associated with costs trying to prevent or control road erosion damages.

Probability of Future Events

Based on previous occurrences and applying the criteria identified in Table 5-2, it is unlikely that riverine erosion will occur in the next 10 years (event has up to 1 in 10 years chance of occurring) as the history of events is less than or equal to 10 percent likely per year.

However, snowmelt runoff damage is highly likely as an event is probable within the calendar year, event has up to 1 in 1 year chance of occurring, and history of events is greater than 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; and ice overflow (aufeis) flooding.

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 snow pack 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, Koyukuk, Kuskokwim, Susitna, 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, and then froze.

Timing of events

Many floods are predictable based on rainfall patterns. Most of the annual precipitation is received from May 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.

5.3.3.2 History

The USACE Alaska Community Flood Data Report (June 1993) states the last flood event which impacted the City occurred in 1968 where water reportedly reached the level of the boardwalk of the old log store on Front Street. The flood was caused by an ice jam (USACOE 2009).

"The highest recorded flood occurred in 1963 at 37.9 feet. Full bank is 28 feet. Other flood events occurred in 1930, 1965, 1967" (CH2MHILL 2001).

However, the Planning Team stated that the flood threat for Ruby is low as most of the community is located on high ground at an elevation of 175 ft.

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

Location

The US Army Corp of Engineers stated, "The [City of Ruby's September 1995 Flood Survey Information] elevations were based on a National Weather Service, River Forecast Center slope gauge."

Table 5-6 Flood Elevation Information

DESCRIPTION	ELEVATION
Ground at the "A" marker	50.12
Ground at the new "B" marker	19.86
elevation of the "B" marker (Alum. cap)	20.28
Typical shoulder elevation of Front Street near the City ice house	31.29
Typical boardwalk elevation of the old log store on Front Street	33.73
Water elevation of the Yukon on 7/9/98	6.17

"The "A" marker is a 3" copper disk on a copper rod approximately 0.8 ft above ground level at the northwest corner of Clara Honea's old log house. The disk is marked "USWB UM A" and has a recorded elevation of 50.92 ft.

It is believed that the original "B" marker was destroyed or buried by fill placed on Front Street and was therefore unrecoverable at the of time of the site visit. According to the River Forecast Center the recorded elevation of the original "B" marker is 33.00 ft. Ruby has never flooded. However, water reportedly reached the level of the boardwalk of the old log store on Front Street due to an ice jam" (USACE 2009).

The 2017 Planning Team stated the above statement by the USACE in 2009 is still true: "Ruby has never flooded". In 2013, the water level of the river did crest up to the campground level, but it receded without causing damage.

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, and 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
- Village or city location related to the base flood elevation as indicated with their certified high water mark

Most of the community's structures are above the level of this periodic flooding. "However, water reportedly reached the level of the boardwalk of the old log store on Front Street due to an ice jam, date unknown" (USACOE 2009).

Based on past flood events, USACE data, and the criteria identified in Table 5-3, the extent of flood impacts 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

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 released by 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 5.3.2).

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).

Probability of Future Events

Based on the lack of previous occurrences and applying the criteria identified in Table 5-2, it is unlikely a flood event will occur in the next ten years (event has up to 1 in 10 years chance of occurring) as the history of events is less than or equal to 10 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 ft, 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

Uneven settling throughout the years within the City has damaged buildings and roads constructed in permafrost areas. There is no defined list of historical events available. Community members deal with re-leveling or repairing damages from these infrequent events.

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

Location

CH2MHill developed a Sanitation Facilities Master Plan for the City in 2001. They obtained existing soil surveys to augment their report and to minimize cost and reduce effort duplication. Those surveys included:

- Shannon & Wilson, Inc, February 1982, (proposed washeteria and water plant)

- Clarke Engineering Company, January 1994 (residential housing foundations)
- State of Alaska, Department of Transportation and Public Facilities, February 1980, (Airport)
- Alaska Area Native Health Services (water logs from the Ruby area)

CH2MHill found silty soil overlain bedrock formations throughout the community.

> *"Ruby is located within a narrow band along the Yukon River that is underlain by discontinuous permafrost…Within this zone, permafrost is present in most areas, but can be locally absent, particularly near large water bodies. To the north and south of this narrow discontinuous permafrost zone along the Yukon, moderately thick to thin zones of continuous permafrost are present" (CH2MHill 2001).*

The CH2MHILL analysis confirms the generalized Alaska Permafrost Map (Figure 5-4) stating that the entire City is underlain by discontinuous permafrost.

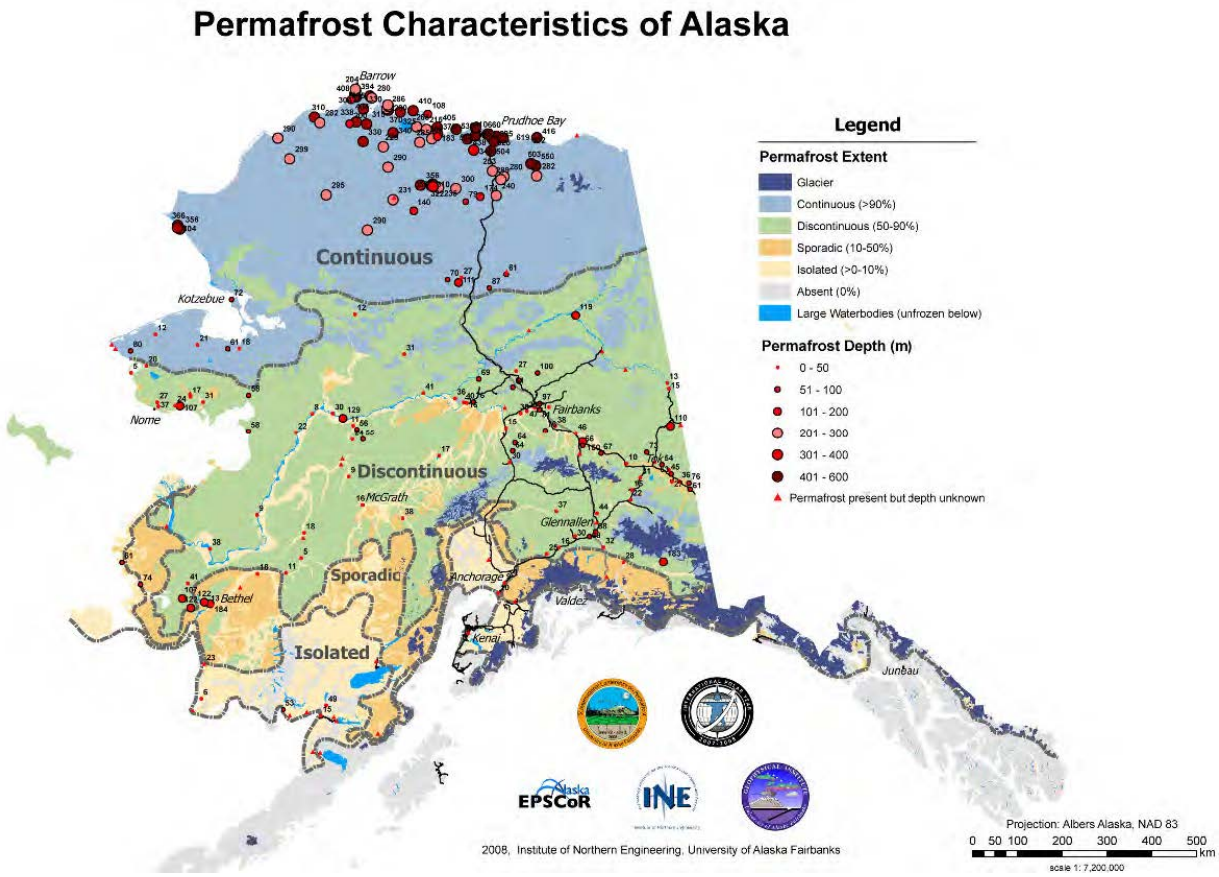

Figure 5-4 Permafrost Map of Alaska (Alaska Hazard Mitigation Plan 2013)

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 affected.

There is no documented data defining the City's permafrost damage history. Consequently, the Planning Team determined from their knowledge of past permafrost degradation events that the City follows the criteria identified in Table 5-3, the extent of permafrost degradation impacts in the City are considered negligible where injuries are treatable with first aid, minor quality of life is lost, shutdown of critical facilities and services occurs for 24 hours or less, and less than 10 percent of property is severely damaged.

Impact

Impacts associated with degrading permafrost include surface subsidence, infrastructure, structure, and/or road damage. 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.

Probability of Future Events

Historical permafrost damage data is non-existent for the City. However, the Planning Team stated that permafrost damage occurs annually due to the silty soil located adjacent to wetlands. The Planning Team determined that the probability for permafrost occurring follows the criteria in Table 5-2, the probability of future damage resulting from permafrost is possible in the next five years as the history of events is greater than 10 percent but less than or equal to 20 percent likely per year.

5.3.5 Weather (Severe)

5.3.5.1 Nature

Severe weather in Alaska includes thunderstorms, lightning, hail, heavy and drifting snow, freezing rain/ice storm, extreme cold, and high winds. The City experiences 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.

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.

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 over the interior due to strong pressure differences, especially where influenced by mountainous terrain.

5.3.5.2 History

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

Table 5-7 Severe Weather Events

Zone(s)	Location(s)	Date(s)	Event	Description
AK004, AK008,	Various	24-25-Feb-89	Winter Storm	Wind and heavy snow in many areas, probably affected all villages.
AK008	East of Galena	10-Nov-85	Heavy Snow	10" (1-day).
AK008	Galena	27-28-Dec-90	Heavy Snow	11-13" (1-day).
AK008	Galena	22-Mar-91	Heavy Snow	6" (1-day).
AK004 & AK008	Galena	26-29-Feb-96	Heavy Snow	Snowfall totals for the one-to-two day event. Galena 4".
AK004 & AK008	Galena, Nulato Kaltag, Ruby	22-24-Jan-99	Heavy Snow	Blizzard Conditions, precipitation, strong winds Nulato 7", Ruby 10.2, Kaltag 12".
AK004 & AK008	Galena	29-31-Jan-99	Extreme Cold	Cold air mass -50 degrees Fahrenheit (ºF) to during the period and reached the -60 ºF. The lowest recorded temperatures and dates are: Galena -64 ºF.
AK004 & AK008	Galena, Kaltag, Ruby,	01-12-Feb-99	Extreme Cold	Cold air mass -50 ºF to during the period and reached the -60 ºF. The lowest recorded temperatures and dates are: Galena -64 ºF.
AK004 & AK008	Koyukuk Valley, Galena	20-23-Dec-99	Heavy Snow	Cold, high winds, snow and ice Galena 7", 22nd.
AK004 & AK008	Nulato, Kaltag	22-24-Jan-00	Winter Storm	Winter weather, heavy snow Nulato 9.6", 23rd; Kaltag 7", 23rd, 7", 24th.
AK004 & AK008	Galena, Kaltag	01-03-Feb-00	Blizzard	Winter weather, strong winds, blizzard conditions, high winds, and heavy snow: Galena 8.3", 2nd; Kaltag 8" 2nd.
AK004 & AK008	Nulato, Galena, Kaltag	09-11-Nov-00	Winter Storm	Winter Weather, strong winds, blizzard conditions. Nulato and Galena reported freezing rain, Kaltag reported freezing rain. Nulato reported 9" of snow.
AK008	Nulato,	12-13-Nov-00	Heavy	Blizzard conditions, heavy snow Kaltag and Nulato

Table 5-7 Severe Weather Events

Zone(s)	Location(s)	Date(s)	Event	Description
	Kaltag		Snow	strong winds Nulato 9"; Kaltag, 8".
AK216	Galena, Nulato, Kaltag	02-03-Apr-01	Heavy Snow	Blizzard conditions, heavy snow, high winds Galena 7-10"; Nulato 10-12"; Kaltag 6".
AK216	Kaltag	14-15-Jan-02	Heavy Snow	Heavy snow Kaltag reported 6" of new snow over a 12 hour period.
AK216-AK218	Kaltag	16-17-Apr-02	Heavy Snow	Heavy snow, strong winds, blizzard conditions Kaltag reported 6" of new snow.
AK216	Kaltag	03-04-Feb-03	Heavy Snow	Heavy snow Kaltag where 6" snow.
AK216 & AK219	Bettles, Galena	01-03-Mar-03	Heavy Snow	Heaviest snow fell near Bettles (Zone 219) where 11" of new snow; Galena (Zone 216) measured 8" and reported near white out conditions.
AK216	Galena	03-05-Feb-04	Heavy Snow	Zone 216: Galena reported: 9" Snowfall.
AK216	Galena	15-Feb-04	Heavy Snow	Cold air mass produced heavy snow. Zone 216: Galena reported 6".
AK216	Galena	10-Nov-04	Heavy Snow	Heavy snow Galena reported 9.0".
AK216	Galena	01-Dec-04	Heavy Snow	Six" of snow reported by Galena.
AK216	Galena	22-Dec-04	Heavy Snow	Winter Storm Conditions reported at: Zone 219. Heavy snow reported at Zone 216- Galena reported 8".
AK216-AK219	Galena, Bettles	02-05-Jan-05	Heavy Snow	Arctic cold front, heavy snow reported: Zone 216: Galena 8". Zone 219: Bettles Airport 10.4".
AK216	Galena	13-Feb-05	Heavy Snow	Heavy snow reported at Galena 6".
AK216	Galena, Kaltag	20-22-Mar-05	High Wind	Zone 216- Kaltag Peak Wind 55 mph and Galena highest gust 39 mph.
AK216	Kaltag	26-Nov-06	Heavy Snow	Zone 216- Kaltag reported 12" snow.
AK216	Galena	09-10-Oct-07	Heavy Snow	Galena reported eight" of snow.
AK216	Kaltag	04-05-Nov-07	Heavy Snow	Heavy snow over the Nulato Hills including Kaltag. Kaltag reported 8" of snow.
AK215 & AK216	Galena, Kaltag,	03-05-Apr-08	Winter Storm	Zone 216: Kaltag heavy snow with rain and/or freezing rain, snowfall amounts of 7 to 9". Galena reported only 1-2" of snow.
AK216	Galena	03-04-Dec-08	Heavy Snow	Galena reported 7" of snow.
AK216 &	Galena,	01-12-Jan-09	Extreme Cold/Wind Chill	Cold snap did not produce any record low temperatures. It was the most prolonged cold snap across interior Alaska since 1999.

Table 5-7 Severe Weather Events

Zone(s)	Location(s)	Date(s)	Event	Description
				Zone 216: Galena: -51ºF on the 2nd.
AK216 & AK219	Galena &	02-Jan-09	Temperatures	Zone 216: Galena: -51ºF, Cold snap did not produce any record low temperatures; it was the most prolonged cold snap across interior Alaska since 1999.
AK215, AK216 & AK219	Galena, Kaltag, Ruby	13-16-Jan-09	Winter Storm	Estimated 8 to 12" of snow fell along the eastern slopes of the Nulato Hills. Above freezing temperatures at Kaltag, the Galena and Ruby, it is likely that the snow changed to freezing rain in spots, and the freezing rain likely accumulated in excess of a tenth of an inch In spots.
AK216	Galena	16-17-Jan-09	Winter Storm	High winds, heavy snow, blizzard conditions and freezing rain. Zone 216: Galena reported trees and power lines down during the early morning hours of the 17th. Sustained winds of 50mph were observed, with a peak wind gust of 64mph.
AK216 & AK215	Galena	17-Jan-09	High Wind	Galena reported trees and power lines down. Sustained winds of 50 mph were observed, with a peak wind gust of 64 mph.
AK216	Ruby	05/10-05/13/10	Ice Jam Flood	An ice jam near Ruby caused the water levels on the Yukon River to rise significantly on the 10th, and flood stage was exceeded by 0500AKST on the 11th. The water level crested at 41.5 feet at Ruby 1000AKST on the 11th, and remained above flood stage until 2100AKST on the 13th. The stage of 41.5 feet was the highest on record at Ruby. The village of Ruby sits on a hill above the Yukon River, and damages were limited to two fish camps and two cabins that were inundated with 3 to 6 feet of water. Two additional cabins were damaged by ice. The cabins were located on the Novi River, with the exception of one fish camp on the Yukon River near Ruby.
AK216	Galena	05/27-05/31/13	Ice Jam Flood	An ice jam formed at Bishop Rock on the Yukon River, downstream of Galena on the 26th and caused water to back up. Flooding began on the 27th and flood waters did not recede until the 31st. All structures were impacted by the high water except those significantly elevated or protected by the dike which surrounds the airport. Almost all roads were washed out…with boats being used for emergency transportation. Power was out to most of the city. Many residents were evacuated to nearby villages or to Fairbanks. Ice chunks knocked some houses off their foundation. Other buildings had up to 8 feet of water. On the 29th, water started slowly falling. It was not until the 31st when water levels fell below flood stage. Damage amounts are estimated and include 14 homes destroyed, 90 homes with major damage, and 55 homes with minor damage, and nearly $ 6 million for emergency response and public infrastructure. Ruby was not affected.

(Lingaas 2009)

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

Location

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 area is equally vulnerable to the effects of severe weather. Blizzard conditions and heavy snow depths for the area can reach ten inches per storm event; wind speed can exceed 64.4 mph; and extreme low temperatures have reached -64ºF.

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 motor vehicle, all-terrain vehicle (ATV), 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 vicinity.

The Alaska Interagency Coordination Center [AICC] lists over 316 wildland fires which occurred within 50 miles of the City. Table 5-8 lists 83 wildfires that exceeded 3,000 acres impacted for the historical period of 77 years (i.e., from 1939 to 2016).

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

Location

Under certain conditions, wildland fires may occur in any area surrounding the City with combustible fuel sources. 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, 316 wildland fire events have occurred within 50 miles of the City (Figure 5-5).

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.

Over the past 77 years, an average of 42,804 acres burned during each of the 83 largest wildland fire events from Table 5-8. 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 much more efficiently manages wildland fires using a four-tiered suppression methodology based on infrastructure criticality while using more modern available resources as the response to wildland fires which potentially threaten populated areas (DOF 2009).

Table 5-8 Wildfire Locations from 1939 to 2016

(Within 50 Miles Of The City Of Ruby)

Fire Name	Fire Year	Estimated Acres	Specific Cause
Dulbi River	2015	54503	Lightning
Fox Creek	2015	5797.7	Lightning
Moose Point	2015	13775.7	Lightning
Little Moose	2015	4897	Lightning
Kokrine	2015	4088.6	Lightning
Nikolai Slough	2015	5802.2	Lightning
Bruno Creek	2015	15131.6	Lightning
Holtnakatna	2015	223154.1	Lightning
Falco	2015	4488.6	Lightning
Hard Luck	2015	12923.6	Lightning
Big Creek Two	2015	312918.2	Lightning
Glacier	2015	47333.2	Lightning
Melozitna 2	2015	3356.5	Lightning
Ketlkede 3	2015	3932.2	Lightning
Flint Creek	2015	35748.9	Lightning
Trail Creek	2015	29501.4	Lightning
Lost River	2015	52108.5	Lightning
Black Sand	2015	12880.7	Lightning
Tip Creek	2015	3409.7	Lightning
Melogitna	2015	9592.8	Lightning
Little Mud	2013	25973.8	Lightning
Sulatna River	2013	48078.1	Lightning
Yuki River	2010	9383	Lightning
Lost River	2010	15331	Lightning
Big Creek	2007	3416.9	Lightning
Coffee Can Lake	2007	39795	Lightning
East Fork Yuki River	2005	32774.5	Lightning
Dulbi South	2005	3432.6	Lightning
Camp Creek	2005	13755	Lightning
Holtnakatna Creek	2005	194015.2	Lightning
Little Mud #2	2005	193399.8	Lightning
Louis Lake	2004	22193	Lightning
Moose Creek	2002	5275	Lightning
Holtnaka	2002	23033	Unknown
Long Creek	2002	74931	Lightning
Natlaratlen River	2000	8541	Lightning
Big Creek	1999	28634	Lightning
631588 Antelope Cr.	1996	9300	Lightning
Gal Ne 38	1994	3680	Lightning
331662	1993	3300	Lightning
331653	1993	4800	Lightning
131356	1991	5170	Lightning

Table 5-8 Wildfire Locations from 1939 to 2016

(Within 50 Miles Of The City Of Ruby)

Fire Name	Fire Year	Estimated Acres	Specific Cause
Gal Ne 30	1991	11040	Lightning
Gal Ne 50	1991	4740	Lightning
132241	1991	81140	Lightning
Gal N 38	1990	60000	Lightning
031044	1990	25000	Lightning
Tal Sw 53	1990	3000	Lightning
831023	1988	141546	Lightning
631053	1986	15700	Lightning
631039	1986	5120	Lightning
Gal Ne 57	1985	37000	Lightning
Otz Ne 100	1985	3000	Lightning
531035	1985	34000	Lightning
Mueller	1969	90000	Lightning
Cottonwood	1969	140000	Lightning
Thirsty	1969	2000	Lightning
Bear	1969	422000	Lightning
Dulbi	1969	12000	Lightning
Base Line	1968	8000	Lightning
Sheets Creek	1968	7000	Lightning
Melozi Springs	1968	16000	Lightning
Holt Creek	1968	8000	Lightning
Yuki River	1968	3000	Lightning
Cottonwood	1968	6000	Lightning
Nowitna	1966	52000	Lightning
Big Creek	1959	65000	Lightning
Kokrines Nw-19	1959	6400	Lightning
Galena N-35	1956	23000	Lightning
Dubli #2	1956	112492	Lightning
Kokrines Nw 15	1956	3000	Lightning
20 Mile	1954	17920	Lightning
Nowitna	1954	58240	Lightning
Yuko River	1953	2380	Unknown
Nowitna #3	1953	171000	Lightning
Galena	1946	15360	Lightning
Yuko	1946	128000	Lightning
Nowitna	1946	4100	Lightning
Galena	1941	10000	Unknown
Ruby	1941	100000	Unknown
Head Long Creek	1940	10000	Unknown
Poorman	1940	10000	Unknown
East Ruby	1940	5000	Unknown

(AICC 2017)

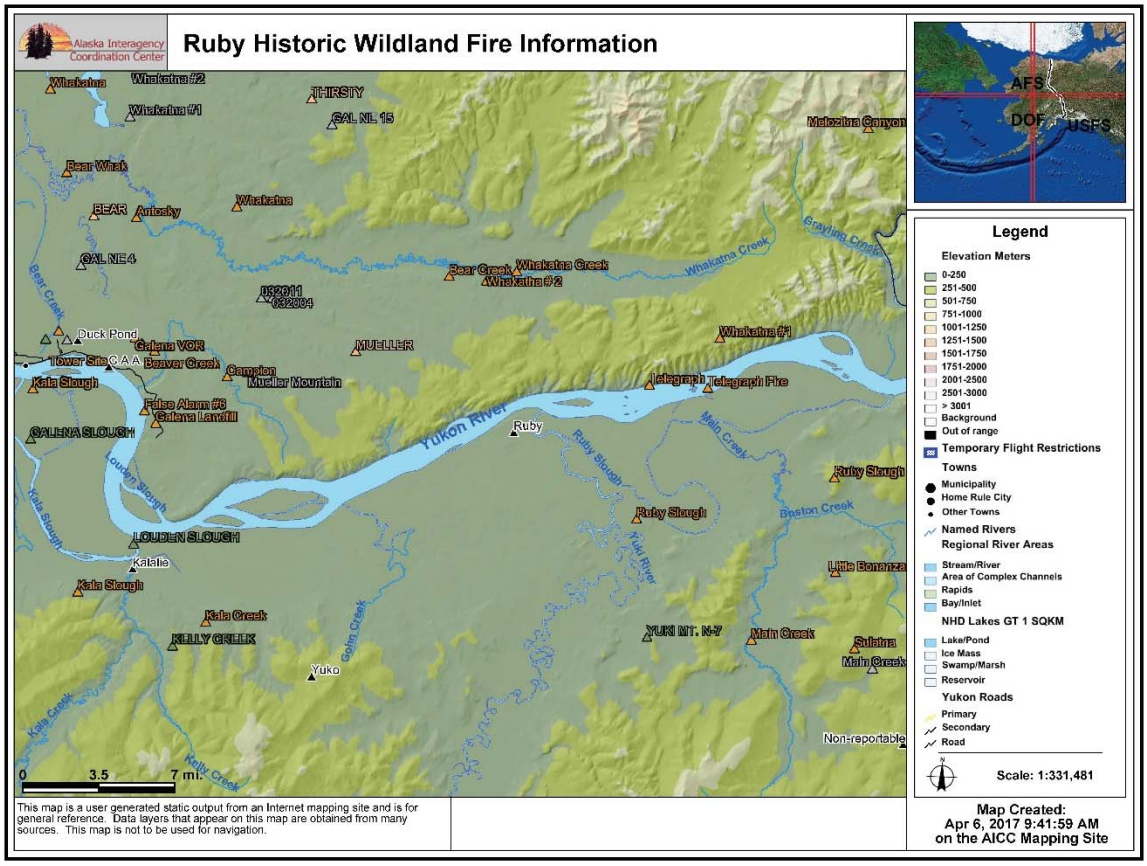

Figure 5-5 Ruby Area Wildfire History (AICC 2017)

Based on past wildland fire events and the criteria identified in Table 5-3, the magnitude and severity of impacts in the City are considered negligible with injuries and/or illnesses treatable with first aid, minor quality of life lost, 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 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 firefighter and 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.

Based on the history of wildland fires in the City area and applying the criteria identified in Table 5-2, it is likely a wildland fire event will occur in the next three years (event has up to 1 in 3 years chance of occurring) and the history of events is greater than 20 percent but less than or equal to 33 percent likely each year.

5.3.7 Climate Change

5.3.7.1 Nature

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

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

5.3.7.2 History

The 2015 Ruby Community Plan stated that, "Climate change is beginning to negatively affect our community. The Yukon River is not frozen as long as it was, and travel is more limited because of dangerous conditions. Hunting season is warmer which seems to affect animal behavior relevant to subsistence activities, grassy ponds are losing more water every year, and there were no berries in the summer of 2014 which people rely on. Unpredictable weather patterns increase situations for accidents and other consequences in daily living. We have seen insects, birds, and other flora and fauna that has never been in Ruby before. We don't know how much this will determine the future of our local environment and eco system. Change in subsistence activities can be attributed to changing climates and increasing state regulations. More than 100 years ago, caribou were much more abundant in this area and was the main ungulate harvested for subsistence food when moose were rare at the time. Caribou are rarely seen now. The community used to participate in livestock herding, raising reindeer, but the practice went away over time. Restricted fishing regulations and closures drastically limited a large percentage of subsistence fishing in our community. The same can be said with hunting regulations in the area. Hunting regulations are difficult to understand with antler cutting,

timeframes, and specific use areas. Our local fish and game advisory committee submits proposals to all federal and state authorities to modify and change regulations in support of required subsistence harvest and maintaining high fish and wild life populations and cooperate with authorities." (Ruby 2015)

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

Location

Climate change and mass extinctions are global events. Therefore, the entire community of Ruby is vulnerable to climate change.

Extent

Climate change affects water acidity, atmospheric composition, precipitation, weather patterns, and temperatures.

Impact

Climate change has the potential to aggravate natural disasters already discussed in Section 5.3.7.2. Climate change will continue to exacerbate these issues. The major effect of climate change, and therefore, mass extinctions is the abrupt decline of the earth's bio-diversity and population of organisms. However, periods of mass extinction have been followed by periods of new species development. The dinosaurs developed and flourished after one of the most thorough mass extinctions in Earth's history. Today, they are the most popular subject of the most studied mass extinction ever, the Cretaceous event. The Cretaceous event cleared the path for mammals such as humans to evolve.

Probability of Future Events

Given the Earth's history of mass extinctions attributed to climate change, and the current observed changes in the atmosphere, it is "Credible" a disaster event attributed to climate change will occur in the next ten years as the probability is less than or equal to 10 percent likely per year.

5.3.7.4 Previous Occurrences

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

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

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

perished.

4. End Triassic (~210Ma): 12% of all families and 65% of all life in the Triassic period perished.
5. End Cretaceous (~65Ma): 11% of all families and 62% of all species became extinct.

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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: including asset inventory, methodology, data limitations, exposure analysis for current assets, and areas of future development.

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

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

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 the new or updated 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 2010 U.S. Census. The City's total population for 2010 was 166. The most recent 2016 Department of Community, Commerce, and Economic Development (DCCED)/DCRA Department of Labor Estimate population is 178. (Table 6-1).

Table 6-1 Estimated Population and Building Inventory

Population		Residential Buildings	
2010 Census	DCCED 2016 Data	Total Building Count	Total Value of Buildings[1] ($)
166	178	108	7,614,000

Sources: City of Ruby, U.S. Census 2010, and the DCCED/DCRA 2016 Department of Labor Estimate Population.
[1] Average structural value of all single-family residential buildings is $70,500 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 2010 U.S. Census, and DCCED/DCRA. A total of 108 single-family residential buildings were considered in this analysis. Only 62 of the 108 single-family residential buildings are occupied per DCRA.

6.2.1.2 Repetitive Loss Properties

The City is located above the normal floodplain with no residential or public infrastructure at risk to floods and does not currently participate in the NFIP. Therefore, the City does not have a RL Property Inventory that meets the RL or SRL criteria. This is not a high priority action item as the community has a very low flood threat. However, the City is investigating NFIP program participation.

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, Village Public Safety Officer (VPSO), fire, and Code Red equipment.
- 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. Replacements costs in Table 6-2 have been updated with 2015 insurance value provided by the City.

The Tribe has built a Multi-Use Facility that will open in August 2017 on land that the City gifted them. This new facility is adjacent to the City Office.

Table 6-2 Ruby Critical Facilities

Occupancy Type	Facility Name	Location/Address	Structure/ or Per Mile Replacement Cost	Length/ Gallons/ # Occupants
Government Facility	City Admin Building & Public Safety Office	90 Wildberry Rd	$292,263	1 Occ.
	Dineega Corporation Office	Wildberry Rd	$180,000	2 Occ.
	Tribal Council Office	Good Time Rd	$100,000	10 Occ.
	US Post Office	Wildberry Rd	$200,000	1 Occ.
Transportation Facilities	Ruby Airport	Airport Road	$7,560,000	2 Occ.
	State Airport Maintenance Shop	Airport Rd	$1,000,000	2 Occ.
Emergency Response Facility	VPSO Office in City Admin Building	90 Wildberry Rd	N/A	N/A
	City Fire Hall/Public Safety Building	Short Street	$836,000	1 Occ.
Educational Facility	Head Start	Good Time Road	$80,000	2 Occ.
	Merreline A. Kangas School	Airport Road	$1,057,670	6 Occ.
Care Facility	Altona Brown Health Clinic	Wildberry Road	$775,348	3 Occ.
Community Facility	City Teen Center	Bobby Kennedy Sr Way	$234,925	0 Occ.
	City Community Hall	Good Time Road	$466,208	0 Occ.
	City Shop	Short Street	$256,627	0 Occ.
	Public Campground Waterfront Park	Front Street	$38,487	0 Occ.
	St Peter in Chains Catholic Church	Good Time Road	$150,000	1 Occ.
	Ruby Bible Church	Good Time Road	$50,000	1 Occ.
	Resident Owned Store	Off Titna Street	$250,000	2 Occ.
	Ruby Commercial Company	Good Time Road	$350,000	5 Occ.
	Teacher Housing	Adjacent to School on Airport Road	Not Known	0 Occ.
	Teacher's Quarters 1 (for sale)	Little Loop Roadt	$80,000	2 Occ.
	Teacher's Quarters 2 (for sale)	Little Loop Roadt	$80,000	2 Occ.
Roads	Roads (Bureau of Indian Affairs [BIA]) (@ $1M/mile)	N/A	$94,000,000	94 miles 0 Occ.
	Roads (Community)	N/A	$14,293,000	14.4 miles 0 Occ.
	Landfill Road	N/A	$330,000	0 Occ.
	Airport Right-of-Way	N/A	$108,000	0 Occ.
Utilities	Dineega Corporation Fuel Storage Tanks 2164,800 gal	Front Street	$4,195,154	1 Occ.
	Generation Facility	Short Street	$106,911	0 Occ.

Table 6-2 Ruby Critical Facilities

Occupancy Type	Facility Name	Location / Address	Structure / or Per Mile Replacement Cost	Length / Gallons / # Occupants
	Yukon Koyukuk Schools 65,610 gal	Airport Road	N/A	0 Occ.
	City Fuel Storage Tank 12,000 gal (NOT USED); City is in process of transferring the land and tank to Tribe	Front Street	N/A	0 Occ.
	AK DOT Fuel Storage Tank 4,000 gal	Airport Road	N/A	0 Occ.
	School Water Treatment Plant	Airport Road	N/A	0 Occ.
	City of Ruby Electric Utility Building	Short Street	$356,012	0 Occ.
	City of Ruby Power Plant		1,200,000	0 Occ.
	Old Laundromat Site Well	Wildberry Road	$30,000	0 Occ.
	New Laundromat Site Well	Mosquito Street	$30,000	1 Occ.
	Internet Dish at School	Airport Road	$35,000	0 Occ.
	Alaska Rural Communication Service (ARCS) TV Dish at City Bldg.	Wildberry Road	$35,000	0 Occ.
	Yukon Telephone Co.	Wildberry Road	$200,000	0 Occ.
	Old Washeteria	Wildberry Road	$1,460,069	1 Occ.
	New Washeteria	Mosquito Street	$1,642,749	1 Occ.
	Washeteria Water Treatment Plant (NOT USED)	Wildberry Road	$1,262,200	0 Occ.
	Barge Fuel Header	Front Street	$75,000	0 Occ.
	Ruby Landfill, Class 3	Landfill Road	$1,200,000	0 Occ.
	Sawmill (NOT USED)	Front Street	$26,553	1 Occ.
	Sewage Lagoon (3 acre, 2 cell) w/1,800 feet of Sewer Force Main	Little Loop Road	$2,055,000	0

(Ruby 2017, DCRA 2017)

6.2.1.4 Future Critical Facilities and Infrastructure

The last construction projects of the new health clinic and generator facility in 2013 helped increased income for the community. The Tribe's newly built Multi-Purpose Facility will open in August 2017.

As of 2015 in the Community Plan, the dump/landfill is full and overused and ready to be closed. Construction of a new landfill is planned to be completed and operational for 2018.

It is important to note that the City's infrastructure is located above the floodplain and not susceptible to other "controllable" hazard impacts. All infrastructure is prone to earthquake, weather, and wildfire impacts.

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.

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

Replacement structure and contents values were developed for physical assets. These values were obtained from the State of Alaska Critical Facilities Database, the capital projects database, Ruby, Alaska, or 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 below and in the following discussion.

Table 6-3 City of Ruby Potential Hazard Exposure Analysis

			Residential Structures		Critical Facilities		Total	
Hazard	Methodology	Population[(A)]	Number	Structure Value	Number	Structure Value	Structures	Value
Earthquake*	Simplified exposure-level analysis	166	108	$7,614,000	42	$122,163,363	149	$129,706,863
Erosion	Simplified exposure-level analysis	19	5**	$352,500	9	$103,225,194	14	$103,577,694
Flood	DCRA community flood mapping	19	5**	$352,500	10	$103,411,592	14	$103,764,092
Permafrost*	Simplified exposure-level analysis	166	108	$7,614,000	42	$122,163,363	149	$129,706,863
Weather (Severe)*	Simplified exposure-level analysis	166	108	$7,614,000	42	$122,163,363	149	$129,706,863
Wildland Fire*	Simplified exposure-level analysis	166	108	$7,614,000	42	$122,163,363	149	$129,706,863

* *All people, critical facilities, and residential structures are equally vulnerable to this hazard.*

*** These 5 houses are located on Front Street closest to the River. Only two of the houses are occupied as one homeowner died, one sold out, and one moved to another community.*

N/A = not available

(a) total population was based on DCCED 2016population data - population estimates were provided by the Planning Team for the Erosion and Flood hazard areas.

(b) cost estimates based on 2017 DCRA Capital Improvement Project data and Planning Team input.

Earthquake

Based on earthquake probability model maps produced by the USGS, the entire City of Ruby area is at risk of experiencing the impacts from an earthquake. However, the probability is low (see Section 5.3.1.3). Impacts to the community such as significant ground movement that may result in infrastructure damage are not expected. The entire existing and future City population, residences, and critical facilities are exposed to the effects of an earthquake. This includes 166 people in 108 residences (worth approximately $7,614,000), and 42 critical facilities (worth approximately $122,163,363).
Impacts to the community such as significant ground movement that may result in infrastructure damage are not expected. Minor 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 low impact level as the City is not located in an area with a high probability of strong shaking (i.e., >M 4.8).

Erosion

Based on local knowledge, (see Section 5.3.2.3) areas within the City affected by erosion are the same areas affected by flood. There are approximately 19 people in five residential buildings (worth approximately $352,500) and nine critical facilities (worth $103,225,194) located in areas exposed and historically prone to erosion.

Impacts from erosion include loss of land and any development on that land. 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.

The probability of 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. Land use controls were recommended in 2010 but have not been implemented.

Flood

Based on local knowledge, areas within the City affected by erosion are the same areas affected by flood (see Section 5.3.3.3). There are approximately 19 people in five residential buildings (worth approximately $352,500) and ten critical facilities (worth $103,411,592) located in areas exposed and historically prone to erosion.

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. 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.

Impacts to future populations, residences, critical facilities, and infrastructure are anticipated at the same impact level and funding can be secured to elevate or relocate flood prone structures. As the City is not a NFIP participant, repetitive loss flood claim data is not available.

Permafrost

According to mapping completed by the Department of Natural Resources' Division of Geological and Geophysical Survey (DGGS), the entire City is underlain by discontinuous permafrost, (see Section 5.3.4.3) thus exposed to the impacts from this hazard. This includes 166 people in 108 residences (worth approximately $7,614,000) and all 42 critical facilities (worth approximately $122,163,363).

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. These options were recommended in 2010 but have not been implemented.

Weather, Severe

Using information provided by the City and the National Weather Service, the entire existing and future City population, residences, and critical facilities are equally exposed to the effects of a severe weather event (see Section 5.3.5.3). This includes 166 people in 108 residences (worth approximately $7,614,000) and all 42 critical facilities (worth approximately $122,163,363).

Impacts associated with severe weather events includes roof collapse, trees and power lines falling, damage light aircraft and sinking small boats, injury and death resulting from snow machine or vehicle accidents, and 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, frozen pipes, and carbon monoxide poisoning. Section 5.3.6.5 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

According to the Alaska Fire Service, there are no areas within the City boundaries. However, 316 wildland fires have occurred since 1939 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. This includes 166 people in 108 residences (worth approximately $7,614,000) and all 42 critical facilities (worth approximately $122,163,363).

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.

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

Land use surrounding Ruby varies and includes Doyon Regional Native Corporation Lands, Dineega Corporation, Federal, State and local land ownership. As a result of the ANCSA land settlement, Ruby's Village Dineega Corporation owns 115,000 acres surrounding the community. These lands are primarily used for subsistence activities, biomass harvesting, and some mining. There is currently no land management plan for corporation lands.

Land use in the City is predominately residential with limited areas of commercial services and community facilities (or institutional). Suitable developable vacant land is in short supply within the boundaries of the City, as the surrounding land is owned by native corporations and water bodies. The airport is located approximately 3.5 miles southwest of town while the Yukon River borders its northern border, the Koyukuk and Yuki Rivers flow into the Yukon River to the west, and the Melozitna and Nowitna Rivers flow into the Yukon east of the City. (CH2MHILL 2001)

The City has no formal zoning or other land use controls. However, a few commercial land uses exists in the City. There are only two commercial enterprises within the City such as the Resident Owned Store and the Ruby Commercial Company.

Community and critical facilities are classified under institutional land uses such as schools and government facilities.

Development Trends

Development in the City will likely remain relatively flat as the population growth has remained stable since 1960. Approximately 65 percent of residents haul water from the washeteria and use outhouses. Individual wells and septic systems are also used. Three residents have built wells since the 2010 HMP. The school operates its own well.

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This section outlines the four-step process for preparing a mitigation strategy including: developing mitigation goals, identifying mitigation actions, evaluating mitigation actions, and implementing mitigation action plans. Within this section, the Planning Team developed the mitigation goals and potential mitigation actions for the City and updated goals and actions from the 2010 plan.

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.
2	Promote cross referencing 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.

After mitigation goals and actions were developed, the Planning Team assessed the potential mitigation actions to carry forward in 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 six broad categories: prevention, property protection, public education and awareness, natural resource protection, emergency services, and structural projects. In the 2010 HMP, the Planning Team developed 47 potential mitigation actions (Table 7-2), with a particular emphasis placed on projects and programs that reduce the effects of hazards on both new and existing buildings and infrastructure. These actions were selected for potential implementation during the five-year life cycle of this HMP. On June 27, the Planning Team annotated in red font to identify the completed, deleted, or deferred mitigation actions as a benchmark for progress. If activities were unchanged (i.e., deferred), a reason was provided for why no changes occurred.

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.

Table 7-2 Mitigation Goals and Potential Actions

(Bold "ID" items were selected to carry forward into the Mitigation Action Plan for implementation)

GOALS		ACTIONS	
No.	**Description**	**ID**	**Description**
1	Promote recognition and mitigation of all natural hazards that affect the City.	**A**	Hold an annual or biennial "hazard meeting" to provide information to residents about recognizing and mitigating all natural hazards that affect the City. Discussion will be added as an agenda item to regularly held City Council Meeting near HMP anniversary.
		B	Identify potential outside agencies to fund and implement identified mitigation projects such as Tanana Chiefs Conference, Alaska Native Tribal Health Consortium (ANTHC), Department of Community, Commerce, and Economic Development (DCCED), Department of Transportation/Public Facilities (DOT/PF), and Housing and Urban Development (HUD) etc.). In progress and ongoing. Funding opportunities seem to be getting more difficult to identify.
		C	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. Will look into reaching out to Tanana Chiefs Conference for formal role.
		D	Develop, produce, and distribute information materials concerning mitigation, preparedness, and safety procedures for all natural hazards. Still need when funding is available.
		E	Join the National Flood Insurance Program to reduce monetary losses to individuals and the community. No action has been taken. Needs to be done.
2	Promote cross-referencing mitigation goals and actions with other City planning mechanisms and projects.	**2A**	The City will strive to cross reference and 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. In progress and ongoing. See Section 8.2.
		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. There are no ordinances. Outreach programs are in progress and ongoing.
		C	Integrate the Mitigation Plan findings for enhanced emergency planning. The Tribe completed a SCERP in 2014.
		D	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. The City does not use exercise authority to institute ordinances. Community development processes are ongoing.

Table 7-2 Mitigation Goals and Potential Actions

(Bold "ID" items were selected to carry forward into the Mitigation Action Plan for implementation)

GOALS		ACTIONS	
No.	**Description**	**ID**	**Description**
		E	Identify and list repetitively flooded structures and infrastructures, analyze the threat to these facilities, and prioritize mitigation actions to protect the threatened population. There are none.
3	Reduce possibility of losses from all natural hazards that affect the City.	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. Still need when funding is available.
		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. There are no structures that need to be relocated.
		C	Harden utility headers located along river embankments to mitigate potential flood, debris, and erosion damages. Still need when funding is available.
		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.) Still need when funding is available.
		E	Develop vegetation projects to restore clear cut and riverine erosion damage and to increase landslide susceptible slope stability. Still need when funding is available.
		F	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. Still need when funding is available.
4	Reduce vulnerability of structures to earthquake damage.	**A**	Disseminate FEMA pamphlets to educate and encourage homeowners concerning seismic structural and non-structural retrofit benefits. Still need when funding is available.
		B	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. Still need when funding is available.
		C	Inspect, prioritize, and retrofit any critical facility or public infrastructure that does not meet current State Adopted Building Codes. Still need when funding is available.
		D	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. Still need when funding is available.
		E	Encourage utility companies to evaluate and harden vulnerable infrastructure elements for sustainability. Still need when funding is available.
5	Reduce possibility of damage and	**A**	Relocate buildings that are at risk of being affected by erosion. Completed.

Table 7-2 Mitigation Goals and Potential Actions

(Bold "ID" items were selected to carry forward into the Mitigation Action Plan for implementation)

GOALS		ACTIONS	
No.	**Description**	**ID**	**Description**
	losses from erosion.	**B**	Apply for grants/funds to implement riverbank protection methods. Still need when funding is available.
		C	Develop and provide information to all residents on riverbank erosion and methods to present it in an easily distributed format. Still need when funding is available.
6	Reduce the possibility of damage and losses from flooding.	A	Develop and maintain GIS mapped critical facility inventory for all structures located within 100-year and 500-year floodplains. Still need when funding is available.
		B	Develop and maintain GIS mapped inventory, and develop prioritized list of residential and commercial buildings within 100-year and 500-year floodplains. Still need when funding is available.
		C	Develop and maintain GIS mapped inventory of repetitive loss properties to include the types and numbers of properties. Still need when funding is available.
		D	Establish flood mitigation priorities for critical facilities and residential and commercial buildings located within the 100- year floodplain using survey elevation data. Still need when funding is available.
		E	Develop and maintain an inventory of locations subject to frequent storm water flooding based on most current USACOE flood data. Still need when funding is available.
		F	Determine and implement most cost beneficial and feasible mitigation actions for locations with repetitive flooding and significant damages or road closures. Still need when funding is available.
		G	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. Still need when funding is available.
		H	Develop, implement, and enforce floodplain management ordinances. Ruby does not have ordinances.
		I	Develop outreach program to educate residents concerning flood proofed well and sewer/septic installation. Still need when funding is available.
		J	Acquire (buy-out), relocate, elevate, or otherwise flood-proof identified critical facilities and private properties. See 3B.
		K	Create relief drainage ditch opening using a culvert, bridge, or multiple culverts; to relieve rapid water accumulation during high water flow events. Still need when funding is available.
7	Reduce possibility of damage and losses from permafrost.	**A**	Identify and map existing permafrost areas to assist in critical facility relocation siting. Local knowledge is heavily relied on. There is no local map.
		B	Promote permafrost sensitive construction practices in permafrost areas. Completed.

Table 7-2 Mitigation Goals and Potential Actions

(Bold "ID" items were selected to carry forward into the Mitigation Action Plan for implementation)

GOALS		ACTIONS	
No.	**Description**	**ID**	**Description**
8	Reduce vulnerability of structures to severe weather damage.	**A Ongoing**	Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms. Completed.
		B	Develop critical facility list needing emergency back-up power systems, prioritize, seek funding, and implement mitigation actions. Completed.
		C	Develop and implement tree clearing mitigation programs to keep trees from threatening lives, property, and public infrastructure from severe weather events. Completed.
		D	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. Does not have authority to do.
9	Reduce possibility of damage and losses from wildland fires.	**A**	Identify evacuation routes away from high hazard areas and develop outreach program to educate the public concerning warnings and evacuation procedures. Completed.
		B	Develop Community Wildland Fire Protection Plans for all at-risk communities. The Tribe operates the ambulance, water truck, satellite phone, and search and rescue radios.
		C	Promote FireWise building siting, design, and construction materials. State and Federal agencies such as U.S. Fish & Wildlife Service, BLM, and other agencies temporarily employ residents firefighting state and nationwide. These positions include firebreaks and forestry contracts locally.
		D	Provide wildland fire information in an easily distributed format for all residents. Completed.
		E	Develop outreach program to educate and encourage fire-safe construction practices for existing and new construction in high risk areas. Completed.
		F	Identify, develop, implement, and enforce mitigation actions such as fuel breaks and reduction zones for potential wildland fire hazard areas. Completed.

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?

Source: FEMA, July 2008.

The Planning Team evaluated each of the mitigation actions on June 27, 2017 to determine which actions would be included in the updated Mitigation Action Plan. The Mitigation Action Plan contained in Table 7-2 represents mitigation projects and programs to be implemented through the cooperation of multiple entities in the City. The Planning Team determined that these actions did not need to be reprioritized from 2010 due to the last seven years of historical record within the community.

The Planning Team reviewed the simplified Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) evaluation criteria (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 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 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 June 27, 2017, the hazard mitigation Planning Team reviewed each mitigation action from Table 7-1. The Planning Team considered each hazard's history, extent, and probability. 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. Table 7-4 provides a summary of the mitigation action priorities.

The Planning Team determined in 2017 that all items in Table 7-4 are ongoing and should be retained in the 2017 plan update.

7.4 IMPLEMENTING A MITIGATION ACTION PLAN

Table 7-4 shows the City's 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 Ruby Mitigation Action Plan Matrix

ACTION ID	DESCRIPTION	PRIORITIZATION	RESPONSIBLE DEPARTMENT	POTENTIAL FUNDING	TIMEFRAME	BENEFIT-COSTS / TECHNICAL FEASIBILITY
1A	Hold an annual or biennial "hazard meeting" to provide information to residents about recognizing and mitigating all natural hazards that affect the City. wildland fires.	Medium	City of Ruby, Ruby Tribal Council President (In order to obtain ANA funding, the Tribe would need to be the applicant)	City of Ruby, Ruby Tribal Council, FEMA HMA, HMGP, 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, Administration for Native Americans (ANA) Grant Programs, Emergency Food and Shelter Program (EFSP)	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.
1B, 5B	Identify potential outside agencies to fund and implement identified mitigation projects such as Alaska Native Tribal Health Consortium [ANTHC), Department of Community, Commerce, and Economic Development (DCCED), Department of Transportation/Public Facilities (DOT/PF), and Housing and Urban Development (HUD) etc.).	High	City of Ruby Mayor, Ruby Tribal Council Grants Manager	City of Ruby, Ruby Tribal Council, Denali Commission, DCCED/Community Development Block Grant (CDBG)	1-3 years	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.
1C	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.	Medium	City of Ruby Mayor, Ruby Tribal Council President	City of Ruby, Ruby Tribal 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

Table 7-4 City of Ruby Mitigation Action Plan Matrix

ACTION ID	DESCRIPTION	PRIORITIZATION	RESPONSIBLE DEPARTMENT	POTENTIAL FUNDING	TIMEFRAME	BENEFIT-COSTS / TECHNICAL FEASIBILITY
						availability and willingness to serve their community.
2A	The City will strive to cross reference and 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 Ruby Clerk, Ruby Tribal Council Grants Manager	City of Ruby, Ruby Tribal 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.
3B, 6J	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 "new structures" in identified hazard areas.	High	City of Ruby Mayor, Ruby Tribal Council President	City of Ruby, Ruby Tribal Council, FEMA HMA, HMGP, 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.
4A	Disseminate FEMA pamphlets to educate and encourage homeowners concerning seismic structural and non-structural retrofit benefits.	Low	City of Ruby Clerk, Ruby Tribal Council Administrative Assistant	City of Ruby, Ruby Tribal Council, FEMA HMA, HMGP	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

Table 7-4 City of Ruby Mitigation Action Plan Matrix

Action ID	Description	Prioritization	Responsible Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
						increments. This activity is ongoing demonstrating its feasibility.
5A	Relocate buildings that are at risk of being affected by erosion.	Medium	City of Ruby Mayor, Ruby Tribal Council President	City of Ruby, Ruby Tribal Council, Lindbergh Grants Program, HMA, HMGP, AFG, FP&S, SAFER, ANA,, Emergency Food and Shelter Program	3-5 years	B/C: Relocation costs are minor compared to building replacement due to the community's rural location where materials shipping is exceedingly expensive. TF: The project is technically feasible as the community has staff and resources they have used to relocate and elevate buildings.
6F	Determine and implement most cost beneficial and feasible mitigation actions for locations with repetitive flooding and significant damages or road closures.	High	City of Ruby Mayor, Ruby Tribal Council President	City of Ruby, Ruby Tribal Council	1-3 years	B/C: Flood hazard mitigation is among FEMA's highest national priorities. FEMA desires communities 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 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.	Medium	City of Ruby Mayor, Ruby Tribal Council President asking Tanana Chiefs Conference for assistance	City of Ruby, Ruby Tribal Council, FEMA HMA, Denali Commission	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

Table 7-4 City of Ruby Mitigation Action Plan Matrix

Action ID	Description	Prioritization	Responsible Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
						hazard specific information can be presented in small increments. This activity is ongoing demonstrating its feasibility.
6K	Create relief drainage ditch opening using a culvert, bridge, or multiple culverts; to relieve rapid water accumulation during high water flow events.	High	City of Ruby Mayor, Ruby Tribal Council President	City of Ruby, Ruby Tribal Council, HMA, ANA	2-4 years	B/C: This retrofit project can be a very cost effective method for bush communities as materials and shipping costs are very high. TF: This project is technically feasible as the community need only demonstrate cost savings by demonstrating losses from history utility impacts and down time.
7A	Identify and map existing permafrost areas to assist in siting locations for "new" critical facilities and residential properties.	Low	City of Ruby Mayor, Ruby Tribal Council President	City of Ruby, Ruby Tribal Council, DCCED/CDBG, Denali Commission	1-5 years	B/C: Pre-identification ensures that structures are not placed inappropriately and are built or relocated with the hazard as a focus. TF: This is feasible using existing resources as the community has awareness of permafrost areas due to prior project reports and studies.
8A	Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms.	Low	City of Ruby Mayor, Ruby Tribal Council President	City of Ruby, Ruby Tribal Council, DCCED/CDBG, Denali Commission	Ongoing	B/C: Scheduling maintenance and implementing mitigation activities will potentially reduce severe winter storm damages caused by heavy snow loads and icy rain. TF: This type activity is technically feasible within the community typically using

Table 7-4 City of Ruby Mitigation Action Plan Matrix

Action ID	Description	Prioritization	Responsible Department	Potential Funding	Timeframe	Benefit-Costs / Technical Feasibility
						existing labor, equipment, and materials. Specialized methods are not new to rural communities as they are used to importing required contractors.
8D	Develop and implement tree clearing mitigation programs to keep trees from threatening lives, property, and public infrastructure from severe weather events.	Medium	City of Ruby Mayor, Ruby Tribal Council President	City of Ruby, Ruby Tribal Council, HMA, AFG, FP&S, SAFER, ANA	1-4 years	B/C: Sustained maintenance programs have minimal cost and will help reduce or eliminate future tree related damages. TF: This project is technically feasible through available community member skill sets.
9A	Identify evacuation routes away from high hazard areas and develop outreach program to educate the public concerning warnings and evacuation procedures.	Medium	City of Ruby Mayor, Ruby Tribal Council President	DOF: VFAG, RAGP	1-2 years	B/C: This project will ensure the community looks closely at their wildland fire hazard to ensure they can safely evacuate their residents and visitors to safety during a fire event. TF: This is technically feasible using existing city and tribal resources.

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:

- Monitoring, evaluating, and updating the HMP
- Implementation through existing planning mechanisms
- 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. HMP monitoring or evaluating has not been completed since the 2010 plan was developed.

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 update was prepared as a collaborative effort among the Planning Team Members. 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 Mayor (or designee), will serve as the primary point of contact and will coordinate local efforts to monitor, evaluate, and revise the HMP.

The Planning Team will conduct an annual review during the anniversary week of the plan's official FEMA approval date to monitor the progress in implementing the HMP, particularly the Mitigation Action Plan. 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

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?

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 staff 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.
- The City Clerk will be responsible for providing a list of all City of Ruby documents to contractors focused on developing new or updating existing City Plans and ensuring that this HMP is incorporated into plans as applicable. Additionally, contractors performing mitigation action implementation will complete the Mitigation Action Implementation Worksheet contained in Appendix E and submit the completed worksheet to Clerk prior to start of work. The Clerk will retain the Worksheet in a folder for the five-year update of the HMP.

8.3 CITY OF RUBY CAPABILITY ASSESSMENT

The City 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 Ruby Regulatory Tools

REGULATORY TOOLS (ORDINANCES, CODES, PLANS)	EXISTING?	COMMENTS (YEAR OF MOST RECENT UPDATE; PROBLEMS ADMINISTERING IT, ETC)
Building code	No	The City can exercise this authority.
Zoning ordinances	No	The City can exercise this authority.
Subdivision ordinances or regulations	No	The City can exercise this authority.

Special purpose ordinances	No	Fire break resolution, enable community to receive funding for building a fire break. (Bureau of Indian Affairs [BIA], City, and Tribal land)
Comprehensive Plan	No	
Economic Development Plan	Yes	Completed in 2003 for the years 2004-2009.
Emergency Response Plan	Yes	Completed in 2014.
Land Use Ordinance	No	
Sanitation Facilities Master Plan	Yes	Describes water, sewage, and solid waste options; recommends the most appropriate alternatives; and presents a funding plan for comprehensive sanitation system design and construction.
Land Use Plan	No	
Community Plan	Yes	Completed in 2015
Forest Inventory Report, 1982	Yes	Used to qualify for fire break construction project

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 (DHHS/ACF), 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.
- USACE. The USACE's 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.
- 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.

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 Veteran's 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.
- DCCED/DCRA. 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.
- Department of Environmental Conservation (DEC). DEC's 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). 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 buyout 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/P 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/P budgets for the temporary replacement bridges and materials necessary to make the multi-model transportation system operational following a natural disaster.

- Alaska Department of Natural Resources (DNR). 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.
    - 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.
    - Division of Forestry (DOF). 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 Ruby Staff Resources

Staff / Personnel Resources	Y / N	Department / Agency and Position
Planner or engineer with knowledge of land development and land management practices	No	Provided by: Denali Commission/ANTHC/TCC
Engineer or professional trained in construction practices related to buildings and/or infrastructure	No	Provided by: Denali Commission/ANTHC/TCC
Planner or engineer with an understanding of natural and/or human-caused hazards	No	Provided by: Denali Commission/ANTHC/TCC
Floodplain Manager	No	Jimmy C. Smith, State Floodplain Manager
Personnel skilled in GIS	No	Provided by: Denali Commission/ANTHC/TCC
Staff with education or expertise to assess the jurisdiction's vulnerability to hazards	No	
Personnel skilled in GIS and/or HAZUS	No	
Scientists familiar with the hazards of the jurisdiction	No	US Fish and Wildlife Service (USFWS) local office; AK Dept. of Fish & Game (ADF&G) local office
Emergency manager	No	
Grant writers	Yes	Jennie Peter, City Clerk
Public Information Officer	Yes	Mayor, Elizabeth Captain

Table 8-3 City of Ruby Financial Resources

Financial Resources	Accessible or Eligible to Use (Yes / No / DK-Don't Know)
Community Development Block Grants	Yes
Capital Improvement Projects Funding	Yes, insufficient funds to enable extensive mitigation action implementation.
Authority to levy taxes for specific purposes	Yes, with City Council approval
Fees for water, septic pumping, gas, or electric service	Yes
Impact fees for homebuyers or developers for new developments/homes	No
Withhold spending in hazard-prone areas	No

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. This HMP will also be stored on the State Department of Commerce, Community, and Economic Development Community and Regional Affairs, (DCCED/DCRA) plans website for public reference, http://commerce.alaska.gov/web/dcra/PlanningLandManagement/CommunityPlansAndInfrastructure.aspx after plan approval and adoption.

The Planning Team will continue to raise community awareness about the HMP and the hazards that affect Ruby. Each year in July, the City/Tribe holds an annual 4th or July event that is an all day event that includes information booths that the community visits regarding various programs. The City will sponsor a booth as their main community outreach activity regarding the HMP. Community surveys will be provided at the booth to remind the community about the potential hazards that could affect Ruby as well as to provide an opportunity for the community to comment on their concerns. See Appendix E for a sample public opinion survey. This survey will be tailored to Ruby prior to the 2018 4th of July event. 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
Public Involvement

Multi-Jurisdictional Hazard Mitigation Plan for Ruby, Alaska

Newsletter #1: May 24, 2017

Aerial photograph of the City of Ruby (DCRA, 2009)

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 FEMA to update a hazard mitigation plan (HMP) for the City of Ruby. LeMay Engineering & Consulting, Inc. was contracted to assist the City with updating the HMP.

Join the planning team and offer your advice: Any interested community member may join the planning team. To join, call or send Jennifer LeMay an email at jlemay@lemayengineering.com. The purpose of this newsletter is to introduce this project and encourage public involvement during this process. The goal is to receive comments, identify key issues or concerns, and improve mitigation ideas.

Attend the June 27, 2017, Community Council Meeting at 7:00 pm: One of the agenda items will be a summary of the HMP process by Jennifer LeMay. You're invited to provide input to the plan. Specifically, we'll be discussing what information has changed since the HMP was developed in 2010.

For more information, contact:
Jennie Hopson, City Clerk, (907) 468-4401
Jennifer LeMay, PE, PMP, Lead Planner, (907) 350-6061
George Grady, DMVA, DHS&EM Project Manager, (907)428-7055

Multi-Jurisdictional Hazard Mitigation Plan for Ruby, Alaska

Newsletter #2: June 14, 2017

Aerial photograph of the City of Ruby (DCRA, 2009)

The goal of Newsletter #2 is to announce the availability of the working draft copy of the update to the 2010 hazard mitigation plan and to invite you to the June meeting to provide comments, identify key issues or concerns, and improve mitigation ideas. Jennifer LeMay has prepared a working draft copy of the plan based on updating the 2010 plan with information from the 2013 All State Hazard Plan for Alaska, the State of Alaska Community Database for Ruby, and the 2015 Ruby Community Plan. The draft working copy is available for your review at City Hall. Comments or questions can be emailed to Jennifer LeMay or provided at the meeting.

Attend the June 27, 2017, Community Council Meeting at 7:00 pm and Provide Input to the Plan: One of the agenda items will be a summary of the HMP update process by Jennifer LeMay. Specifically, we'll be discussing what information has changed since the HMP was developed in 2010 and whether potential hazards for Ruby are the same or need to be modified.

For more information, contact:
Jennie Hopson, City Clerk, (907) 468-4401
Jennifer LeMay, PE, PMP, Lead Planner, (907) 350-6061
George Grady, DMVA, DHS&EM Project Manager, (907)428-7055

Ruby Multi-Hazard Mitigation Plan Meeting

June 27, 2017

7:00 pm

Name	Organization	Contact Information (phone or email)
JENNIFER LEMAY	LEMAY ENGINEERING + CONSULTING, INC.	350-9038
Malcolm Nickoli	City of Ruby	468-1011
Vernon Albert	Power Plant	468-1041
Elaine Wright	TCC B+A	468-1087
Martha ann Wright	City of Ruby,	468-4476-1017
Pat McCarty	"	468-1016
~~Elizabeth~~ Captain	City of Ruby	468-1025
~~Dale V. Honea~~	"	468-1090
Ed Sarter	City of Ruby	468-4499

Ruby City Council
Regular Meeting
June 27, 2017
7:00 P.M.

1. Call to Order
2. Roll Call
3. Approval of Agenda
4. Approval of Meeting Minutes
   a. June 8, 2017
   b. May 25, 2017
5. Public Comment
   a. Multi-Jurisdiction Hazard Mitigation Plan for Ruby
6. Employee Reports
   a. Power Plant Operator/Maintenance
   b. Water Plant Operator/Septic Pumping
   c. City Clerk
7. New Business
   a. FY-18 Budget Ord. 02-17 Public Hearing
   b. Morgan Stanley Report-FYI
   c. Ruby Electric Monthly Drawing
   d. Donation Request from Ruby Royals Little League
   e. Donation Request from 4th of July Events Committee
   f.
   g.
8. Next Meeting July 27
9. Adjournment

Ruby City Council
June 27, 2017
Regular Meeting
Minutes

1. **Call to Order:**
The June 27, 2017 Regular Meeting was call to order by Mayor Elizabeth Captain at 7:04 P.M.

2. **Roll Call:**
Present were Mayor Elizabeth Captain, Vice-Mayor Ed Sarten, Council Members Dale Honea, Martha Wright, Pat McCarty,
Elaine Wright and Katherine Dozette was Absent Excused. Quorum Established.
Guest is Jennifer Lemay with Multi- Jurisdiction Hazard Mitigation Plan for Ruby. and Employees Vernon Albert and
Malcolm Nickoli.

3. **Approval of Agenda:**
Ed motion to approve the Agenda second by Elaine. All ayes none opposed. Motion Carries.

4. **Approval of Meeting Minutes:**
Ed motion to approve the June 8, 2017 Special Meeting Minutes and May 25, 2017 Regular Meeting Minutes as a block
second by Elizabeth. All ayes none opposed. Motion Carries.

5**. Public Comment:**
a. **Multi-Jurisdiction Hazard Mitigation Plane for Ruby:**
Jennifer Lemay introduced herself and explained to the council about the plan and she will give a copy to Jennie once
it is ready for approval.

6. **Employee Reports:**
a. **Power Plant Operator/Maintenance:**
Vernon said he's been cutting brush around the power lines, ran a new lines for a customer. ordered 5 batteries,
safety building moved and door is not working and fixed it. Did a tour with TCC. Switched generators to run even.
Everything is going good.

b. **Water Plant Operator:**
Written Report Given. Malcolm said the coin counter needs a new part. waiting for John Sims with ANTHC
to get it ordered.

c. **City Clerk:**
Jennie said all the reports are turned in. I emailed Dave Messier with TCC and the Racee grant about the Streetlights.

Pat would like Jennie to contact Don Eller or Alaska Cooperative about KWH adjustments for Ruby Electric.

Get Vernon Albert to dig an outhouse hole at the Airport. Need to get Wash Rock for the Washeteria Watering Point.

7. **New Business:**

a. **FY-18 Budget Ord. 02-17 Public Hearing:**

Elizabeth motion to purchase a Utility Truck for Ruby Electric and Maintenance for $20,000.00 and $20,000.00 for a

Path Finder for Admin and increase Washeteria from $2500.00 to $5000.00 for future expenditures and Approve

the 2018 Budget second by Ed. All ayes none opposed. Motion Carries.

Pat said to move monies over $200,000.00 in Ruby Electric accounts to savings and keep it under $200,000.00 in the

bank accounts for City and Ruby Electric.

b**. Morgan Stanley Report:**

FYI.

c. **Ruby Electric Monthly Drawing:**

May 2017 Winner is Jonathan Nickoli.

d. **Donation Request from Ruby Royals Little League:**

A Banner was ordered for the Little League team as a donation.

e. **Donation Request from Ruby Sports Association:**

Pat motion to donate $400.00 from the City of Ruby and $400.00 from Ruby Electric second by Elizabeth.

All ayes none opposed. Motion Carries.

f. **Donation Request from the Ruby Gems:**

Elizabeth motion to purchase Trophies for the Men's and Women's Softball Teams for the upcoming Tourney

second by Pat All ayes none opposed. Motion Carries.

8. **Next Meeting Date:**

July 27, 2017.

9. **Adjournment:**

Elizabeth motion to adjourn at 8:27 P.M. second by Ed. All ayes none opposed. Motion Carries.

June 30, 2017

Notes from Jennifer LeMay, PE, PMP

Official City of Ruby meeting minutes documenting the June 27, 2017, meeting will be forthcoming from the City Clerk after the current wave of salmon subsides (mid-July).

I met with Mayor Elizabeth Captain and City Clerk Jennie Peter for a few hours on the afternoon of June 27 at City Hall. We paged through the working copy of the HMP and reviewed the draft for accuracy—ensuring that the 2017 update met the City's needs. We specifically targeted plan development information, hazard impacts, community vulnerability analysis, and mitigation strategies.

The City Council had their regularly scheduled meeting at 7 pm at City Hall. I was an agenda item and provided an overview of the HMP update and verified that hazards in the 2017 working copy were represented accurately, and that there were no new hazards to be included. The only public comment received was by First Chief Patrick McCarty. He asked why the 2017 update was being done now and not in 2015 in accordance with FEMA regulations. I replied that funding was available now to update the plan.

Appendix B

Map

AREA USE MAP
RUBY

64° 44' 25" N 155° 28' 30" W (NAD 83)
Approximate Elevation: 500'
Townships 8 & 9 South, Ranges 17 East, K.R.M., AK
U.S.G.S. Quadrangle "RUBY C-5 & C-6", Alaska
NULATO RECORDING DISTRICT

SEE SHEETS 1 – 3 FOR DETAILED COMMUNITY MAP

0 500 1000 1500
SCALE IN FEET

SCALE: 1"=500'
Date of Photography: July 10, 2009
Magnetic Declination computed by U.S.G.S. Geomag Program using WMM-2005.COF model as of August 1, 2009

Legend & Notes

Future Fireline Road
ANCSA 17(b) Easements

MAP NOTES

This map was prepared by the Alaska Department of Commerce, Community, and Economic Development, Division of Community and Regional Affairs (Commerce) using funding from Federal Emergency Management Agency and US Department of the Interior Bureau of Indian Affairs. Commerce contracted with Global Positioning Services, Inc. in June of 2009 to prepare the map.

YUKON RIVER

Sec. 6
Pat. No. 50-2005-0047
Dineega Corp.

Magnetic North 19° E

True North

US SURVEY No. 8962
NA Cert. 50-93-0055

Sec. 5
Pat. No. 50-2005-0047
Dineega Corp.

US SURVEY No. 8630
NA Cert. 50-88-0173

Sec. 7
Pat. No. 50-2005-0047
Dineega Corp.

Trustee Deed to City of Ruby
Bk. 3, Pg. 784
10/12/76

NATIVE CEMETERY

USS 5088 Tract G

USS 5088 Tract H
Statutory QCD to City of Ruby
2006-000013-0
1/31/06

USS 5088 Tract F
Trustee Deed to City of Ruby
Bk. 14, Pgs. 97-98
9/28/87

USS 5088 Tract B

USS 5088 Tract E

RUBY TOWNSITE ADDITIONS
Plat No. 86-05

SUBDIVISION OF TRACT D
Plat No. 89-01

FISHER SUBDIVISION
Plat No. 89-01/2004-03

Sec. 4
Pat. No. 50-2005-0047
Dineega Corp.

Sec. 5
Pat. No. 50-2005-0047
Dineega Corp.

STAGING AREA

PITKA TRAIL

LENA CLEAVER SUBDIVISION
Plat No. 85-02

14(c) TR. C

RUBY ANCSA 14(c) TRACT B
Plat No. 98-01

JOHN HONEA SUBDIVISION
Plat No. 2005-04

AIRPORT HEIGHTS SUBDIVISION
Plat No. 97-03/2004-03

Omnibus Act
QCD to State of Alaska
6/30/1959
(ROW 100')

Sec. 4
Pat. No. 50-2005-0047
Dineega Corp.

Sec. 32
Pat. No. 50-2005-0047
Dineega Corp.

US SURVEY No. 5031
NA Cert. 50-73-0113

Sec. 33
Pat. No. 50-2005-0047
Dineega Corp.

T. 8 S. R. 17 E.
T. 9 S. R. 17 E.

RUBY CITY BOUNDARY

DOT&PF MAINTENANCE SITE
Modified Quit Claim Deed to SOA DOT&PF
Bk. 10, Pgs. 722-727
1/18/84

APPROXIMATE LOCATION
25' Wide Existing Access Trail
EIN 11d, E

Corporation Warranty Deed to SOA DOT&PF
Bk. 18, Pgs. 457-466
10/14/93

Tr. II Par. C

TRACT II PARCEL B
Corporation Warranty Deed to SOA DOT&PF
Bk. 18, Pgs. 457-466
10/14/93

Sec. 3
Pat. No. 50-2005-0047
Dineega Corp.

RUBY AIRPORT
Tr. II, Par. A
Plat No. 94-02RS

Special Warranty Deed to SOA DOT&PF
Bk. 17, Pgs. 509-516
5/1/92

RUBY ANCSA 14(c) TRACT A
Plat No. 98-01
Statutory Quit Claim Deed to City of Ruby
2006-000013-0
1/31/06

Sub. by Metes & Bounds
2006-000128-0
8/29/06

Sec. 8
Pat. No. 50-2005-0047
Dineega Corp.

RUBY - FOORMAN ROAD

FAS Route No. 271
Omnibus Act
QCD to State of Alaska
6/30/1959
(ROW 200')

Corporation Warranty Deed to SOA DOT&PF
Bk. 18, Pgs. 123-128
5/1/93

Special Warranty Deed to SOA DOT&PF
Bk. 17, Pgs. 509-516
5/1/92

TRACT III PARCEL A

RUBY AIRPORT
TRACT I
PARCEL A
Plat No. 94-02RS

Special Warranty Deed to SOA DOT&PF
Bk. 17, Pgs. 509-516
5/1/92

TRACT III PARCEL B

TRACT I PARCEL B

RUBY AIRPORT ROAD 50'

Corporation Warranty Deed to SOA DOT&PF
Bk. 18, Pgs. 457-466
10/14/93

RUBY LANDFILL ROAD
Corp. Warr. Deed to City of Ruby
Bk. 22, Pgs. 1-11
1/28/1998

APPROXIMATE LOCATION
60' Wide Existing Road
EIN 11c, C5, L

FAS Route No. 271
Omnibus Act
QCD to State of Alaska
6/30/1959
(ROW 200')

Sec. 17
Pat. No. 50-2005-0047
Dineega Corp.

Sec. 16
Pat. No. 50-2005-0047
Dineega Corp.

Sec. 9
Pat. No. 50-2005-0047
Dineega Corp.

BIG CREEK

Sec. 10
Pat. No. 50-2005-0047
Dineega Corp.

Sec. 11
Pat. No. 50-2005-0047
Dineega Corp.

Sec. 2
Pat. No. 50-2005-0047
Dineega Corp.

RUBY AREA USE MAP SHEET 1 1"=500' (2009 PHOTOGRAPHY)

Appendix C
FEMA Review Tool

APPENDIX A:
LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: Ruby, Alaska (Region 10)	**Title of Plan:** City of Ruby Local Hazard Mitigation Plan Update	**Date of Plan:** June 30, 2017
Local Point of Contact: Jennie Peter	**Address:** P.O. Box 90 Ruby, AK 99768	
Title: City Clerk		
Agency: City of Ruby		
Phone Number: (907) 468-4401	**E-Mail:** jenniehopson@gmail.com	

State Reviewer: George Grady	**Title:** Hazard Mitigation Planner	**Date:** August 1, 2017

FEMA Reviewer: Amanda Siok Amanda.Siok@fema.dhs.gov	**Title:** Mitigation Planner	**Date:** 09/19/2017
Date Received in FEMA Region 10	August 7, 2017; 11/20/2017	
Plan Not Approved		
Plan Approvable Pending Adoption	01/05/2018	
Plan Approved	March 29, 2018	

SECTION 1: REGULATION CHECKLIST

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Chapter 4, pages 4-1 thru 4-4, Appendix A PDF 20	X	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Chapter 4 PDF 20-22	X	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Chapter 4, pages 4-1 thru 4-4, Appendix A PDF 21-22, PDF 91	X	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Chapter 4, page 4-4 PDF 23	X	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Chapter 8, Appendix E PDF 89, PDF 121	X	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Chapter 8, Appendix E PDF 78-80	X	
ELEMENT A: REQUIRED REVISIONS			

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Chapter 5, Section 5.3 and its subsections PDF 27-33, 34-38	X	
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Chapter 5, Pages 5-6 to 5-8, 5-9 to 5-11, 5-12 to 5-15,	X	

B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Chapter 5, Page 5-7, 5-11, 5-14, 5-17, 5-21, 5-26, 5-28, 6-8 to 6-10	X	
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	PDF 55	X	
ELEMENT B: REQUIRED REVISIONS			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Tables 8-1, 8-2, and 8-3 on pages 8-3/4, and 8-9 as well as Chapter 2 on page 2-1	X	
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	N/A--Ruby does not participate in the NFIP	N/A	
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Chapter 7, Tables 7-1 and 7-2 PDF 64	X	
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Chapter 7, Tables 7-2 and 7-4 PDF 65-76	X	
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Chapter 7, Tables 7-2 and 7-4 PDF 74	X	
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Pages 8-2 and 8-3, Appendix E	X	
ELEMENT C: REQUIRED REVISIONS			

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Yes, see Section 6.3 on page 6-10	X	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Yes, see page 4-2, item #4. Table 7-2 on PDF 68-71	X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	PDF 69-76	X	
ELEMENT D: REQUIRED REVISIONS			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))		X	
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	Not applicable - City Plan only		
ELEMENT E: REQUIRED REVISIONS			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1.			
F2.			
ELEMENT F: REQUIRED REVISIONS			

SECTION 2:
PLAN ASSESSMENT

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

Plan Strengths:

- The Planning Team includes City, Tribal, and State staff.
- Public notice was given from two newsletters posted in three different public locations.
- Public comment was documented in Appendix E.

Opportunities for Improvement:

- Review and incorporation of existing plans and other relevant information can be improved and expanded upon. Consider providing high-level information of what was used and how it informed the plan.

Element B: Hazard Identification and Risk Assessment

Plan Strengths:

- Table 5-1 does an excellent job demonstrating the planning team's process to identify and screen hazards for the updated plan.
- Table 5-2 clearly explains the criteria used to assess the probability of each hazard.
- Each hazard is clearly assessed by impact to the community and ranked by probability and likelihood for damage.
- The plan includes an analysis of climate change.
- The plan used a strong methodology for determining vulnerability to critical facilities.

Opportunities for Improvement:

- Climate change could be assessed as catalyst to existing hazards rather than as a standalone hazard. Consider how warmer temperatures could increase wildfires, increased precipitation events could increase flood, erosion, and severe weather events, etc.
- Consider using GIS to map the exposure assessments conducted in Table 6-3

Element C: Mitigation Strategy

Plan Strengths:

- The plan identifies mitigation goals for each hazard.
- The plan clearly identifies the mitigation actions moving forward from the previous plan via bolded text.

Opportunities for Improvement:

- The plan could identify more stakeholders as being responsible for implementing actions.
- The plan could improve methodology for plan integration by developing strategies based on community regulation and planning capabilities. Ruby has limited land use regulations and several of the mitigation actions reference restricting land use; prioritizing actions based on feasibility could improve plan integration.
- Mitigation actions should be informed by problem statements develop by the exposure assessment on identified critical facilities.

Element D: Plan Update, Evaluation, and Implementation (*Plan Updates Only*)

Plan Strengths:

- The Plan will be reviewed annually.
- The Plan includes an appendix of plan review materials to support the annual meeting.

Opportunities for Improvement:

- The plan could expand upon how the public and stakeholders will be engaged during the five year planning cycle.
- The Plan could include more analysis on the strengths and weaknesses of the planning process from the last five years and how it will be improved/strengthened over the next planning cycle.

A. Resources for Implementing Your Approved Plan

The **Region 10 Integrating Natural Hazard Mitigation into Comprehensive Planning** is a resource specific to Region 10 states and provides examples of how communities are integrating natural hazard mitigation strategies into comprehensive planning. You can find it in the FEMA Library at http://www.fema.gov/media-library/assets/documents/89725.

The **Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials** resource provides practical guidance on how to incorporate risk reduction strategies into existing local plans, policies, codes, and programs that guide community development or redevelopment patterns. It includes recommended steps and tools to assist with local integration efforts, along with ideas for overcoming possible impediments, and presents a series of case studies to demonstrate successful integration in practice. You can find it in the FEMA Library at http://www.fema.gov/library/viewRecord.do?id=7130.

The **Mitigation Ideas: A Resource for Reducing Risk from Natural Hazards** resource presents ideas for how to mitigate the impacts of different natural hazards, from drought and sea level rise, to severe winter weather and wildfire. The document also includes ideas for actions that communities can take to reduce risk to multiple hazards, such as incorporating a hazard risk assessment into the local development review process. You can find it in the FEMA Library at http://www.fema.gov/library/viewRecord.do?id=6938.

The **Local Mitigation Planning Handbook** provides guidance to local governments on developing or updating hazard mitigation plans to meet and go above the requirements. You can find it in the FEMA Library at http://www.fema.gov/library/viewRecord.do?id=7209.

The **Integration Hazard Mitigation and Climate Adaptation Planning: Case Studies and Lessons Learned** resource is a 2014 ICLEI publication for San Diego with a clear methodology that could assist in next steps for integration impacts of climate change throughout mitigation actions. http://icleiusa.org/wp-content/uploads/2015/08/Integrating-Hazard-Mitigation-and-Climate-Adaptation-Planning.pdf

The **Local Mitigation Plan Review Guide and Tool** resource is available through FEMA's Library and should be referred to for the next plan update. http://www.fema.gov/library/viewRecord.do?id=4859

Volcanic Eruption Mitigation Measures: For information on Mitigation Actions for Volcanic Eruptions that would satisfy the C4 requirement, please visit: http://earthzine.org/2011/03/21/volcanic-crisis-management-and-mitigation-strategies-a-multi-risk-framework-case-study/ and http://www.gvess.org/publ.html.

The FEMA Region 10 **Risk Mapping, Analysis, and Planning program (Risk MAP)** releases a monthly newsletter that includes information about upcoming events and training opportunities, as well as hazard and risk related news from around the Region. Past newsletters can be viewed at http://www.starr-team.com/starr/RegionalWorkspaces/RegionX/Pages/default.aspx. If you would like to receive future newsletters, email rxnewsletter@starr-team.com and ask to be included.

The mitigation strategy may include eligible projects to be funded through FEMA's hazard mitigation grant programs (Pre-Disaster Mitigation, Hazard Mitigation Grant Program, Flood Mitigation Assistance). Contact your State Hazard Mitigation Officer, Brent Nichols at Brent.Nichols@alaska.gov, for more information.

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).

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:

Mitigation Action Implementation Worksheet

Complete a mitigation action implementation worksheet for each identified mitigation action.

Jurisdiction:	
Mitigation Action/Project Title:	
Background/Issue:	
Ideas for Integration:	
Responsible Agency:	
Partners:	
Potential Funding:	
Cost Estimate:	
Benefits: (Losses Avoided)	
Timeline:	
Priority:	
Worksheet Completed by:	(Name/Department)

Sample Mitigation Public Opinion Survey

Mid-Columbia Region Natural Hazard Mitigation Public Opinion Survey

Your household has been randomly selected to participate in this survey about public perceptions and opinions regarding natural hazards in your county. In addition, we would like information regarding the methods and techniques you prefer for reducing the risks and losses associated with these hazards. The questionnaire should be completed by an adult, preferably the head of household. The information you provide will be used to help improve public/private coordination, mitigation, and risk reduction efforts in your county. The survey should take less than 30 minutes to complete.

This is a public opinion survey, the results of which will inform local natural hazard mitigation planning in Oregon. Your returned, completed survey indicates your willingness to take part in the study. Participation in this study is voluntary. The survey is not intended to contribute to "generalizable knowledge" and none of the information you provide will be attributed to you directly. If you have questions regarding your rights as a research participant, please contact the Office for Protection of Human Subjects, 1600 Millrace Drive, Suite 105, University of Oregon, Eugene, OR 97403-5219, or call (541) 346-2510.

NATURAL HAZARD INFORMATION

First we would like to know about your experiences involving natural hazards and your exposure to preparedness information.

1. During the past five years in the county you currently reside in, have you or someone in your household directly experienced a natural disaster such as an earthquake, severe windstorm, flood, wildfire, or other type of natural disaster?
   - ☐ Yes
   - ☐ No (***IF NO Skip to Question 2***)

   If "YES", which of these natural disasters have you or someone in your household experienced in the past five years?
   (***Please check all that apply***)
   - ☐ Drought
   - ☐ Dust Storm
   - ☐ Earthquake
   - ☐ Flood
   - ☐ Landslide / Debris Flow
   - ☐ Wildfire
   - ☐ Windstorm
   - ☐ Volcanic Eruption
   - ☐ Severe Winter Storm
   - ☐ Other (specify): _____

2. How concerned are you about the following natural disasters affecting your county?
   (***Check the corresponding box for each hazard)***

Natural Disaster	Very Concerned	Somewhat Concerned	Neutral	Not Very Concerned	Not Concerned
Drought	☐	☐	☐	☐	☐
Dust Storm	☐	☐	☐	☐	☐
Earthquake	☐	☐	☐	☐	☐
Flood	☐	☐	☐	☐	☐
Landslide / Debris Flow	☐	☐	☐	☐	☐
Wildfire	☐	☐	☐	☐	☐
Volcanic Eruption	☐	☐	☐	☐	☐
Wind Storm	☐	☐	☐	☐	☐
Severe Winter Storm	☐	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐	☐

3. Have you ever received information about how to make members of your household and your home safer from natural disasters?
   - ☐ Yes
   - ☐ No (***IF NO Skip to Question 5***)

   If "YES", how recently?
   - ☐ Within the last 6 months
   - ☐ Between 6 and 12 months
   - ☐ Between 1 and 2 years
   - ☐ Between 2 and 5 years
   - ☐ 5 years or more

4. From whom did you **last** receive information about how to make members of your household and your home safer from natural disasters?
   (***Please check only one***)
   - ☐ News media
   - ☐ Government agency
   - ☐ Insurance agent or company
   - ☐ Utility company
   - ☐ University or research institution
   - ☐ Neighbor / friend / family member
   - ☐ Elected official
   - ☐ American Red Cross
   - ☐ Other non-profit organization
   - ☐ Social media (e.g. Facebook)
   - ☐ Not sure
   - ☐ Other:_____

5. Whom would you most trust to provide you with information about how to make your household and home safer from natural disasters?
   (*Please check up to three*)
   - ☐ News media
   - ☐ Government agency
   - ☐ Insurance agent or company
   - ☐ Utility company
   - ☐ University or research institution
   - ☐ Neighbor / friend / family member
   - ☐ Elected official
   - ☐ American Red Cross
   - ☐ Other non-profit organization
   - ☐ Social media (e.g. Facebook)
   - ☐ Not sure
   - ☐ Other:_____

6. What is the most effective way for you to receive information about how to make your household and home safer from natural disasters?
   (*Please check up to three*)

   Newspapers:
   - ☐ Newspaper stories
   - ☐ Newspaper ads

   Television:
   - ☐ Television news
   - ☐ Television ads

   Radio:
   - ☐ Radio news
   - ☐ Radio ads

   Internet:
   - ☐ Email newsletters
   - ☐ Online news outlets
   - ☐ Social media (e.g. Facebook)

   Other methods:
   - ☐ Schools
   - ☐ Outdoor advertisements (billboards, etc.)
   - ☐ Books
   - ☐ Mail
   - ☐ Fire Department/Rescue
   - ☐ Fact sheet/brochure
   - ☐ Chamber of Commerce
   - ☐ Public workshops/meetings
   - ☐ Magazine
   - ☐ University or research institution
   - ☐ Other: _____

7. Prior to receiving this survey, were you aware of your county's Natural Hazard Mitigation Plan (NHMP)?
   - ☐ Yes
   - ☐ No

8. Prior to receiving this survey, were you aware that the Federal Emergency Management Agency (FEMA) requires your county to update the NHMP every five years in order for your county to be eligible for federal pre- and post-disaster hazard mitigation funds?
   - ☐ Yes
   - ☐ No

COMMUNITY VULNERABILITIES AND HAZARD MITIGATION STRATEGIES

In order to assess community risk, we need to understand which community assets may be vulnerable to natural hazards in the region. Vulnerable assets are those community features, characteristics, or resources that may be impacted by natural hazards (e.g. populations with functional needs, economic components, environmental resources, etc.). The next set of questions will focus on vulnerable assets in your community and your preferred strategies to mitigate risk to those assets.

9. Community assets are features, characteristics, or resources that either make a community unique or allow the community to function. In your opinion, which of the following *categories* are most susceptible to the impacts caused by natural hazards in your county?
   (Please rank the community assets in order of vulnerability, 1 being most vulnerable and 6 being least vulnerable)

Community Assets	Potential Natural Hazard Impact	Order of Vulnerability
Human	Loss of life and/or injuries	_____
Economic	Business closures and/or job losses	_____
Infrastructure	Damage or loss of bridges, utilities, schools, etc.	_____
Cultural/Historic	Damage or loss of libraries, museums, fairgrounds, etc.	_____
Environmental	Damage or loss of forests, rangeland, waterways, etc.	_____
Governance	Ability to maintain order and/or provide public amenities and services	_____

10. Next we would like to know what specific types of community assets are most important to you.
    (*Check the corresponding box for each asset)*

Community Assets	Very Important	Somewhat Important	Neutral	Not Very Important	Not Important
Elder-care facilities	☐	☐	☐	☐	☐
Schools (K-12)	☐	☐	☐	☐	☐
Hospitals	☐	☐	☐	☐	☐
Major bridges	☐	☐	☐	☐	☐
Fire/Police Stations	☐	☐	☐	☐	☐
Museums/Historic buildings	☐	☐	☐	☐	☐
Major employers	☐	☐	☐	☐	☐
Small businesses	☐	☐	☐	☐	☐
College / University	☐	☐	☐	☐	☐
City Hall / Courthouse	☐	☐	☐	☐	☐
Parks	☐	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐	☐
Other: _____	☐	☐	☐	☐	☐

11. A number of activities can reduce your community's risk from natural hazards. These activities can be both regulatory and non-regulatory. **Please check the box that best represents your opinion of the following strategies to reduce the risk and loss associated with natural disasters.**

Community-wide Strategies	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Sure
I support a regulatory approach to reducing risk	☐	☐	☐	☐	☐	☐
I support a non-regulatory approach to reducing risk	☐	☐	☐	☐	☐	☐
I support a mix of both regulatory and non-regulatory approaches to reducing risk	☐	☐	☐	☐	☐	☐
I support policies to prohibit development in areas subject to natural hazards	☐	☐	☐	☐	☐	☐
I support the use of tax dollars (federal and/or local) to compensate land owners for not developing in areas subject to natural hazards	☐	☐	☐	☐	☐	☐
I support the use of local tax dollars to reduce risks and losses from natural disasters	☐	☐	☐	☐	☐	☐
I support protecting historical and cultural structures	☐	☐	☐	☐	☐	☐
I would be willing to make my home more disaster-resistant	☐	☐	☐	☐	☐	☐
I support steps to safeguard the local economy following a disaster event	☐	☐	☐	☐	☐	☐
I support improving the disaster preparedness of local schools	☐	☐	☐	☐	☐	☐
I support a local inventory of at-risk buildings and infrastructure	☐	☐	☐	☐	☐	☐
I support the disclosure of natural hazard risks during real estate transactions	☐	☐	☐	☐	☐	☐

12. Natural hazards can have a significant impact on a community, but planning for these events can help lessen the impacts. The following statements will help determine citizen priorities regarding planning for natural hazards in your county. **Please tell us how important each one is to you.**

Statements	Very Important	Somewhat Important	Neutral	Not Very Important	Not Important
Protecting private property	☐	☐	☐	☐	☐
Protecting critical facilities (e.g. transportation networks, hospitals, fire stations)	☐	☐	☐	☐	☐
Preventing development in hazard areas	☐	☐	☐	☐	☐
Enhancing the function of natural features (e.g. streams, wetlands)	☐	☐	☐	☐	☐
Protecting historical and cultural landmarks	☐	☐	☐	☐	☐
Protecting and reducing damage to utilities	☐	☐	☐	☐	☐
Strengthening emergency services (e.g.- police, fire, ambulance)	☐	☐	☐	☐	☐
Disclosing natural hazard risks during real estate transactions	☐	☐	☐	☐	☐
Promoting cooperation among public agencies, citizens, non-profit organizations, and businesses	☐	☐	☐	☐	☐