City of Shishmaref, Alaska

Local Hazard Mitigation Plan

September 2015

Prepared by:

City of Shishmaref

LeMay Engineering & Consulting, Inc.

Alaskan Solution Based—Customer Driven

Acknowledgements

Shishmaref City Council
Howard Weyiouanna Sr., Mayor
Stella Havatone, Vice-Mayor
Donna Barr, Secretary
Ruth Nayokpuk, Treasurer
William P. Jones, Sr.
Edwin Weyiouanna
Alice Schultze

City Staff
City of Shishmaref
Zena Barr, City Clerk
P.O. Box 83
Shishmaref, AK 99772
Phone: (907)649-3781
Fax: (907) 649-2131
Email: cityofshhclerk@gci.net

Village Council
Native Village of Shishmaref
Stanley Tocktoo, President
P.O. Box 72110
Shishmaref, AK 99772
Phone: (907) 649-3821
Fax: (907) 649-2104
Email: tc.shh@kawerak.org

Contractor
LeMay Engineering & Consulting, Inc.
Jennifer LeMay, PE, PMP
4272 Chelsea Way
Anchorage, Alaska 99504
Phone: (907) 350-6061
Email: jlemay@lemayengineering.com

Technical Assistance, Alaska State DHS&EM
Scott Nelsen and Ann Gravier

The preparation of this plan was financed by funds from a grant from the Alaska State Division of Homeland Security and the Federal Emergency Management Agency.

Adoption Resolution

CITY OF SHISHMAREF

P.O. BOX 83
SHISHMAREF, ALASKA 99772
TEL. (907) 649-3781/4811
FAX (907) 649-2131

Resolution 15-06

A Resolution to adopt Federal Emergency Management Agency Local Hazard Mitigation Plan

WHEREAS, The City of Shishmaref, recognizes the threat that local natural hazards pose to people and property; and

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

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

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

NOW THEREFORE BE IT FURTHER RESOLVED THAT The City of Shishmaref will submit the adopted Local Hazard Mitigation Plan to the Alaska Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency officials for final review and approval.

PASSED AND APPROVED BY THE SHISHMAREF CITY COUNCIL ON AUGUST 26, 2015 by vote of 7 yes, _____ no, _____ abstain, _____ absent.

Howard P Weyiouanna Sr. — 8-26-15

Mayor Howard P. Weyiouanna Sr. — Date

Zena Bart — 8/26/15

Attest: Zena Bart, City Clerk — Date

FEMA Approval Letter

U.S. Department of Homeland Security
FEMA Region X
Federal Regional Center
130 228th Street, SW
Bothell, WA 98021-8627

FEMA

September 8, 2015

Honorable Howard P. Weyiouanna
Mayor, City of Shishmaref
P.O. Box 83
Shishmaref, Alaska 99772

Dear Mayor Weyiouanna:

The U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) has approved the ***City of Shishmaref Local Hazard Mitigation Plan*** as a local plan as outlined in 44 CFR Part 201. With approval of this plan, the City of Shishmaref is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through September 7, 2020.

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

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

www.fema.gov

If you have questions regarding your plan's approval or FEMA's mitigation grant programs, please contact Scott Nelson, Emergency Management Specialist with Alaska Division of Homeland Security and Emergency Management, at (907) 428-7010, who coordinates and administers these efforts for local entities.

Sincerely,

Mark Carey, Director
Mitigation Division

cc: Ann Gravier, Alaska Division of Homeland Security and Emergency Management

KM

Table of Contents

Acknowledgements ii

Acronyms xi

Chapter 1. Planning Process and Methodology 1

1.1 Introduction 1
1.1.1 Purpose 1
1.1.2 Authority 2

1.2 Plan Development 2
Project Staff 2
Plan Research 3
Public Involvement 4
Incorporation of Existing Plans 5

1.3 Plan Maintenance 6
Incorporation into Existing Planning Mechanisms 6
Continued Public Involvement 6
Monitoring, Evaluating and Updating the Plan 7
State and FEMA Review and Technical Assistance 7
Formal Plan Adoption and Assurances 8

Chapter 2. Community Profile 9

2.1 Community Overview 9
Location 9
History 11
Culture 11
Population 11
Economy 11
Facilities 11
Transportation 12
Climate 12
Vegetation and Soil 12
Wildlife 12

2.2 Shishmaref Capability Assessment 13
Government 13
Community Maps 13
Infrastructure 13

2.3 Local Resources 16

2.4 Hazard Mitigation Funding Resources 18
State Mitigation Funding 18
State of Alaska Supporting Mitigation Programs 19

Federal Mitigation Funding 19
Federal Disaster Mitigation Grants 20
Additional Mitigation Grant Resources 23

Chapter 3. Risk Assessment 24

3.1 Requirements 24

3.2 Vulnerability Assessment Methodology 26

Section 1. Identifying Hazards 29

Section 2. Assessing Vulnerability 32
Overview 32
Identification of Assets 32

Section 3. Risk Assessment Summaries 34

3.1 Risk Analysis 34

3.2 Asset Inventory 35

3.3 Risk Assessment Summaries 36

3.4 Land Use and Development Trends 37

Section 4. Flood 38
Hazard Description 38
Location 38
Extent 39
Probability 39
Impact 39
Previous Occurrences 39
Climate Influence upon Storm Surge Flooding 41
Community Participation in the NFIP 42
Repetitive Loss Properties 47
Current Mitigation Projects 48
Flood Mitigation Goals and Projects 48

Section 5. Erosion 50
Hazard Description 50
Location 50
Extent 51
Probability 51
Impact 52
Previous Occurrences 52
Climate Influence upon Erosion 53
Current Mitigation Projects 53
Erosion Mitigation Goals and Projects 53

Section 6. Severe Weather 55
Hazard Description 55

Location 57
Extent 58
Impact 58
Probability 58
Previous Occurrences 58
Climate Influence upon Severe Weather 58
Severe Weather Mitigation Goals and Projects 58

Section 7. Earthquakes *61*
Hazard Description 61
Location 62
Extent 62
Impact 63
Probability 63
Previous Occurrences 64
Earthquake Mitigation Goal and Projects 64

Section 8. Wildland Fire *66*
Hazard Description 66
Location 67
Extent 67
Impact 67
Probability 67
Previous Occurrences 68
Climatic Influence 68
Wildland Fire Mitigation Goals and Projects 69

Section 9. Climate Change *70*

Section 10. Description of Hazards Not Profiled in the 2015 Shishmaref MHMP *72*
Avalanche 72
Ground Failure Hazard 72
Tsunamis and Seiches 73

Chapter 4. Mitigation Strategy 74

Benefit - Cost Review *74*
Benefit-Cost Analysis 76
Facilitating BCA 76
Eligible Projects for PDM Funding 77
Eligible Projects for HMGP Funding 77

Benefit – Costs Review Listing *79*

Mitigation Project Plan *87*

Glossary of Terms 91

Bibliography 100

List of Tables

Table 1. Shishmaref Planning Documents 5

Table 2. Shishmaref Community Information 9

Table 3. Regulatory Tools 16

Table 4. Fiscal Capability 17

Table 5. Administrative and Technical Capability 18

Table 6. FEMA 2013 HMA Eligible Activities 19

Table 7. Risk Assessment - Federal Requirements 24

Table 8. Extent of Hazard Ranking 27

Table 9. Probability Criteria Table 28

Table 10. Hazard Matrix 29

Table 11. Previous Occurrences of Hazards 1978 to Present 30

Table 12. Hazards Identification and Decision to Profile 30

Table 13. Shishmaref Asset Matrix - Structures and Infrastructure 32

Table 14. Critical Infrastructure in Alaska 34

Table 15. Vulnerability Overview for City of Shishmaref 35

Table 16. FIRM Zones 42

Table 17. NFIP Statistics 46

Table 18. Housing Use Types in Shishmaref 46

Table 19. Local and State Floodplain Coordinator Contact Information 47

Table 20. Tin City Weather Summary 60

Table 21. Benefit Cost Review Listing 80

Table 22. Mitigation Project Plan 87

List of Figures

Figure 1. Hazard Mitigation Planning Cycle 8

Figure 2. Historic Shorelines 51

Figure 3. AEIS Historic Earthquakes in Alaska 64

Figure 4. USGS Earthquake Probability Map 65

Figure 5. Alaska All-Hazards Mitigation Plan - Fire Risk Map 67

Figure 6. Historic Wildland Fires 68

Figure 7. Tsunami Hazard by Community 73

List of Maps

Map 1. Regional Map 13

Map 2. Critical Facilities and Infrastructure 15

Map 3. Flood Hazard Zones from FIRM 44

Map 4. Flood Hazard Zones from FIRM 45

Appendix A: Public Involvement 102

Acronyms

ADOT&PF	Alaska Department of Transportation and Public Facilities
ANTHC	Alaska Native Tribal Health Consortium
APA	Approval Pending Adoption
ARDORs	Alaska Regional Development Organizations
ATV	All-Terrain Vehicle
AVEC	Alaska Village Electric Cooperative
AWCG	Alaska Wildfire Coordinating Group
BCA	Benefit-Cost Analysis
BCR	Benefit-Cost Review
CDBG	Community Development Block Grant
CFR	Code of Federal Regulations
DCCED	(Alaska) Department of Commerce, Community and Economic Development
DCRA	(DCCED) Division of Community and Regional Affairs
DFR	Disaster Relief Fund
DHS&EM	(Alaska) Division of Homeland Security and Emergency Management
DMA	Disaster Mitigation Act
DNR	Department of Natural Resources
DPC	Disaster Policy Cabinet
EHRSAP	Earthquake Hazards Reduction State Assistance Program
°F	Degrees Fahrenheit
FDIC	Federal Deposit Insurance Corporation
FEMA	Federal Emergency Management Agency
FHLBB	Federal Home Loan Bank Board
FIRM	Flood Insurance Rate Maps
FLD	Flood Projects
FMA	Flood Mitigation Assistance
GO Bonds	General Obligation Bonds
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMP	Hazard Mitigation Plan
HMPG	Hazard Mitigation Planning Grant
HMTAP	Hazard Mitigation Technical Assistance Program
IA	Individual Assistance
IGAP	Indian General Assistance Program
IAW	Immediate Action Workgroup
LHMP	Local Hazard Mitigation Plan
MJHMP	Multi-Jurisdictional Hazard Mitigation Plan

NFIP	National Flood Insurance Program
NOAA	National Oceanographic and Atmospheric Administration
NRCS	National Resource Conservation Service
NTHMP	National Tsunami Hazard Mitigation Grant Program
PA	Public Assistance
PDM	Pre Disaster Mitigation
PDMG	Pre Disaster Mitigation Grant
PNP	Private Nonprofit
RCASP	Remote Community Alert Systems Program
REAA	Regional Educational Attendance Area
RSA	Reimbursable Service Agreements
SBA	Small Business Administration
SHMAC	State Hazard Mitigation Advisory Council
SHMO	State Hazard Mitigation Office
USACE	United States Army Corps of Engineers, Alaska District
USC	United States Code
USGS	United States Geological Survey
VA	Veterans Administration
VPO	Village Police Officer
VPSO	Village Public Safety Officer

Chapter 1. Planning Process and Methodology

1.1 Introduction

Hazard mitigation is the process of profiling hazards, analyzing risk, and developing preventative actions. When the preventative actions are implemented, risks are reduced or eliminated. This Hazard Mitigation Plan for the City of Shishmaref includes information to assist the city and residents with planning to avoid future disaster losses. The plan provides information on natural hazards that affect Shishmaref, describes past disasters, and lists projects that may help the community prevent disaster losses. The plan was developed to help the City make decisions regarding natural hazards that affect Shishmaref. The City will decide at a later date whether this plan should also be applicable to the Tribal Council.

1.1.1 Purpose

The purpose of this Local Hazard Mitigation Plan (LHMP) is to identify and coordinate risk mitigation efforts with State, Federal, and local partners and to fulfill the requirements set forth by the Code of Federal Regulations (CFR), Title 44 "Emergency Management and Assistance", Part 201 "Mitigation Planning", Subsections 6 and 7 (44 CFR §201.6, §201.7):

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

Current Federal regulations 44 CFR §201.6 and §201.7 require local communities and tribes, except under Regional Administrator approved "extraordinary circumstances" [§201.6(a)(3)], to have a Federal Emergency Management Agency (FEMA) approved hazard mitigation plan for most of FEMA's grant programs [all but Public Assistance (PA) Categories A, B, and Individual Assistance (IA)]. Currently, Federal regulations require local plans to be formally updated and approved by FEMA every five years.

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

This LHMP complies with Title 44 CFR current as of March 11, 2015 and applicable guidance documents.

Specific FEMA programs, such as PA Categories C through G, Pre-Disaster Mitigation (PDM), Flood Mitigation Assistance (FMA), and the Hazard Mitigation Grant Program (HMGP) are detailed in Chapter 2, Subsection "Resources."

1.1.2 Authority

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

For implementation guidance, FEMA published the Final Rule in the Federal Register on September 16, 2009 [Docket ID FEMA-2006-0010], 44 CFR Part 201 with subsequent updates. The planning requirements for local entities are described in detail throughout this chapter and are identified in their appropriate sections throughout this LHMP.

Alaskan Native Tribes with an approved Tribal Mitigation Plan in accordance with 44 CFR 201.7 may apply for assistance from FEMA as a grantee. If the Tribe coordinates with the State of Alaska for development and review of their Tribal Mitigation Plan, then the Tribe also has the option to apply through the State as a subgrantee. A grantee is an entity such as a State, territory, or Tribal government to which a grant is awarded and is accountable for use of the funds. A subgrantee is an entity, such as a community, local, or Tribal government; State-recognized tribe; or a private nonprofit (PNP) organization to which a subgrant is awarded and is accountable to the grantee for use of the funds. The City will make this decision at a later date.

1.2 Plan Development

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

1. Community demographic, land use, and economic information.
2. A review of the local hazards facing the community.
3. A hazard vulnerability assessment and exposure analysis.
4. A hazard mitigation strategy with attainable goals and actions.
5. A glossary of terms.
6. A list of incorporated planning documents.

Shishmaref Tribal members reside within the City of Shishmaref and are included as City residents in all State and Federal demographic research.

Project Staff

The City of Shishmaref designated Zena Barr, City Clerk as the primary local staff person on this project.

LeMay Engineering & Consulting, Inc. was hired to write the plan with the community. Scott Nelsen and Ann Gravier of DHS&EM provided technical assistance and reviewed the drafts of this plan.

Plan Research

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

1. Organize resources: Members of the planning team identified information resources, such as local experts and various organizations, capable of providing the technical expertise and historical information.
2. Assess risks: The planning team reviewed their hazards and risk assessments.
3. Assess capabilities: The planning team assessed their community's current administrative, technical, regulatory, and fiscal capabilities.
4. Develop the mitigation strategy: The planning team identified and prioritized their mitigation goals and actions.
5. Monitor, evaluate, and update the plan: The planning team evaluated their goals and actions for compatibility with community priorities.

The plan was developed from existing Shishmaref plans and studies as well as outside information and research. The following list contains the most significant of the plans, studies, and websites that were used in preparing this document. Additional sources are listed in the bibliography.

1. *Alaska All-Hazard Risk Mitigation Plan*. Prepared by and for DHS&EM. October 2013.
2. *Division of Community and Regional Affairs (DCRA) Community Information*: http://commerce.state.ak.us/cra/DCRAExternal/community/Details/c075af9a-a51e-47bb-9dfb-60fd2513da0a
3. *Shishmaref Local Economic Development Plan*, prepared by Kawerak, Inc., December 2012.
4. *USACE Baseline Erosion Assessments*, http://www.poa.usace.army.mil/Library/ReportsandStudies/AlaskaBaselineErosionAssessments.aspx
5. *It's a Disaster! And what are you gonna do about it?* Prepared by FedHealth, Revised April 2013.
6. FEMA How to Guides:
    a. *Getting Started: Building Support For Mitigation Planning (FEMA 386-1)*
    b. *Local Multi-Hazard Mitigation Planning Guidance, July 1, 2008 (FEMA 386-8)*
    c. *Understanding Your Risks: Identifying Hazards and Estimating Losses (FEMA 386-2)*

d. *Developing The Mitigation Plan: Identifying Mitigation Actions And Implementing Strategies (FEMA 386-3)*
e. *Bringing the Plan to Life: Implementing the Hazard Mitigation Plan (FEMA 386-4)*
f. *Using Benefit-Cost Review in Mitigation Planning (FEMA 386-5)*

7. USGS Earthquake Probability Mapping at: http://geohazards.usgs.gov/ eqprob/2009/index.php
8. Alaska Interagency Wildlife Management, http://fire.ak.blm_gov/predsvcs/maps.php
9. West Coast and Alaska Tsunami Warning Center, NOAA, http://wcatwc.arh.noaa.gov/
10. Governor's Climate Change Sub-Cabinet Immediate Action Work Group: www.climatechange.alaska.gov

General Hazard Planning Web Sites

American Planning Association:	http://www.planning.org
Association of State Floodplain Managers:	http://www.floods.org
Developing the Implementation Strategy:	http://www.pro.gov.uk
Federal Emergency Management Agency:	http://www.fema.gov/fima/planning.shtm
Community Rating System:	http://www.fema.gov/nfip/crs.htm
Flood Mitigation Assistance Program:	http://www.fema.gov/fima/planfma.shtm
Hazard Mitigation Grant Program:	http://www.fema.gov/fima/hmgp
Individual Assistance Programs:	http://www.fema.gov/rrr/inassist.shtm
Interim Final Rule:	http://www.access.gpo.govl
National Flood Insurance Program:	http://www.fema.gov/nfip
Public Assistance Program:	http://www.fema.gov/rrr/pa

Public Involvement

On April 20, 2015, DHS&EM began community relations with the City Office regarding the hazard mitigation plan update.

Initial Public Meeting: On June 16, 2015, the planning team announced the hazard mitigation plan project during their City Council/public meeting. An invitation was extended to the entire community through a public announcement in a posted newsletter (Appendix A). The planning team posted a project newsletter describing the plan update process at the City Office and the Store. The newsletter was also placed on the DHS&EM website for review by the State Hazard Mitigation Advisory Council (SHMAC), Disaster Policy Cabinet (DPC), and general public, http://ready.alaska.gov/plans/localhazmitplans. During the meeting, participants reviewed the existing 2009 plan and updated the plan. Identified hazards known to impact the Community of Shishmaref are:

1. Flood
2. Erosion

3. Severe Weather
4. Earthquakes
5. Wildland Fire
6. Climate Change

The planning team conducted a vulnerability assessment of Shishmaref's assets. The results revealed the extent of damage each hazard could inflict in a worst case scenario. Following the meeting, the City Council delegated the final review to LeMay Engineering & Consulting, Inc. before the State of Alaska DHS&EM review and pre-approval of the updated 2015 plan.

Second Public Meeting: On August 26, 2015, the City of Shishmaref adopted the 2015 plan by resolution. This meeting took place after the State of Alaska DHS&EM and FEMA reviewed and pre-approved the plan.

The meeting sign in sheet and newsletter are contained in the public involvement appendix. A copy of the LHMP is available for public perusal at the City Office.

Incorporation of Existing Plans

During the planning process, the planning team reviewed and incorporated information from existing plans into the LHMP. The Shishmaref LHMP and all future updates or changes will be adopted through resolution of the City Council. This governing body has the authority to promote sound public policy regarding hazards. The LHMP will be assimilated into other Shishmaref plans and documents as they come up for review according to each plan's review schedule. Current plans for the community of Shishmaref are listed in Table 1.

Table 1. Shishmaref Planning Documents

Document	Completed	Scheduled Review
Recommendations to the Governor's Subcabinet on Climate Change	2009	
Local Economic Development Plan	2013	2018
Section 117 Shoreline Erosion Protection	2006	
Alaska Baseline Erosion Assessment	2009	
Shishmaref Traditional Industries Inc. Into the 21st Century A Plan for Growth and Expansion	1998	
Shishmaref Water and Sewer Feasibility Study	1998	
Ponds as Potable Water Sources	1980	Needs to be updated
Water, Wastewater and Solid Waste Haul System Feasibility Study	1979	
Shishmaref Expansion and Relocation Study	1978	

Document	Completed	Scheduled Review
Shishmaref Various Letters and Soils Report	1975	
Shishmaref Erosion Protection, Alternatives Feasibility and Cost Study	1975	
Background Information on the Shishmaref Relocation Effort	1974	

1.3 Plan Maintenance

This LHMP will be maintained using the following five step process:

1. Incorporation into existing planning mechanisms.
2. Continued public involvement.
3. Monitoring, reviewing, evaluating, and updating the LHMP.
4. State and FEMA review and technical assistance.
5. Formal plan adoption and assurances.

Incorporation into Existing Planning Mechanisms

The planning team will incorporate planning mechanisms into their LHMP through the following activities:

Research the community's regulatory tools when implementing mitigation planning initiatives.

Involve pertinent agencies when integrating hazard mitigation concepts.

Update or amend existing planning mechanisms as necessary.

The City Council of Shishmaref will involve the public to continually reshape and update this LHMP. A paper copy of this plan will be available at the City office. This LHMP is also stored on the State Department of Commerce, Community, and Economic Development Community and Regional Affairs, (DCCED/DCRA) plans website for public reference, http://commerce.state.ak.us/dnn/dcra/PlanningLandManagement/CommunityPlansAndInfrastructure.aspx. Planners are encouraged to integrate components of this LHMP into their own plans.

Continued Public Involvement

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

Monitoring, Evaluating and Updating the Plan

> Section §201.6(c)(4)(i) of the mitigation planning regulation requires that 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.

Monitoring the Plan: The Shishmaref mayor or his designee is responsible for monitoring the plan. On an annual basis, the Administration will seek a report from the agencies and departments responsible for implementing the mitigation projects in Chapter 4 of the plan. The compiled report will be provided to the City and Council as information and noticed to the public. Public comments will be sought. A report outlining all five years of the plan monitoring will be included in the plan update.

Evaluating the Plan: The Shishmaref mayor or his designee will evaluate the plan during the five-year cycle. On an annual basis, concurrent with the report above, the evaluation should assess whether:

- The goals and objectives address current and expected conditions.
- The nature, magnitude, and/or types of risks have changed.
- The current resources are appropriate for implementing the mitigation projects in Chapter 4.
- There are implementation problems, such as technical, political, legal, or coordination issues with other agencies.
- The outcomes have occurred as expected (a demonstration of progress).
- The agencies and other partners participated as originally proposed.

Updating the Plan: Plans must be updated and resubmitted to FEMA for approval every five years in order to continue eligibility for FEMA hazard mitigation assistance programs. Plan updates must demonstrate that progress has been made in the past five years to fulfill commitments outlined in the previously approved plan. This involves a comprehensive review and update of each section of the plan and a discussion of the results of evaluation and monitoring activities described above. Plan updates may validate the information in the previously approved plan or may involve a major plan rewrite. A plan update may not be an annex to this plan; it must stand on its own as a complete and current plan. The tasks required to monitor, evaluate, and update the LHMP are illustrated on Figure 1.

State and FEMA Review and Technical Assistance

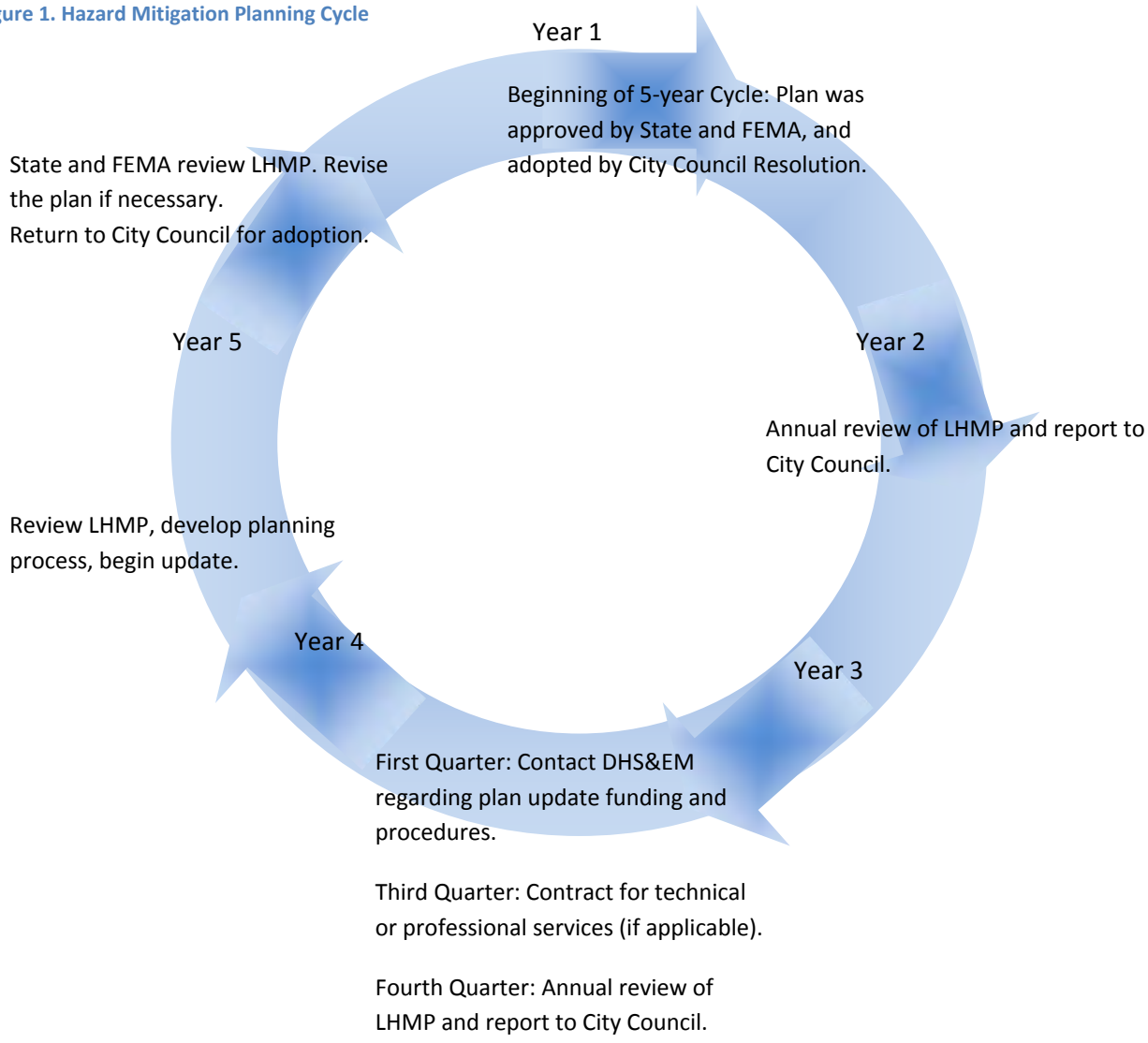
Draft local hazard mitigation plans are submitted to the State Hazard Mitigation Officer (SHMO) for review. The SHMO reviews the plan for consistency with the State HMP and the DMA 2000 regulations. The primary guidance is the FEMA Tribal Multi-Hazard Mitigation Planning Guidance and Crosswalk, March 2010. The State assists the community with any necessary revisions and then forwards the plan to FEMA Region 10 for final review. If no further revisions are necessary, FEMA issues an “approval pending adoption” (APA) letter to the City Council. The local community council will formally adopt the plan by a resolution. Once the plan is adopted, the SHMO forwards a copy of the adoption resolution to

FEMA Region 10 for final approval. FEMA sends the final approval letter to the community and the State for their records. Finally, the SHMO places a copy of the FEMA approved Local LHMP in DHS&EM files and on the State web site for reference.

Formal Plan Adoption and Assurances

The Shishmaref City Council supports 44 CFR 201 and assures compliance with all applicable federal statutes and regulations during the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c), and will amend its plan whenever necessary to reflect changes in tribal or federal laws and statutes as required in 44 CFR 13.11(d). The Shishmaref City Council, with assistance from the SHMO, the State Hazard Mitigation Advisory Committee (SHMAC), and FEMA, are responsible for monitoring, evaluating, and updating the LHMP in accordance with 44 CFR §201.7.

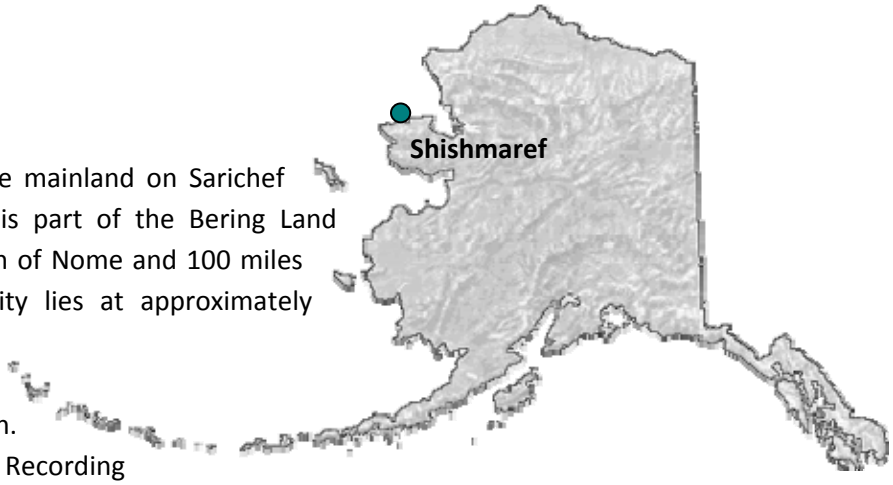
Figure 1. Hazard Mitigation Planning Cycle



Chapter 2. Community Profile

2.1 Community Overview

Location



Shishmaref is located five miles from the mainland on Sarichef Island, in the Chukchi Sea. Shishmaref is part of the Bering Land Bridge National Preserve; 126 miles north of Nome and 100 miles southwest of Kotzebue. The community lies at approximately 66.256670° North Latitude and -166.071940° West Longitude and Sector 23, T010N, R035W, Kateel River Meridian. Shishmaref is located in the Cape Nome Recording District. Shishmaref encompasses 2.8 square miles of land and 4.5 square miles of water.

Current Population:	563 (2010 DCRA Certified Population based on 2010 U.S. Census)
Pronunciation:	SHISH-muh-reff
Incorporation Type:	Second Class City
Borough:	Unorganized
Census Area:	Nome

Table 2 provides local and regional contact information for Shishmaref.

Table 2. Shishmaref Community Information

Community Information	Contact Information and Type
City of Shishmaref	City of Shishmaref Howard Weyiouana, Sr., Mayor P.O. Box 83 Shishmaref, AK 99772 Phone: (907) 649-3781 Fax: (907) 649-2131 Email: cityofshhclerk@gci.net
Borough	Unorganized

Community Information	Contact Information and Type
Village Corporation	Shishmaref Native Corporation Stanley Tocktoo, President P.O. Box 72151 Shishmaref, AK 99772 Phone: (907) 649-3751 Fax: (907) 649-3731 Email: tc.shh@kawerak.org
Electric Utility	Alaska Village Electric Cooperative, Inc. (AVEC) 4831 Eagle St. Anchorage, Alaska, 99503 (907) 561-1818 Web: www.avec.org
Village Council	Native Village of Shishmaref P.O. Box 72110 Shishmaref, AK 99772 Phone: 907-649-3821 Fax: 907-649-2104
Regional Native Corporation	Bering Straits Native Corp. 4600 Debarr Rd., Suite 200 Anchorage, AK 99508-3126 Phone: 907-563-3788 Fax: 907-563-3788 Web: http://www.beringstraits.com
Regional Native Non-Profit	Kawerak, Incorporated P.O. Box 948 Nome, AK 99762 Phone: 907-443-5421 Fax: 907-443-4452 Web: http://www.kawerak.org
School District	Bering Straits Schools P.O. Box 225 Unalakleet, AK 99684 Phone: 907-624-4261 Fax: 907-624-3099 Web: http://www.bssd.org

History

Iñupiat Eskimos inhabited Sarichef Island for several centuries prior to the arrival of western culture. The Iñupiat population called their village "Kigiktaq;" the name "Shishmaref" was the name of a crewmember of Lt. Otto Von Kotzebue, who in 1861 named the inlet surrounding the island "Shishmarev". The harbor in Shishmaref became central to the gold mining supply chain in the early 1900s. By 1901, the first Post Office was established, and by the 1920s, the BIA opened the first school. The City of Shishmaref was incorporated in 1969. During a storm in October 1997, 30 feet of the north shore was eroded. As a result, 14 homes and the National Guard Armory were forced to relocate. After additional storms forced the relocation of five other homes, the community voted in July 2002, to relocate the entire community. In 2009, Shishmaref relocation was examined by the Governor's Climate Change Sub-Cabinet Immediate Action Work Group (IAWG); recommendations were provided in March 2009. The IAWG worked to provide early assessment and development of an action plan addressing climate change impacts on coastal and other vulnerable communities in Alaska. The US Army Corps of Engineers (USACE), Alaska District built a seawall from 2005 to 2009 to protect the community as temporary measure. The location of the revetment fronts the shoreline from the teachers' quarters to the eastern corner of the sewage lagoon fence. The community has hired a consultant to conduct a relocation site selection feasibility study.

Culture

Shishmaref has a significant Iñupiat Eskimo population. Subsistence hunting and fishing are central to the community's culture. Approximately 478,612.9 pounds of food (fish, seal, etc.) are harvested annually by Shishmaref residents; 764.6 pounds per capita, respectively (Alaska Department of Fish and Game, 2006).

Population

The population of the community is 94.85 percent Alaska Native or part Native; primarily Iñupiat Eskimos with a subsistence lifestyle. During the 2010 U.S. Census, total housing units numbered 151, and vacant housing units numbered ten, one of which was vacant due to seasonal use.

Economy

Shishmaref's economy is supplemented by part-time work but mainly consists of subsistence activities. One resident holds a commercial fishing permit. U.S. Census data for Year 2010 showed 222 residents as employed. The unemployment rate provided in the 2013 *State of Alaska All-Hazard Risk Mitigation Plan* is 16.4 percent although practical unemployment or underemployment is likely to be significantly higher. The median household income was $36,750, per capita income was $10,651, and 29.2 percent of residents were living below the poverty level.

Facilities

Shishmaref's main water supply is a catch basin on the east side of the island. The water is filtered, chlorinated, and stored in a tank for both community and washeteria use. In the winter time, drinking water is also obtained from ice chopped from ponds on the mainland on both east and west sides of the

inlet, five to seven miles from Sarichef Island. Other summer water sources include rainwater collected from roofs, and hauling water from the Serpentine River. The school, clinic, washeteria, teaching housing, and approximately 1/3 of homes have complete piped water and sewer service (i.e., flush toilet, sink, shower, or a combination of these installed). Most residents self-haul water, and there are City honey-bucket bins available around town. The Alaska Native Tribal Health Consortium (ANTHC) has completed the Shishmaref Sanitation Master Plan which is shovel-ready when funded. The city also operates three lagoons and provides honeybucket hauling.

The City operates a Class 3 non-permitted landfill. The site is over-filled and needs expansion to a new site. The landfill road currently functions as a seawall for the runway. An old landfill on the north side of the island is being washed out to sea due to erosion. The electric utility, Alaska Village Electric Cooperative (AVEC), in co-operation with the City, operates a 971-kilowatt capacity diesel generator and three wind turbines.

The Shishmaref K-12 school, part of the Bering Straits School District, is attended by 202 students and has a staff of 19. The clinic is staffed by a health aide who also provides emergency services. Residents in need of more extensive services may also be medevaced to Nome.

Transportation

A State-owned 5,000-foot-long by 70-foot-wide paved runway provides access to Shishmaref. Scheduled, charter, and freight flights use the airport. Small boats are also commonly used to access the island from the mainland. During the winter months, travel via snowmachine is also possible between the island and mainland. The nearest hub communities are Nome, which offers regular aircraft service to and from the village, and Kotzebue. The Alaska Department of Transportation and Public Facilities (ADOT/PF) has been approved to perform a relocation road reconnaissance assessment for a road connecting the island to the mainland. The road would be used as an evacuation route and may ease the relocation process. A preliminary data report was released in 2015.

Climate

Winter temperatures average from -12 to 2 degrees Fahrenheit. Summer temperatures average from 47 to 54 degrees Fahrenheit. Annual precipitation is 8 inches, and average snowfall is 33 inches.

Vegetation and Soil

Shishmaref is located on a barrier island composed of sand soils. Permafrost encompasses the entire island. Shishmaref has exceptional berry patches.

Wildlife

Ringed, ribbon, bearded and spotted seals and walrus can be found 40-70 miles off-shore. Herring, tomcod, whitefish, grayling, Arctic char, flounder, salmon, and sculpin are fish found closer in; along with waterfowl. Large land mammals are not found on the island.

2.2 Shishmaref Capability Assessment

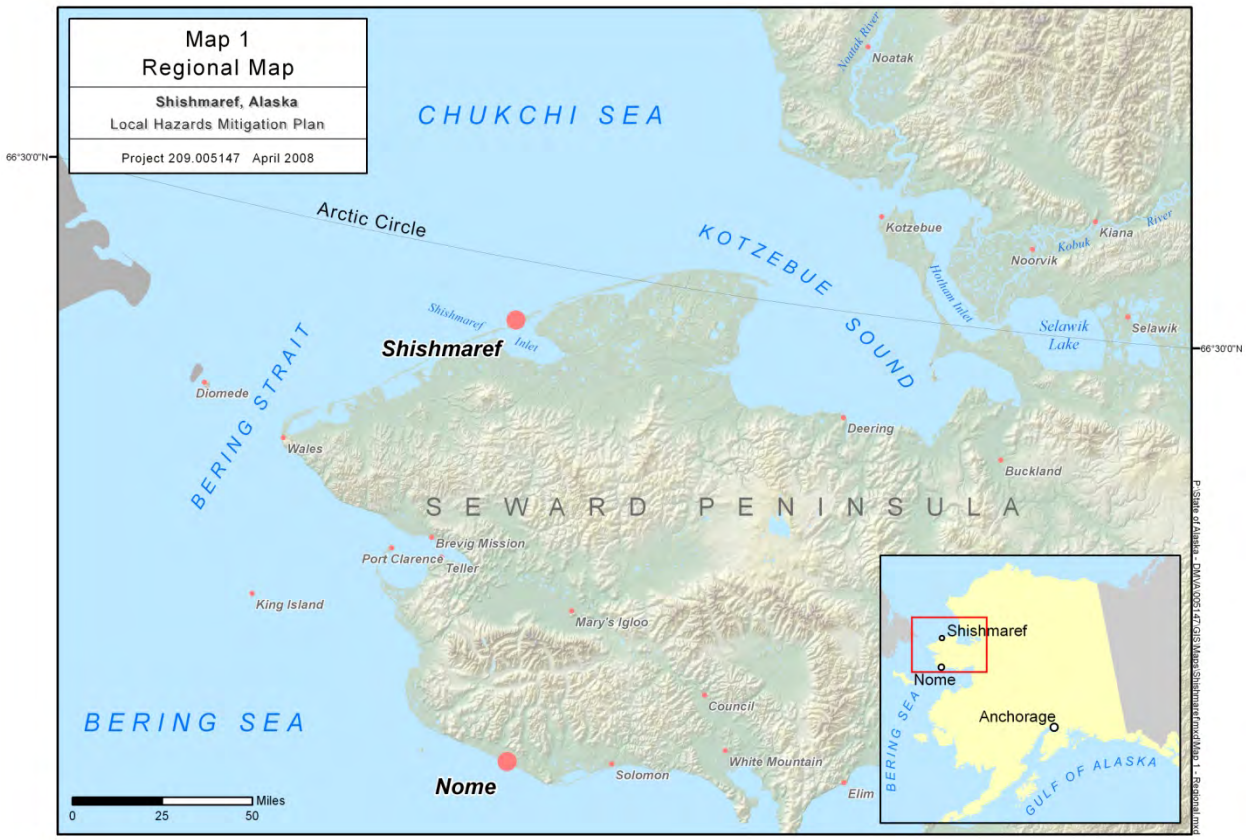
Government

The City Council of Shishmaref consists of one mayor and seven council members (although six presently serve), elected by the residents of Shishmaref. City elections are held on the first Tuesday in October, and each council member serves a three-year term. The City Council meets twice a month on the first and third Tuesday.

Community Maps

Community maps were developed using data from the DCRA website, Flood Insurance Rate Maps (FIRM) and input from residents. Map 1 provides a regional view of Shishmaref.

Map 1. Regional Map



Infrastructure

The list of assets that are most important to protect, as well as the criticality of any given facility, can vary widely from community to community. For planning purposes, a jurisdiction should determine

criticality based on the relative importance of its various assets for the delivery of vital services, the protection of special populations, and other important functions. Infrastructure may be considered critical for a variety of reasons.

Critical Facilities

Critical facilities are those facilities and infrastructure necessary for emergency response efforts and whose loss of function would present an immediate threat to life, public health, and safety. See Map 2. In Shishmaref, they include:

- Landing Strip
- Katherine Miksruaq Olanna Health Clinic
- Public Works Garage
- Public Utilities

Essential Facilities

Essential facilities are those facilities and infrastructure that supplement response efforts and whose loss of function would present an immediate threat to life, public health, and safety, including:

- Designated Shelters – Church
- Bulk Fuel Storage Tank Farms
- Washeteria
- Power Plant
- General and Native Stores

Critical Infrastructure

Critical infrastructure consists of the various service networks in Shishmaref, including:

- Communication Networks
- Power Lines
- Transportation Networks
- Water and Wastewater Facilities

Vulnerable Populations

Locations that serve populations with special needs or require special consideration include:

- School
- Katherine Miksruaq Olanna Health Clinic

Cultural and Historical Assets

Cultural and historical assets include those facilities that augment or help define community character that, if lost, would represent a significant loss to the community. These include:

- Shishmaref Church
- Shishmaref Cemetery
- Friendship Center

Map 2. Critical Facilities and Infrastructure

2.3 Local Resources

Shishmaref is a small community with a limited number of planning and land management tools. The resources available in these areas have been assessed by the City, and are summarized in the following tables. While the Shishmaref Tribal Council is a sovereign and federally recognized tribe, they are not a regulatory authority in the vicinity of Shishmaref. The City of Shishmaref depends upon any available government and private grants for much of their mitigation projects. Additional funding resources are identified in the next subsection.

Table 3. Regulatory Tools

Regulatory Tools (ordinances, codes, plans)	Local Authority (Y/N)	Comments (Year of most recent update; problems administering it, etc)
Building code	Y	
Zoning ordinance	N	
Subdivision ordinance or regulations	N	
Special purpose ordinances (floodplain management, stormwater management, hillside or steep slope ordinances, wildfire ordinances, hazard setback requirements)	Y	
Growth management ordinances (also called "smart growth" or anti-sprawl programs)	N	
Site plan review requirements	N	
Comprehensive plan	N	
A capital improvements plan	N	
An economic development plan	Y	Local Economic Development Plan 2013-2018
An emergency response plan	Y	2010
A post-disaster recovery plan	Y	2010
Real estate disclosure requirements	N	

Table 4. Fiscal Capability

Staff/Personnel Resources	Y/N	Department/Agency and Position
City Manager	N	
City Planner	N	
Fire Chief	Y	Volunteer
City Clerk	Y	
Public Works Director	N	
Public Safety Director	Y	City/Kawerek
Librarian	N	
Fire Department	Y	Volunteer
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	N	
Planners or Engineer(s) with an understanding of natural and/or human-caused hazards	Y	Planning Committee
Floodplain Manager	Y	City Zoning Department
Surveyors	Y	City Zoning Department
Staff with education or expertise to assess the community's vulnerability to hazards	N	
Personnel skilled in GIS and/or HAZUS	Y	City Zoning Department
Scientists familiar with the hazards of the community	N	
Incident Commander	Y	Mayor
Grant Writers	Y	Native Village of Shishmaref
Environmental Advisory Council	N	Native Village of Shishmaref IGAP

Table 5. Administrative and Technical Capability

Financial Resources	Accessible or Eligible to Use (Yes or No)
Community Development Block Grants (CDBG)	Yes
Capital Improvements Project Funding	Yes
Authority To Levy Taxes For Specific Purposes	No
Fees For Sewer/Water	Yes, cover operation costs
Impact fees for homebuyers or developers for new developments/homes	No
Incur Debt Through General Obligation Bonds	No
Incur Debt Through Special Tax And Revenue Bonds	No
Incur Debt Through Private Activity Bonds	No
Withhold Spending in Hazard-Prone Areas	Yes

2.4 Hazard Mitigation Funding Resources

State Mitigation Funding

Direct State Disaster Mitigation Funding

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

State Provision of Non-Federal Match to Federal Mitigation Programs

Many federal mitigation programs require a local match of non-federal funds. The match required varies with the program regulations and community being granted funds. There are several mitigation programs in which the State of Alaska may provide the entire non-federal match for local communities resulting in 100% funds being granted to the community for mitigation. These programs, described in detail below, include the Public Assistance (also called 406 mitigation) and Hazard Mitigation Grant Program (HMGP) which are funded under federally declared disasters. The matching funds are paid through the State DRF. Therefore, while these programs are listed below under "Federal mitigation

programs" for convenience, the State provides substantial funding for these programs, sometimes in the millions of dollars. On occasion the State has likewise provided a portion of the non-Federal match for National Resource Conservation Service (NRCS) projects.

State of Alaska Supporting Mitigation Programs

Division of Homeland Security and Emergency Management Disaster Relief Fund

The State of Alaska provides State funding for PA and IA in State declared disasters and cost share funds for federally declared disasters through the DRF.

Department of Commerce, Community & Economic Development

Community Development Block Grants

These grants fund community projects and planning activities improving health, safety and essential community services.

Alaska Regional Development Organizations

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

Rural Development Assistance Mini-Grants

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

Unincorporated Community Grants

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

Federal Mitigation Funding

There are several Federal agencies and programs funding mitigation projects in the State of Alaska. Mitigation grants are administered through the DHS&EM as the grantee to local communities functioning as sub-grantees with the State providing the required matching funds for HMGP. Table 6 is an overview of grant programs and their eligible programs.

Table 6. FEMA 2013 HMA Eligible Activities

Activities	HMGP	PDM	FMA
1. Mitigation Projects	√	√	√
Property Acquisition and Structure Demolition	√	√	√
Property Acquisition and Structure Relocation	√	√	√
Structure Elevation	√	√	√
Mitigation Reconstruction			

Dry Floodproofing of Historic Residential Structures	√	√	√
Dry Floodproofing of Non-residential Structures	√	√	√
Minor Localized Flood Reduction Projects	√	√	√
Structural Retrofitting of Existing Buildings	√	√	
Non-Structural Retrofitting of Existing Buildings and Facilities	√	√	
Safe Room Construction	√	√	
Infrastructure Retrofit	√	√	
Soil Stabilization	√	√	
Wildfire Mitigation	√	√	
Post-disaster Code Enforcement	√		
5% Initiative Projects	√		
2. Hazard Mitigation Planning	√	√	√
3. Management Costs	√	√	√

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

Federal Disaster Mitigation Grants

406 Public Assistance Mitigation

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

Hazard Mitigation Grant Program

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

Federal Unmet Needs Program

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

Additional Primary Federal Mitigation Programs

FEMA

Pre-Disaster Mitigation Grant Program

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

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

Earthquake Hazards Reduction State Assistance Program

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

Hazard Mitigation Technical Assistance Program

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

Department of Commerce National Oceanic and Atmospheric Administration (NOAA)

National Tsunami Hazard Mitigation Grant Program

The National Tsunami Hazard Mitigation Grant Program (NTHMP) combines Federal and State partners

involved in mitigating tsunami risk. This NOAA directed program includes Federal partners from the United States Geological Survey (USGS), FEMA and NSF, and States with tsunami risk. The State of Alaska serves as a member of the Coordination Committee for the NTHMP and is the grantee for NTHMP funds allocated to Alaska. In Alaska, NTHMP funds are combined with State managed projects, local community sub-grants, and intra-state reimbursable services agreements (RSAs) for tsunami hazard mapping, outreach and warning systems. In Alaska, the NTHMP is managed though the SHMO.

Remote Community Alert Systems Program

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

Small Business Administration

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

Department of Agriculture

Natural Resource Conservation Service

Emergency Watershed Protection Program

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

Department of Defense

U.S. Army Corps of Engineers

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

Additional Federal Agencies

Department of Agriculture

U.S. Forest Service

Department of Commerce

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

Department of Defense

USACE Army Corps of Engineers - National Flood Proofing Committee

Department of Health, Education & Welfare

Center for Disease Control (CDC)

Department of Housing & Urban Development

Community Development Block Grant
HOME Investment Partnerships Program

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

Environmental Protection Agency

Department of Transportation

Federal Highway Administration
Federal Aviation Administration

National Trust for Historic Preservation

Additional Mitigation Grant Resources

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

- FEMA Disaster Assistance: A Guide to Recovery Programs

Chapter 3. Risk Assessment

3.1 Requirements

> Section 201.6(c)(2) of the mitigation planning regulation requires local jurisdictions to provide sufficient hazard and risk information from which to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. (FEMA 386-8)

The goal of mitigation is to reduce the future impacts of a hazard including loss of life, property damage, and disruption to local and regional economies, environmental damage and disruption, and the amount of public and private funds spent to assist with recovery.

Mitigation efforts begin with a comprehensive risk assessment. A risk assessment measures the potential loss from a disaster event caused by an existing hazard by evaluating the vulnerability of buildings, infrastructure, and people. It identifies the characteristics and potential consequences of hazards and their impact on community assets.

Federal regulations for hazard mitigation plans outlined in 44 CFR Section §201.6(c)(2) include a requirement for a risk assessment. This risk assessment requirement is intended to provide information that will help the community identify and prioritize mitigation activities that will prevent or reduce losses from the identified hazards. The federal criteria for risk assessments and information on how the Shishmaref LHMP meets those criteria are outlined below.

Table 7. Risk Assessment - Federal Requirements

Section §201.6(c)(2) Requirement	Where requirement is addressed in Shishmaref Local Hazard Mitigation Plan
Identifying Hazards §201.6(c)(2)(i) The risk assessment *shall* include a description of the type . . . of all natural hazards that can affect the jurisdiction . . .	Chapter 3, Sections 4-8 identifies flood, erosion, severe weather, earthquakes, and wildland fires as the natural hazards with the potential to be present in Shishmaref. Chapter 9 discusses climate impacts, and Chapter 10 discusses all potential nature hazards not included in this plan and the rationale for not including them.

Section §201.6(c)(2) Requirement	Where requirement is addressed in Shishmaref Local Hazard Mitigation Plan
Profiling Hazards §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.	Chapter 3, Sections 4-9 includes hazard-specific sections of the Shishmaref LHMP that profile and describe how natural hazards may affect the community. The Plan includes **location, extent, impact,** and **probability** for each natural hazard identified. The LHMP also provides hazard specific information on **past occurrences** of hazards events.
Assessing Vulnerability: Overview §201.6(c)(2)(i) 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.	Chapter 3, Section 1 contains overall summaries of each hazard and its impacts on the community. Summaries are contained in hazard-specific sections in Chapter 3.
Assessing Vulnerability: Addressing Repetitive Loss Properties §201.6(c)(2)(ii) The risk assessment in all plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged floods.	According to Alaska Repetitive Loss Data provided by the State of Alaska, there are no repetitively damaged structures in Shishmaref. There are no repetitively damaged structures in the State of Alaska. Section 3 Flood explains this requirement in more detail.
Assessing Vulnerability: Identifying Structures §201.6(c)(2)(ii)(A) The plan *should* describe vulnerability in terms of the types and number of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.	Chapter 3, Section 2, Table 12 lists structures, infrastructure, and critical facilities located in the identified hazard areas.
Assessing Vulnerability: Estimating Potential Losses §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.	Chapter 3, Section 3, pages 35 and 36, estimate potential dollar losses to facilities. This information was derived from a study by the USACE, "Section 117 Shoreline Erosion Protection, Shishmaref, Alaska." Individual values are unknown.

3.2 Vulnerability Assessment Methodology

The purpose of a vulnerability assessment is to identify the assets of a community that are susceptible to damage should a hazard incident occur.

Critical facilities are described in the Community Profile Section (Chapter 2) of this hazard plan. A vulnerability matrix table of critical facilities as affected by each hazard is provided in Table 12.

Facilities were designated as critical if they are: (1) vulnerable due to the type of occupant (children or elderly for example); (2) critical to the community's ability to function (roads, power generation facilities, water treatment facilities, etc.); (3) have a historic value to the community (cemetery); or (4) critical to the community in the event of a hazard occurring (emergency shelter, etc.).

This hazard plan includes an inventory of critical facilities from Shishmaref records and land use maps.

The assessment includes the following nine sections:

Section 1. Identifying Hazards
Section 2. Assessing Vulnerability: Overview and Potential Losses
Section 3. Risk Analysis
Section 4. Flood
Section 5. Erosion
Section 6. Severe Weather
Section 7. Earthquake
Section 8. Wildland Fire
Section 9. Climate Change
Section 10. Hazards Not Present in Shishmaref

The **description** of each of the identified hazards includes a narrative and in some cases a map of the following information:

- The **location** or geographical areas in the community that would be affected. The location of identified hazards is described by a map wherever appropriate or in some cases with a narrative statement.
- The **extent** (i.e. magnitude or severity) of potential hazard events is determined. Table 8 is used to rank the extent of each hazard. Sources of information to determine the extent include the *Alaska All-Hazard Risk Mitigation Plan,* historical or past occurrences, and information from the location of the hazard.
- The **impact** of the hazard or its potential effects on the community is described.

- The **probability** of the likelihood that the hazard event would occur in an area is taken from the *Alaska All-Hazard Risk Mitigation Plan*. Sources of information to determine the probability include the *Alaska All-Hazard Risk Mitigation Plan*, historical or past occurrences, and information gathered through public meetings and stakeholder interviews.

- **Past occurrences** of hazard events. The past occurrences of natural events are described for identified natural hazards. The information was obtained from the *Alaska All-Hazard Risk Mitigation Plan,* State Disaster Cost Index, City records, other state and federal agency reports, newspaper articles, web searches, etc.

Table 9 taken from the *Alaska All-Hazard Risk Mitigation Plan*, categorizes the probability of a hazard occurring. Sources of information to determine the probability include the *Alaska All-Hazard Risk Mitigation Plan*, historical or previous occurrences, and information from the location of the hazard.

Table 8. Extent of Hazard Ranking

Magnitude/Severity	Criteria to Determine Extent
4 - Catastrophic	□ Multiple deaths □ Complete shutdown of facilities for 30 or more days □ More than 50% of property severely damaged
3 - Critical	□ Injuries and/or illnesses result in permanent disability □ Complete shutdown of critical facilities for at least two weeks □ More than 25% 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% 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% of property is severely damaged

Table 9. Probability Criteria Table

Probability	Criteria Used to Determine Probability
4 – High	□ Hazard is present with a high probability of occurrence within the calendar year. □ Event has up to 1 in 1 year chance of occurring (1/1 = 100 percent). □ Probability is greater than 33 percent per year. □ Event is Highly Likely.
3 – Likely	□ Hazard is present with a moderate probability of occurrence with the next three years. □ Event has up to 1 in 3 year's chance of occurring (1/3 = 33 percent). □ Probability is greater than 20 percent but less than or equal to 33 percent per year. □ Event is Likely.
2 - Plausible	□ Hazard is present with a probability of occurrence within the next five years. □ Event has up to 1 in 5 year's chance of occurring (1/5 = 20 percent). □ History of events is greater than 10 percent but less than or equal to 20 percent likely per year. □ Event is Plausible.
1 - Credible	□ Hazard is present with a low probability of occurrence within the next ten years. □ Event has up to 1 in 10 year's 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 credible.

Section 1. Identifying Hazards

This section identifies and describes the hazards likely to affect Shishmaref. The community used the following sources to identify the hazards present in the community: the *Alaska All-Hazard Risk Mitigation Plan*, interviews with experts and long-time residents, and past occurrences of events.

Table 10 is taken from the *Alaska All-Hazard Risk Mitigation Plan* of October 2013. Data for the Previous Occurrences Matrix, Table 11, comes from the DHS&EM *Disaster Cost Index*, including data from 1978 to January 2015 and major events such as the 1964 earthquake. It may not include events known to the community or from other sources discussed in the sections describing specific hazards.

The Bering Strait REAA encompasses an extremely large area. Much of this area is quite different from Shishmaref and not all the hazards identified in Table 10 are relevant to Shishmaref. For example, avalanches are not a hazard present in Shishmaref as the terrain in the community is quite flat. The presentation order does not signify their importance or risk level.

Table 10. Hazard Matrix

Hazard Matrix – Bering Strait (REAA)				
Flood	**Wildland Fire**	**Earthquake**	**Volcano**	**Avalanche**
Y	Y	Y-M	N	Y-M
Tsunami & Seiche	**Severe Weather**	**Ground Failure**	**Erosion**	
N	Y-H	Y	Y	

Hazard Identification:

Y: Hazard is present in jurisdiction but probability unknown

Y-L: Hazard is present with a low probability of occurrence within the next ten years. Event has up to 1 in 10 year's chance of occurring.

Y-M: Hazard is present with a moderate probability of occurrence within the next three years. Event has up to 1 in 3 year's chance of occurring.

Y-H: Hazard is present with a high probability of occurrence within the next one year. Event has up to 1 in 1 year chance of occurring.

N: Hazard is not present

Source: Alaska All-Hazard Risk Mitigation Plan, 2013

Table 11. Previous Occurrences of Hazards 1978 to Present

Previous Occurrences – Bering Strait (REAA)				
Flood	**Wildland Fire**	**Earthquake**	**Volcano**	**Avalanche** 0
2 - L	3 - L	0	0	
Tsunami & Seiche	**Severe Weather**	**Ground Failure**	**Erosion**	
0	19 - L	0	1 - L	

Source: Alaska All-Hazard Risk Mitigation Plan, 2013

Based on consultation with the Alaska DHS&EM, Tables 10 and 11 from the *Alaska All-Hazard Risk Mitigation Plan*, Shishmaref plans and reports, and interviews, Shishmaref identified the following hazards to be profiled.

Table 12. Hazards Identification and Decision to Profile

Hazard	Yes/No	Decision to Profile Hazard
Flood	Yes	Large western storms, resulting in wave run-up extending 8-10 feet high water in elevation.
Erosion	Yes	Designated as a hazard due to extensive history of erosion.
Earthquake	Yes	Designated as a hazard in Alaska *All-Hazard Risk Mitigation Plan*.
Volcano	No	Designated as not a hazard in *Alaska All-Hazard Risk Mitigation Plan*.
Avalanche	No	Shishmaref's topography is not one likely to produce avalanches and though it is listed as a hazard present in the Bering Strait REAA, no instances of avalanches has been observed in Shishmaref.
Tsunami & Seiche	No	Designated as not a hazard in *Alaska All-Hazard Risk Mitigation Plan*.
Severe Weather	Yes	Designated as a hazard due to extensive history of previous severe

Hazard	Yes/No	Decision to Profile Hazard
		weather events.
Ground Failure	No	The terrain in Shishmaref is not one likely to produce ground failure and though it is listed as a hazard present in the Bering Strait REAA, no instances of ground failure have been observed in Shishmaref.
Wildland Fire	Yes	Wildland fire has not been documented within the boundaries of Shishmaref. Additionally, wildland fires have not occurred in the vicinity.
Climate Change	Yes	The community is experiencing an increase in severity and frequency of severe weather.

See Section 10, Hazards not present in Shishmaref, for more information on the hazards not present in the community. Each hazard that is present in the community is profiled in hazard-specific sections.

Section 2. Assessing Vulnerability

Overview

The vulnerability overview section is a summary of Shishmaref's vulnerability to the hazards identified in Table 12. The summary includes the type of hazard, the types of structures, infrastructure, and critical facilities affected by the hazards. Some hazards are area-wide in scope while others impact certain areas of the community to a lesser extent.

Identification of Assets

Because Shishmaref is a small community of 563 residents, every structure is essential to the sustainability and survivability of Shishmaref residents. Table 13 includes a list of facilities, utilities, and businesses and their vulnerability to natural hazards. No replacement values are known. No information for Shishmaref is contained in HAZUS.

Table 13. Shishmaref Asset Matrix - Structures and Infrastructure

Structure	Flood	Erosion	Earthquake	Severe Weather	Wildland Fire
Airport Road	H	M	L	H	L
AVEC Generator	L	L	L	H	L
BSSD School	M	M	L	H	L
Dump Road	H	M	L	H	L
FAA Maintenance Shelter	M	M	L	H	L
Fire Hall/Post Office	M	M	L	H	L
Friendship Center	M	M	L	H	L
Fuel Tank Farm	H	H	L	H	L
IRA Office	M	M	L	H	L
Landfill	H	M	L	H	L
Landing Strip	H	H	L	H	L
Mukluk Telephone	M	M	L	H	L
National Guard Armory	M	M	L	H	L
Sewage Lagoon	H	M	L	H	L
Shishmaref Lutheran Church	M	M	L	H	L
Shishmaref Tannery	H	H	L	H	L

Structure	Flood	Erosion	Earthquake	Severe Weather	Wildland Fire
SNC Building	M	M	L	H	L
SRB/DOT/FAA Facilities	M	M	L	H	L
Washeteria	H	M	L	H	L
Water Tank	H	M	L	H	L
Water Reservoir	M	M	L	H	L
Water Treatment Plant	H	M	L	H	L

H=High Vulnerability
M=Medium Vulnerability
L=Low Vulnerability

The following facilities were deemed critical by the City:

- Airport Road
- Dump Road
- Fire Hall/Post Office
- Friendship Center
- Fuel Tank Farm
- Landfill
- SRB/DOT/FAA Facilities
- Washerteria
- Water Reservoir
- Water Tank
- Water Treatment Plant

The community of Shishmaref has several current planned projects:

The Shismaref Washeteria will be renovated in 2016.

ANTHC is performing a survey to determine which water and wastewater systems would be best to implement in Shishmaref.

ADOT&PF and FEMA are working on a decision as to how to protect the airport and dump road.

Section 3. Risk Assessment Summaries

The planning team used the State's Critical Facility Inventory to identify critical facility locations in relation to a potential hazard's threat exposure and vulnerability (Table 13). No locally obtained GPS coordinate data was available for Shismaref. Also, no cost information was available either from the City, HAZUS. A very general non-itemized estimate of expected damages was present in the 2009 USACE Baseline Erosion Report. The data was used to model an exposure assessment for each hazard where applicable.

Table 14. Critical Infrastructure in Alaska

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

Source: State of Alaska Hazard Mitigation Plan, 2013

Replacement structure and contents value estimates are not known. A limited exposure analysis was conducted for each physical asset located within a hazard area with the available data. A similar analysis was used to evaluate the proportion of the population at risk. However, the analysis simply represents the number of people at risk; no casualty estimates were prepared.

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

3.1 Risk Analysis

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

Table 15 lists the infrastructure hazard vulnerability for Shismaref.

Table 15. Vulnerability Overview for City of Shishmaref

Hazard	Percent of Shishmaref's Geographic area	Percent of Population	Percent of Building Stock	Percent of Community Facilities and Utilities
Flood	**100%**	**100%**	**100%**	**100%**
Erosion	**100%**	**100%**	**100%**	**100%**
Earthquake	**100%**	**100%**	**100%**	**100%**
Severe Weather	**100%**	**100%**	**100%**	**100%**
Wildland Fire	**100%**	**100%**	**100%**	**100%**
Climate Change	**100%**	**100%**	**100%**	**100%**

3.2 Asset Inventory

Table 12 identifies critical infrastructure in Shismaref.

Potential Dollar Losses to Vulnerable Structures

Replacement values are not known. The following are general estimates of the potential damages that could occur from erosion in Shishmaref according to the USACE, "Section 117 Shoreline Erosion Protection, Shishmaref, Alaska" report dated May, 2008:

- The number of residences lost over the 15-year model range from 23 to 81 with values around $4 million to $19 million.
- Commercial and public property damages are $ 3.4 million for the 15-year model and rise to almost $25 million under the faster erosion rate.
- The value of land lost over the 15-year model ranges from $26,000 to $68,000 using the Nome price per acre of $1,000. Land potentially lost ranges from 25 to 68 acres.
- Given the existing estimates for erosion, the sewage lagoons and landfill will likely need to be closed and cleaned up during the 15-year model; costing approximately $2 million.

The 2009 USACE Alaska Baseline Erosion Assessment AVETA Report Summary for Shishmaref states: The value of the combined land lost, residential and commercial buildings, public buildings and infrastructure lost, and the costs of fuel tank decommissioning and closure due to erosion at Shishmaref

range from more than $47 million to more than $130 million for the 50 – year project horizon. Critical infrastructure and much of the community's residential structures will be lost in the next 10-15 years.

3.3 Risk Assessment Summaries

Flood Erosion

The total elevation gain in the Shishmaref vicinity is no more than 12 feet above the ocean. Therefore, the entire population of Shishmaref, residential structures and community facilities are vulnerable to floods. This includes 563 people in 151 residences valued at a ballpark value of $130 million based on the General Erosion Damages estimated in the 2009 USACE Baseline Erosion Report.

Severe Weather

The entire population of Shishmaref, residential structures, and community facilities are vulnerable to severe weather. This includes 563 people in 151 residences valued at valued at a ballpark value of $130 million based on the General Erosion Damages estimated in the 2009 USACE Baseline Erosion Report.

Wildland Fire

Although the probability is low, the entire population of Shishmaref, residential structures, and community facilities are vulnerable to wildland fires. This includes 563 people in 151 residences valued at valued at a ballpark value of $130 million based on the General Erosion Damages estimated in the 2009 USACE Baseline Erosion Report.

Earthquake

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

Given its location, it is unlikely that an earthquake would be centered in an area around Shishmaref. However, the entire population, residential structures, and critical facilities are vulnerable to an earthquake. For Shishmaref, all 563 people in 151 residences valued at valued at a ballpark value of $130 million based on the General Erosion Damages estimated in the 2009 USACE Baseline Erosion Report.

Climate Change

The entire population of Shishmaref, residential structures, and community facilities are vulnerable to climate change. This includes 563 people in 151 residences valued at valued at a ballpark value of $130 million based on the General Erosion Damages estimated in the 2009 USACE Baseline Erosion Report.

3.4 Land Use and Development Trends

Shishmaref was incorporated as a second class city in 1969. The Alaska Native Claims Settlement Act of 1971 created major economic changes throughout Alaska. During that time, the Shishmaref Native Corporation was formed and subsequently received a land entitlement of 115,200 acres and is now the major landowner in Shishmaref.

The existing land use patterns in Shishmaref are influenced by a number of factors including past tenure of individual use and occupancy. The City of Shishmaref owns their roads. The Native Corporation owns the lands. ADOT&PF leases land for the current airport while the State of Alaska Department of Education has a lease for the school property. Public lands are not currently being conveyed to the City of Shishmaref pursuant to the terms of ANCSA Section 14 (c) 3 for community expansion purposes. This lack of provision has the greatest impact on present and future land use patterns. The location, types of improvements, designation of residential, commercial, public use, and potential future uses are dependent on this conveyance process occurring. The location of the community on an island leaves little room for expansion projects, and land use is predominantly residential with some commercial facilities.

The City of Shishmaref does not have a formal zoning law enacted. Archeological and cultural sites just west of the village near the fresh water source are mapped. As part of the Repatriation Act, human remains and funerary objects in the collections of the National Museum of Natural History, Smithsonian Institution will be returned to Shishmaref. The land and water all around Shishmaref are used for hunting and harvesting.

Section 4. Flood

The following flood hazard profile includes a description of the hazard, the location, extent and probability of the hazard, and past occurrences of flooding in Shishmaref. Climate change, current mitigation projects, and flood and erosion mitigation goals and projects are also included.

Hazard Description

The primary flooding and erosion hazard in Shishmaref is storm surge flooding. Shishmaref is located on a low-lying barrier island with a large portion of the community located below 50 feet of elevation, and therefore, the community is susceptible to significant storm surge flooding. The effects of climate change are expected to add to natural hazards including flooding in coastal areas. As sea level rises and the offshore ice pack retreats, more coastal flooding can be expected.

Storm surge: Storm surges, or coastal floods, occur when the sea is driven inland above the high-tide level onto land that is normally dry. Often, heavy surf conditions driven by high winds accompany a storm surge adding to the destructive floodwater's force. The conditions that cause coastal floods also can cause significant shoreline erosion as the flood waters undercut roads and other structures. Storm surge is a leading cause of property damage in Alaska.

The meteorological parameters conducive to coastal flooding are low atmospheric pressure, strong winds (blowing directly onshore or along the shore with the shoreline to the right of the direction of the flow), and winds maintained from roughly the same direction over a long distance across the open ocean (fetch).

Communities that are situated on low-lying coastal lands with gradually sloping bathymetry near the shore and exposure to strong winds with a long fetch over the water are particularly susceptible to coastal flooding. Several communities and villages, including Shishmaref, along the Bristol Bay coast, the Bering Sea coast, the Arctic coast, and the Beaufort Sea coast have experienced significant damage from coastal floods over the past several decades. Most coastal flooding occurs during the late summer or early fall season in these locations. As shorefast ice forms along the coast before winter, the risk of coastal flooding abates.

Silent storm: Silent storms are a less severe form of storm surge flooding, resulting from high tides and winds. They occur quickly but are less destructive since they aren't accompanied by heavy surf.

Location

Shishmaref is located on a narrow, low-lying barrier island. The entire community is susceptible to significant storm surge and silent storm flooding.

Extent

The community has experienced severe coastal storms that eroded the island of Sarichef to such an extent that the community itself is on the brink of destruction (USACE, 2008). Flooding could have a **catastrophic** extent in Shishmaref as assessed by the criteria in Table 8.

There is the potential for multiple deaths, a complete shutdown of facilities for 30 days or more, and for more than half the property to be severely damaged.

Probability

Flooding is a **high** probability, as outlined in Table 9, with a high probability of occurring within the calendar year, up to a one in one year chance of occurrence. It is currently an ongoing problem and eventually will threaten the entire community unless mitigated. The *Alaska All-Hazard Risk Mitigation Plan* lists Shishmaref as having a flood hazard present with an unknown probability.

Impact

Coastal storm surge flooding and the resulting erosion will, if not mitigated, require the relocation of the entire community (USACE, 2008). The 2009 Alaska Baseline Erosion Assessment Report Summary estimated future erosion for Shismaref utilizing two erosion rates. The current profile shows extreme rates of erosion that will all but eliminate the community's viability in about 10 years. The longer period record shows a slower rate of about 25 years until the community is no longer viable. Loss of viability in this example means a significant decrease in the ability of the community to provide basic services for its residents (i.e., power, water, and education). These rates are highly subjective and can accelerate or decelerate based upon types of bank protection, magnitude and frequency of storms, and differences in soil conditions. Choosing a reasonable midpoint range yields a 10- to 15- year timeline before enough of the critical infrastructure is lost to force an evacuation. The relocation would result in the loss of cultural resources.

Previous Occurrences

The following information is from the DHS&EM *Disaster Cost Index*, January 2015.

13-S-244, 2013 November Storm Disaster declared by Governor Parnell on November 16, 2013 then FEMA declared January 23, 2014 (DR-4162): On November 5, 2013, the National Weather Service (NWS) issued the first of several coastal flood and winter storm warnings ranging from the central Aleutians to and including the western coastline of Alaska from Bristol Bay to the North Slope. In their published message the NWS warned of very strong low pressure system south of Shemya, moving to the central Bering and Chukchi Sea's bringing a combination of gale, high surf, high wind, freezing spray, coastal flooding and sea surge warnings and watches. The west coast was impacted with hurricane force winds exceeding 85 mph, high tidal ranges, and strong sea surges. The resultant impact culminated to, damage to public facilities including roads, seawalls, bridges, airports, and public buildings; damage to electrical distribution systems and drinking water systems; damages to private residences and the losses of personal and real property; and coastal flooding and power outages which necessitated evacuation

and sheltering operations. Overall, the series of storms created a threat to life and property in 23 cities and villages in the **Bering Strait Regional Educational Attendance Area (REAA)**, Lower Yukon REAA, and Lower Kuskokwim REAA, and the Fairbanks North Star Borough.

Per a letter report from the USACE, Alaska District regarding the September 10, 2014 annual inspection, the USACE is performing annual inspections of the Shishmaref Emergency Bank stabilization project. This project was conducted from 2005-2009 and built a revetment on the shoreline from the teachers' quarters to the eastern corner of the sewage lagoon fence. The report noted that the community of Shishmaref is working with FEMA and AKDOT&PF to reconstruct and protect their dump road. During the fall of 2013, the beach west of the USACE Phase IV future work breached the dump road. This report also documents that the permanent and non-permanent structures that were destroyed during the 2013 storms have been relocated to the east of town. Shishmaref Inlet (east of the community) has been experiencing deposition for the last couple of years. New land development east of the community has allowed the community to shift some development in that direction.

12-236, 2011 West Coast Storm declared by Governor Parnell on December 5, 2011 then FEMA declared December 22, 2011 (DR-4050): On November 7, 2011 the National Weather Service (NWS) issued the first of several coastal flood warnings for the western coastline of Alaska from Hooper Bay to the North Slope. The NWS warned of "*a rapidly intensifying storm…expected to be an extremely powerful and dangerous storm…one of the worst on record*." Over the next three days additional warnings in response to the 942 millibar low pressure system were issued for coastal villages as the storm moved northerly from the Aleutian Islands into the **Bering** and Chukchi **Seas**. The west coast was impacted with hurricane force winds exceeding 85 mph, high tidal ranges, and strong sea surges up to 10-ft above mean sea level (msl). Before the first storm had passed, a second equally-low pressure system (e.g., 942 millibar) impacted the western coastline from the Yukon-Kuskokwim Delta south to Bristol Bay. This combined weather extended the incident period for the state to November 13, 2011. The FEMA declaration was limited to the incident period from November 8 – 10, 2011.

09-227, 2009 Spring Flood declared by Governor Palin on May 6, 2009 then FEMA declared under DR-1843 on June 11, 2009: Extensive widespread flooding due to snow melt and destructive river ice jams caused by rapid spring warming combined with excessive snow pack and river ice thickness beginning April 28, 2009 and continuing. The ice jams and resultant water backup along with flood waters from snow melt left a path of destruction along 3,000 miles of interior rivers, destroying the Native Village of Eagle and forcing the evacuation of multiple communities. The following jurisdictions and communities in Alaska have been impacted: Alaska Gateway Rural Regional Educational Attendance Area (REAA) including the City of Eagle and Village of Eagle; the Copper River REAA including the Village Community of Chisotchina; the Matanuska-Susitna Borough; the Yukon Flats REAA including the City Community of Circle, and City of Fort Yukon, the Villages Communities of Chalkyistik, Beaver, Stevens Village, and Rampart; the Yukon-Koyukuk REAA including the Cities of Tanana, Ruby, Galena, Koyukuk, Nulato, and Kaltag; the Iditarod Area REAA including the Cities of McGrath, Grayling, Anvik, and Holy Cross; the

Northwest Arctic Borough including the Cities of Kobuk, and Buckland; the Lower Yukon REAA including the Cities of Russian Mission, Marshall, Saint Mary's, Mountain Village, Emmonak, Alakanuk and Pilot Station and the Community of Ohogamiut; the Lower Kuskokwim REAA including the Cities of Bethel, Kwethluk, Napakiak, Napaskiak, and the Village Community of Oscarville; the Yupiit REAA including the City of Akiak, and the Villages of Akiachak, and Tuluksak; the Kuspuk REAA including the Cities of Aniak, Upper Kalskag, Lower Kalskag, and the Villages Communities of Stony River, Sleetmute, Red Devil, Crooked Creek, and Napaimute; the Fairbanks North Star Borough including the City of North Pole and Community of Salcha; **the Bering Strait REAA** including the City of Nome area.

08-225 2007 Kivalina Storm Admin Order # 239 issued by Governor Palin on January 22, 2008: On September 12 and 13, 2007, a low pressure system from the Bering Sea generated storm conditions and coastal flood warnings for communities along the Chukchi Sea coast, including the Cities of Kivalina, **Shishmaref**, and Point Hope. Substantial coastal erosion by high winds, storm surge, and high waves generated by the storm further damaged the existing sea wall adjacent to the AVEC bulk fuel facility. The Northwest Arctic Borough (NWAB) sent a disaster declaration to the DHS&EM on September 25 that included AVEC's response and tank farm relocation costs.

03-201 Northwest Fall Sea Storm Declared October 23, 2002: Coastal storm surge flooding occurred in communities on the Northwestern coast of Alaska commencing on October, 8, 2002. A fall sea storm with 18 to 20-foot seas, extremely high winds, and strong tidal action caused severe damage. This storm was caused by a low pressure system moving down from the Arctic Ocean and settling over the Chuckchi Sea and the Kotzebue Sound resulting in widespread damage and coastal flooding, including damage to public roads and other public real property. The Governor declared a disaster for the cities of Kotzebue and Kivalina in the Northwest Arctic Borough. On November 6, 2002, an amendment was made to the original declaration to include the community of **Shishmaref**. The Northwest Arctic Borough (NWAB) provided funds to the City of Kotzebue ($10,000) and the City of Kivalina ($5,000). NWAB was provided a grant to reimburse funds given to those communities. Shishmaref did not have any eligible damage or expenses. The total for this disaster is $382K. This is only for Public Assistance totaling $344K for 4 potential applicants with 1 PW.

Climate Influence upon Storm Surge Flooding

The following is from the Alaska Chapter of the Climate Change Impacts in the United States: The Third National Climate Assessment, 2014:

> Arctic summer sea ice is receding faster than previously projected and is expected to virtually disappear before mid-century. This is altering marine ecosystems and leading to greater ship access, offshore development opportunity, and increased community vulnerability to coastal erosion. Arctic sea ice extent and thickness have declined substantially, especially in late summer, when there is now only about half as much sea ice as at the beginning of the satellite record in 1979. The seven Septembers with the lowest ice extent all occurred in the past seven years. There is new information that lack of sea ice causes storms to produce larger waves and more coastal erosion. An

additional contributing factor is that coastal bluffs that were "cemented" by permafrost are beginning to thaw in response to warmer air and ocean waters, and are therefore more vulnerable to erosion. Standard defensive adaptation strategies to protect coastal communities from erosion such as use of rock walls, sandbags, and riprap have been largely unsuccessful.

Community Participation in the NFIP

The City of Shishmaref participates in the NFIP. The function of the NFIP is to provide flood insurance at a reasonable cost to homes and businesses located in floodplains. In trade, the City of Shishmaref agreed to regulate new development and make substantial improvement to existing structures in the floodplain, or to build safely above flood heights to reduce future damage to new construction. The program is based upon mapping areas of flood risk, and requiring local implementation to reduce flood damage primarily through requiring the elevation of structures above the base (100-year) flood elevations. Table 16 describes the FIRM zones. Maps 3 and 4 illustrate the Flood Hazard Zones for Shishmaref from FIRM.

Table 16. FIRM Zones

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

Development permits for all new building construction, or substantial improvements, are required by the City in all A, AO, AH, A-numbered Zones. Flood insurance purchase may be required in flood zones A, AO, AH, A-numbered zones as a condition of loan or grant assistance. An Elevation Certificate is required as part of the development permit. The Elevation Certificate is a form published by the FEMA

required to be maintained by communities participating in the NFIP. According to the NFIP, local governments maintain records of elevations for all new construction, or substantial improvements, in floodplains and to keep the certificates on file.

Elevation Certificates are used to:

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

Floodplain mapping was updated for Shishmaref in May 2010. The north shore is located within a VE zone (areas subject to inundation by the one-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action); coastal flood with velocity hazard (wave action); base flood elevations determined. The majority of the town site is located within an area determined to be outside the 500-year floodplain. Flood hazard zones as delineated in the FIRM, are shown on Maps 3 and 4.

Map 3. Flood Hazard Zones from FIRM

Map 4. Flood Hazard Zones from FIRM

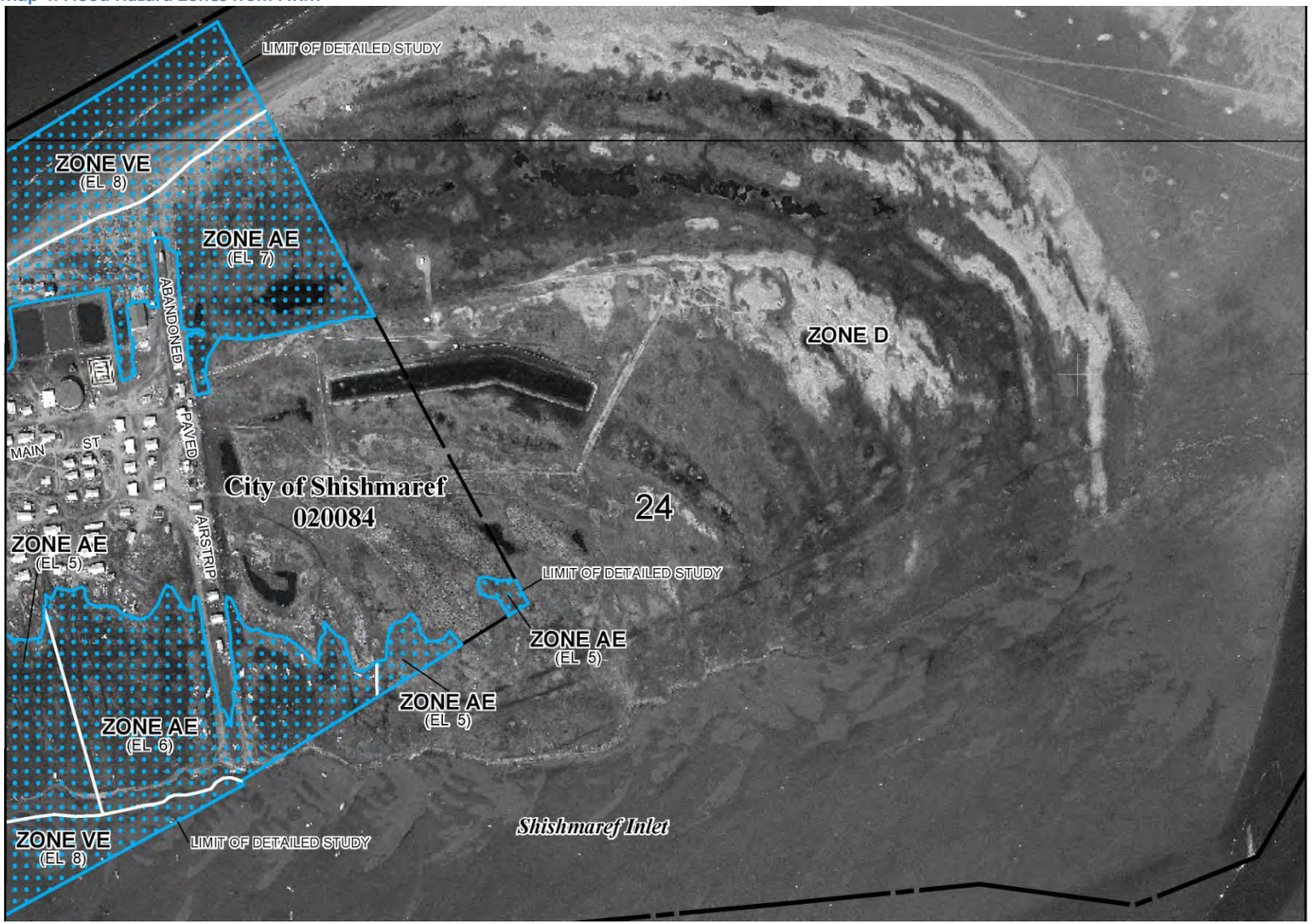


Table 17. NFIP Statistics

Emergency Program Date Identified	Regular Program Entry Date	Map Revision Date	NFIP Community Number	CRS Rating Number	Total # of Current Policies (10/13/09)
6/5/1988	8/23/2001	Prelim. 5/3/2010	020084	None	16
Total Premiums	**Total Loss Dollars Paid**	**Average Value of Loss**	**AK State # of Current Policies**	**AK State Total Premiums**	**AK Total Loss Dollars Paid**
$19,583	$133,490	$66,745	2,979	$2.7 million	$9.5 million
Shishmaref Average Premium	**AK State Average Premium**	**Repetitive Loss Claims**	**Dates of Rep. Losses**	**Total Rep. Loss**	**Average Rep. Loss**
$1,224	$905	0	0	0	0

Source: DCRA, DCA, Floodplain Management

Table 18. Housing Use Types in Shishmaref

Housing Types	Number of Structures
Total Housing Units	151
Occupied Housing (Households)	141
Vacant Housing	10
Vacant Due to Seasonal Use	1
Households located in the flood plain	UNKNOWN

Table 19. Local and State Floodplain Coordinator Contact Information

Shishmaref Floodplain Coordinator	City Contact Person: Zena Barr, City Clerk Address: PO Box 83, Shishmaref, AK 99772 Phone: (907) 649-3781 Email: cityofshhclerk@gci.net
State of AK Floodplain Coordinator	Floodplain Management Programs Coordinator Division of Community Advocacy Department of Commerce, Community & Economic Development Taunnie Boothby, State Floodplain Coordinator 550 W. 7th Avenue, Suite 1640 Anchorage, AK 99501 (907) 269-4583 (907) 269-4066 (fax) Email: taunnie_boothby@alaska.gov Web: http://commerce.alaska.gov/dnn/dcra/PlanningLandManagement/FloodplainManagement.aspx

Repetitive Loss Properties

The risk assessment in all plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged in floods.

Under NFIP guidelines, repetitive loss structures include any currently insured building with two or more flood losses (occurring more than ten days apart) greater than $1,000 in any 10-year period since 1978.

States should provide communities with information on historic floods throughout the state so communities will know what type of damage has occurred (even if it didn't occur within that particular community).

States should ensure that lists of repetitive loss properties are kept up to date and that communities have the most current list. States should contact their FEMA Regional Office for this information.

FEMA also maintains a national list of properties that comprise the “Repetitive Loss Target Group”. These are repetitive loss properties that have either experienced four or more losses with the characteristics above, or have had losses that cumulatively exceed the property value of the building.

Repetitive loss properties are those with at least two losses in a rolling ten-year period and two losses that are at least ten days apart. Specific property information is confidential, but the State DCRA Floodplain Coordinator related that within the City of Shishmaref there have been **zero** properties that meet the FEMA definition of repetitive loss.

Current Mitigation Projects

Three projects have been constructed for erosion control and shoreline protection; the total cost was approximately $3.7 million. Funding came to a half in 2008 after Section 117 was repealed.

Flood Mitigation Goals and Projects

Flood Goals

Goal 1. Reduce flood damage.

Goal 2. Prevent future flood damage.

Goal 3: Increase public awareness

Flood Projects

After receiving public input, it is the recommendation of this plan that the City of Shishmaref, along with other local, State, and Federal entities look at the following projects for flood control.

See Table 21 for analysis of projects to mitigate flooding and erosion.

FLD-1. Train/Drill Suite of Emergency Plans (Goals 1, 2, 3)

A suite of emergency plans including Emergency Operations, Community Evacuation and Hazard Mitigation, were developed in 2010. The community needs to be provided with training on conducting community drills to provide readiness in case of a flood.

FLD-2. Community Mitigation and Relocation Planning and Coordination (Goals 1, 2)

Coordinate with DCCED/DCRA to develop community mitigation and relocation plans.

FLD-3. ADOT/PF Preliminary Engineering & Early Coordination (Goals 1)

This study will examine the feasibility of a road from the island to the mainland. If constructed, this road would be used as an evacuation route and may be used in the relocation of the community.

FLD-4. Letter of Map Revision for Flood Insurance Rate Maps (Goals 1, 3)

FLD-5. Structure Elevation and/or Relocation (Goals 1, 2)

Relocate or elevate structures in immediate danger of flooding.

FLD-6. Update FIRM Shishmaref Maps (Goals 1, 2, 3)

Update flood maps that delineate areas of flooding.

FLD-7. Pursue obtaining a Community Rating System (CRS) Rating (Goal 1, 2, 3)

The NFIP CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Obtaining a CRS rating may lower flood insurance rates.

FLD-8. Continue to obtain flood insurance for all City structures, and continue compliance with NFIP (Goals 1, 2)

FLD-9. Require that all new structures be constructed according to NFIP requirements and set back from the coastal shoreline to lessen future erosion concerns and costs (Goals 1, 2)

FLD-10. Public Education (Goals 1, 3)

Increase public knowledge about mitigation opportunities, floodplain functions, emergency service procedures, and potential hazards. This would include advising property owners, potential property owners, and visitors about the hazards. In addition, dissemination of a brochure or flyer on flood hazards in Shishmaref could be developed and distributed to all households.

FLD-11. Emergency Shelter Upgrades (Goals 1, 3)

The Shishmaref Lutheran Church is designated as an emergency shelter. The Church does not have a kitchen which may be required during an extended flooding event.

Section 5. Erosion

Hazard Description

Erosion is a process that involves the wearing away, transportation, and movement of land. Erosion rates can vary significantly as erosion can result quickly from a flash flood, coastal storm, or other event, or quite slowly from long-term environmental changes. Erosion is a natural process, but human activity exacerbates its effects.

Erosion in Shishmaref is primarily coastal erosion.

Coastal erosion: Coastal erosion is the wearing away of coastal land. It is commonly used to describe the horizontal retreat of the shoreline along the ocean, or the vertical down cutting along the shores of the Great Lakes. Erosion is considered a function of larger processes of shoreline change, which include erosion and accretion. Erosion results when more sediment is lost along a particular shoreline than is redeposited by the water body. Accretion results when more sediment is deposited along a particular shoreline than is lost. When these two processes are balanced, the shoreline is said to be stable. In assessing the erosion hazard, it is important to realize that there is a temporal, or time aspect, associated with the average rate at which a shoreline is either eroding or accreting. Over a long-term period (years), a shoreline is considered to be eroding, accreting, or stable. A hazard evaluation should focus on the long-term erosion situation. However, in the short-term, it is important to understand that storms can erode a shoreline that is, over the long-term, classified as accreting, and vice versa.

Erosion is measured as a rate, with respect to either a linear retreat (i.e., feet of shoreline recession per year) or volumetric loss (i.e., cubic yards of eroded sediment per linear foot of shoreline frontage per year). Erosion rates are not uniform, and vary over time at any single location. Annual variations are the result of seasonal changes in wave action and water levels.

Erosion is caused by coastal storms and flood events; changes in the geometry of tidal inlets, river outlets, and bay entrances; man-made structures and human activities such as shore protection structures and dredging; long-term erosion; and local scour around buildings and other structures. Further information on coastal erosion can be found in FEMA-55, Coastal Construction Manual, FEMA's *Multi-hazard Identification and Risk Assessment, Evaluation of Erosion Hazards* published by The Heinz Center, and *Coastal Erosion Mapping and Management*, a special edition of the Journal of Coastal Research. (FEMA, 386-2)

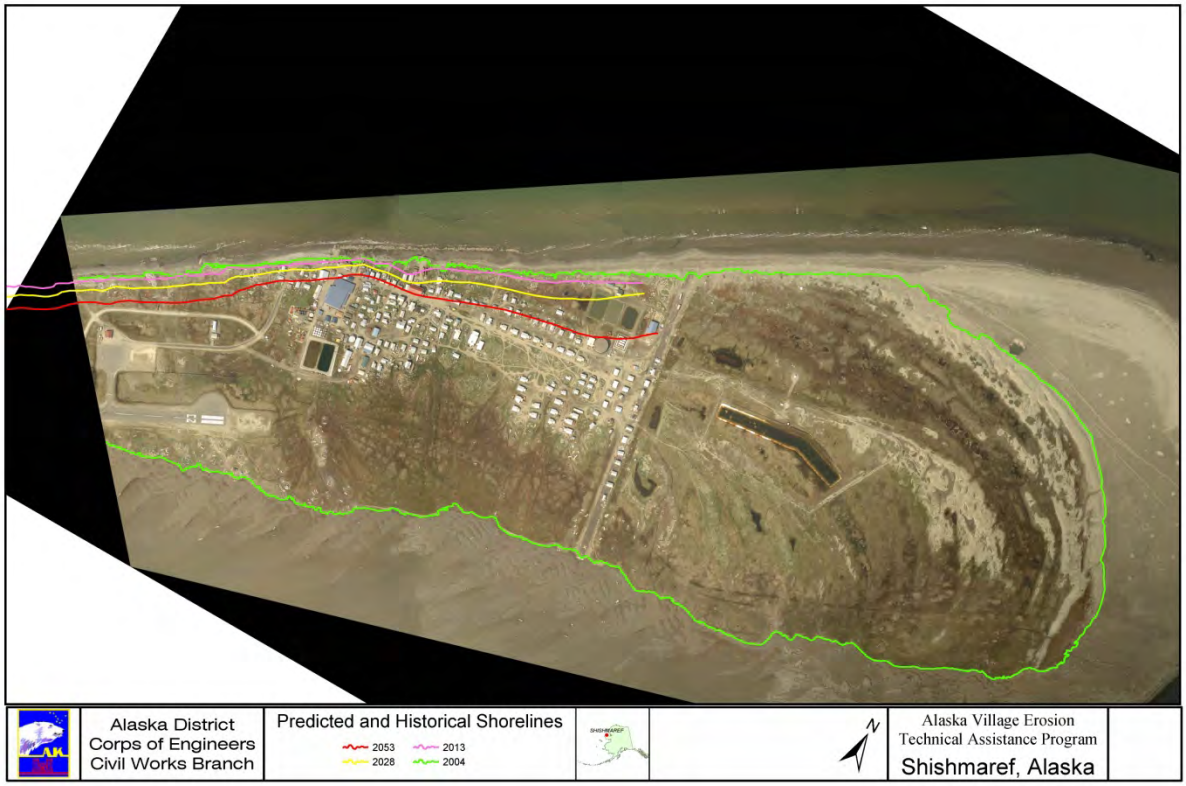
Location

Shishmaref is located on a barrier island formed by frozen sandy soils which are susceptible to significant erosion. The primary erosion hazards are wave and slough erosion, sea ice gouging, and slumping resulting from melting permafrost. The entire community is susceptible to erosion.

Extent

Erosion could have a **catastrophic** extent in Shishmaref as assessed by the criteria in Table 8. There is the potential for multiple deaths, a complete shutdown of facilities for 30 days or more, and for more than half the property to be severely damaged. Figure 2 shows predicted and historical shorelines.

Figure 2. Historic Shorelines



Source: 2009 U.S. Army Corps of Engineers, Alaska District Alaska Baseline Erosion Assessment, AVETA Report Summary – Shishmaref, Alaska.

Probability

The erosion of the north shore is a **high** probability, as outlined in Table 9. It is currently an ongoing problem and eventually will threaten the entire community unless mitigated. The *Alaska All-Hazard Risk Mitigation Plan* lists Shishmaref as having an erosion hazard present with an unknown probability.

The USACE calculated two annual erosion rates. The low annual erosion rates are estimated to be between 2.7 to 13 feet per year; the high annual erosion rates are estimated between 8.9 to 22.6 feet per year (USACE, 2008).

Impact

Erosion at the north shore will, if not mitigated, require the relocation of the entire community. Infrastructures including the community washeteria and sewage lagoon, located along the northeast shoreline, are in immediate danger. Relocation would result in the loss of cultural resources.

Previous Occurrences

The following information is from the DHS&EM Disaster Cost Index, January 2015.

13-S-244, 2013 November Storm Disaster declared by Governor Parnell on November 16, 2013 then FEMA declared January 23, 2014 (DR-4162): On November 5, 2013, the National Weather Service (NWS) issued the first of several coastal flood and winter storm warnings ranging from the central Aleutians to and including the western coastline of Alaska from Bristol Bay to the North Slope. In their published message the NWS warned of very strong low pressure system south of Shemya, moving to the central Bering and Chukchi Sea's bringing a combination of gale, high surf, high wind, freezing spray, coastal flooding and sea surge warnings and watches. The west coast was impacted with hurricane force winds exceeding 85 mph, high tidal ranges, and strong sea surges. The resultant impact culminated to, damage to public facilities including roads, seawalls, bridges, airports, and public buildings; damage to electrical distribution systems and drinking water systems; damages to private residences and the losses of personal and real property; and coastal flooding and power outages which necessitated evacuation and sheltering operations. Overall, the series of storms created a threat to life and property in 23 cities and villages in the **Bering Strait REAA**, Lower Yukon REAA, and Lower Kuskokwim REAA, and the Fairbanks North Star Borough.

02-198 **Shishmaref** Seawall (Admin Order 194): Winds and high tides combined to strike the Shishmaref coastline from October 5 through October 7, 2001, and eroded inward as much as 50 feet. Some sections of the sand scarp were undercut as much as 16 to 20 feet due to the surf melting the underlying permafrost. In order to prevent further destruction of the coastline due to storms prior to tidewater freeze up, Governor Knowles issued Administrative Order No. 194 on October 27, 2001, which was not to exceed $110K (including DES administrative costs). These Public Assistance funds were to be used to establish a sacrificial sandbag revetment to last through the storm season. The total for this incident is $87,858.74.

98-186 Shishmaref Sea Storm: On October 6, 1997, under authority granted by the Alaska Statutes, Section 26.23.020, the Governor declared a condition existed in the City of **Shishmaref** to warrant a disaster declaration in order to provide for assistance. An unusually early sea storm caused severe damage resulting in homes being eroded into tidewater and being destroyed. Additional federal assistance under the Federal Emergency Management Agencies Flood Mitigation Assistance Grant in the amount of $600,000 was provided to complete the move of additional damaged structures. In addition, the Alaska Housing Finance Corporation provided $200,000 in housing assistance for the match to the federal assistance. Individual Assistance totaled $16K for six applicants. Public Assistance totaled $1.2

million for three applicants and 14 DSR's. Hazard Mitigation totaled $50K. The total for this disaster is $1.46 million.

80 Shishmaref, August 5, 1988: In late July and early August, a series of intense windstorms with sea surges caused extensive damage to the seawall and erosion protection structure in the village of **Shishmaref,** leaving a number of critical public and private buildings subject to imminent damage. State disaster assistance provided funding to repair the damage.

Climate Influence upon Erosion

The following is from the Alaska Chapter of the Climate Change Impacts in the United States: The Third National Climate Assessment, 2014:

> There is new information that lack of sea ice causes storms to produce larger waves and more coastal erosion. An additional contributing factor is that coastal bluffs that were "cemented" by permafrost are beginning to thaw in response to warmer air and ocean waters, and are therefore more vulnerable to erosion. Standard defensive adaptation strategies to protect coastal communities from erosion such as use of rock walls, sandbags, and riprap have been largely unsuccessful.
>
> Shishmaref faces immediate threat from coastal erosion and is seeking to relocate, but has been unsuccessful in doing so.

Current Mitigation Projects

Three projects have been constructed for erosion control and shoreline protection; the total cost was approximately $3.7 million. Funding was lost for additional projects when Section 117 was repealed, and no work has been completed since 2008. About half of the sea wall was built before Section 117 was repealed.

Erosion Mitigation Goals and Projects

Erosion Goals

Goal 1. Reduce erosion damage.

Goal 2. Prevent future erosion damage.

Erosion Projects

ER 1: Revetment/Beach Erosion Control Project (Goals 1, 2)

Phase 1: 600 feet of rock revetment was completed in September 2008.

Phase 2: 750 feet of rock revetment was completed in 2009.

Phase 3: 550 feet of rock revetment under design in 2009; construction funding needed.

Phase 4: 1,225 feet to be surveyed in 2009; of this 325 feet will be new rock revetment and 900 feet will be raising existing revetments when funding is provided.

Phases III and IV have not been executed as of June 2015. This is due to the revocation of the original 100% Federal cost authorization (Section 117) by Congress. Subsequently, Congress passed a new law containing a cost-shared authority (Section 116) which has been identified as an acceptable method of completing the already authorized Section 117 projects. However, use of that authority requires a sponsor willing and able to provide a 35% cost-share for the costs of design and construction. Shishmaref has not been able to identify a funding source for this work; thus, the work of migrating the remaining project to the available authority has not been initiated.

Section 6. Severe Weather

Hazard Description

Weather is the result of four main features: the sun, the planet's atmosphere, moisture, and the structure of the planet. Certain combinations can result in severe weather events that have the potential to become a disaster.

In Alaska, there is great potential for weather disasters. High winds can combine with loose snow to produce a blinding blizzard and wind chill temperatures to 75°F below zero. Extreme cold (-40°F to -60°F) and ice fog may last for weeks at a time. Heavy snow can impact the interior and is common along the southern coast. A quick thaw means certain flooding.

In many Alaskan communities, severe weather can disrupt the delivery of fuel by barge or aircraft. Since residents are generally dependent on diesel electric power for heat as well as energy needs, this can be disastrous to the community as a whole.

Weather issues in Shishmaref include winter storms, heavy snow, extreme cold, ice storms, advection fog, and drought.

Winter Storms

Winter storms originate as mid-latitude depressions or cyclonic weather systems. High winds, heavy snow, and cold temperatures usually accompany them. To develop, they require:

Cold air - Subfreezing temperatures (below 32ºF, 0ºC) in the clouds and/or near the ground to make snow and/or ice.

Moisture - The air must contain moisture in order to form clouds and precipitation.

Lift - A mechanism to raise the moist air to form the clouds and cause precipitation. Any or all of the following may provide lift:

- The flow of air up a mountainside.
- Fronts, where warm air collides with cold air and rises over the dome of cold air.
- Upper-level low-pressure troughs.

Heavy Snow

Heavy snow, generally more than 12 inches of accumulation in less than 24 hours, can immobilize a community by bringing transportation to a halt. Until the snow can be removed, airports and major 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 villages and communities. Injuries and deaths related to heavy snow usually occur as a result of vehicle accidents. Casualties also occur due to overexertion while shoveling snow and hypothermia caused by overexposure to the cold weather.

Extreme Cold

What is considered an excessively cold temperature varies according to the normal climate of a region. In areas unaccustomed to winter weather, near freezing temperatures are considered "extreme cold". In Alaska, extreme cold usually involves temperatures below –40 degrees Fahrenheit. Excessive cold may accompany winter storms, be left in their wake, or can occur without storm activity.

Extreme cold can bring transportation to a halt across the interior for days or sometimes weeks at a time. Aircraft may be grounded due to extreme cold and ice fog conditions, cutting off access as well as the flow of supplies to northern villages. This can result from severe weather in the community or in hub locations from where air travel originates.

Extreme cold also interferes with a community's infrastructure. It causes fuel to congeal in storage tanks and supply lines, stopping electric generation. Without electricity, heaters 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.

Ice Storms

The term ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. They can be the most devastating of winter weather phenomena and are often the cause of automobile accidents, power outages, and personal injury. Ice storms result from the accumulation of freezing rain, which is rain that becomes super cooled and freezes upon impact with cold surfaces. Freezing rain most commonly occurs in a narrow band within a winter storm that is also producing heavy amounts of snow and sleet in other locations.

Freezing rain develops as falling snow encounters a layer of warm air in the atmosphere deep enough for the snow to completely melt and become rain. As the rain continues to fall, it passes through a thin layer of cold air just above the earth's surface and cools to a temperature below freezing. The drops themselves do not freeze, but rather they become super cooled. When these super cooled drops strike the frozen ground, power lines, tree branches, etc., they instantly freeze.

Advection Fog

Advection fog is the result of condensation, occurring when warm moist air moves horizontally over a cold surface. Advection fog varies in depth from three feet to about 1,000 feet and is always found at ground level. This type of fog can reduce visibility to near zero (NOAA).

Unless equipped with an Instrumental Landing System, fog prevents aircraft from taking off or landing. Fog can be especially hazardous for light aircraft which often overfly the airfield to assess landing conditions.

The village of Shishmaref is often impacted by fog during the spring; when sea ice cools warm moist spring air creating a dense fog. Spring fog sometimes lasts a couple of day or even several weeks. The fog can prevent aircraft from landing and resupplying the village with food and other critical supplies.

Drought

Drought commonly occurs over a defined period of time of very low precipitation. Drought severity depends on duration, intensity, and geographic extent, as well as the demand on the water supply.

There are three ways to define drought:

1. Meteorological - a degree of dryness. Measures lack of actual precipitation compared to an expressed average.
2. Agricultural - defined as soil moisture deficiencies relative to what the plant life needs.
3. Hydrological - relates to the effects of the lack of precipitation on streams, rivers, lakes, and groundwater levels.

A drought may result in a shortage of water for residential uses and increase wildland fire hazard.

Rain, snow, and ice are the primary source of drinking water in Shishmaref. Small shallow ponds are also used for potable water. Sarichef Island's mean annual runoff quantities are approximately 200,000 to 300,000 gallons per acre; during drought years, less than half of this amount may be available (Wheaton 1980), resulting in a shortage of drinking water for residents.

Location

The hazards of severe weather impact Shishmaref on an area-wide basis. A severe weather event would create an area-wide impact, damage structures, and potentially isolate Shishmaref from the rest of the state. Severe weather affecting regional transportation hubs (i.e. Nome and Kotzebue) also impacts Shishmaref, grounding flights and preventing the transportation of critical goods into the village.

Extent

Severe weather could result in a **critical** situation in Shishmaref. Injuries and/or illness could result from excessive snowfall, extreme cold, fog, or drought causing shutdown of critical facilities, damage to property, water shortage, and isolation of Shishmaref from mainland Alaska.

The *Alaska All-Hazard Risk Mitigation Plan, 2013* lists severe weather as creating 19 limited-damage events in Bering Strait REAA.

Impact

Severe weather can cut off air access limiting medevac availability and access to goods and services, including groceries and medical supplies. A severe weather event would create an area-wide impact and could damage structures and potentially isolate Shishmaref from the rest of the state.

Probability

The City Council and residents describe severe weather as a serious natural hazard risk in Shishmaref, due to snow, ice, high winds, fog, and drought. Shishmaref has a highly likely probability of severe weather, which is defined, as the hazard is present with a high probability of occurrence within the calendar year. The Event has up to a 1 in 1 chance of occurring.

Previous Occurrences

Table 20 from the Western Regional Climate Center provides a weather summary for Tin City. Historic weather data is not available for Shishmaref but is available for nearby Tin City where weather conditions are comparable.

Climate Influence upon Severe Weather

Climatic influences upon regional weather activity are the El Nino/La Nina Southern Oscillation (ENSO) patterns, atmospheric composition and temperatures, and sea temperatures. The Governor appointed Alaska Climate, Ecosystems & Human Health Work Group is determining the pending impact to human health from a changing climate, and subsequently, regional ecosystems.

Severe Weather Mitigation Goals and Projects

Severe Weather Goals

Goal 1: Mitigate the effects of severe weather by instituting programs that provide early warning and preparation.

Goal 2: Educate people about the dangers of severe weather and how to prepare.

Goal 3: Develop practical measures to warn in the event of a severe weather event.

Severe Weather Projects

SW 1: Storm Ready (Goals 1, 2, 3)

Research and consider instituting the National Weather Service program of *"Storm Ready"*.

Storm Ready is a nationwide community preparedness program that uses a grassroots approach to help communities develop plans to handle all types of severe weather—from tornadoes to tsunamis. The program encourages communities to take a new, proactive approach to improving local hazardous weather operations by providing emergency managers with clear-cut guidelines on how to improve their hazardous weather operations.

To be officially Storm Ready, a community must:

1. Establish a 24-hour warning point and emergency operations center.
2. Have more than one way to receive severe weather forecasts and warnings and to alert the public.
3. Create a system that monitors local weather conditions.
4. Promote the importance of public readiness through community seminars.
5. Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises.
6. Demonstrate a capability to disseminate warnings.

Specific Storm Ready guidelines, examples, and applications also may be found on the Internet at: http://www.nws.noaa.gov/stormready.

SW2: Conduct special awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, etc. (Goals 1, 2)

SW3: Expand public awareness about NOAA Weather Radio for continuous weather broadcasts and warning tone alert capability. (Goals 1, 2)

SW4: Encourage weather resistant building construction materials and practices. (Goals 1, 2)

SW5: Install City-wide warning sirens. (Goals 1, 2, 3)

SW6: Develop a policy with local mail and freight carriers to ensure groceries, medical supplies and other necessities are delivered before non-essential mail after periods of limited air service. (Goals 1, 2)

Table 20. Tin City Weather Summary

Station:(509249) TIN CITY															
From Year=1966 To Year=1985															
	Monthly Averages			Daily Extremes				Monthly Extremes				Max. Temp.		Min. Temp.	
	Max.	Min.	Mean	High	Date	Low	Date	Highest Mean	Year	Lowest Mean	Year	>= 90 F	<= 32 F	<= 32 F	<= 0 F
	F	F	F	F	dd/yyyy or yyyymmdd	F	dd/yyyy or yyyymmdd	F	-	F	-	# Days	# Days	# Days	# Days
January	7.9	-2.6	2.7	36	Jun-77	-33	28/1984	16.7	1979	-8.5	1970	0	29.3	30.4	18.2
February	-0.4	-10.2	-5.3	41	13/1970	-39	19/1984	10.4	1982	-24.8	1984	0	27.2	28.2	21.6
March	4.2	-6.1	-1	38	Oct-84	-41	Jun-70	15.2	1967	-16.5	1977	0	30.1	30.7	21.9
April	13.3	3.6	8.5	46	30/1967	-26	Oct-84	18.4	1981	-4	1984	0	27.4	29.6	13.3
May	30.6	23	26.8	56	29/1983	-6	Mar-84	31.7	1969	21.1	1971	0	19.2	28.4	0.2
June	42.8	34.2	38.4	74	28/1971	23	May-69	42.2	1981	33.8	1975	0	1.9	12.4	0
July	49.9	41.9	45.9	73	22/1968	32	Feb-76	50.1	1977	42	1973	0	0	0.4	0
August	48.9	42.2	45.6	69	Apr-67	31	31/1980	50	1974	41.8	1984	0	0	0.2	0
September	43.1	36.5	39.8	61	Jul-74	21	20/1975	44.8	1974	34.7	1975	0	1	6.6	0
October	30.6	24.4	27.5	49	Feb-79	-4	31/1982	31.4	1969	22.9	1970	0	18	26.8	0.1
November	19.8	11.6	15.7	43	29/1983	-18	30/1968	23.4	1978	5.2	1969	0	26.4	29.2	4.9
December	7.8	-1.8	3	40	20/1983	-31	30/1974	19.8	1983	-13.2	1974	0	29.2	30.6	20
Annual	**24.9**	**16.4**	**20.6**	**74**	**19710628**	**-41**	**19700306**	**24.8**	**1967**	**17.3**	**1976**	**0**	**209.7**	**253.3**	**100.2**
Winter	5.1	-4.9	0.1	41	19700213	-39	19840219	8.5	1979	-8.3	1976	0	85.7	89.1	59.8
Spring	16.1	6.8	11.4	56	19830529	-41	19700306	20.8	1967	4.5	1984	0	76.7	88.7	35.4
Summer	47.2	39.4	43.3	74	19710628	23	19690605	45.3	1982	40.9	1973	0	1.9	13	0
Fall	31.1	24.2	27.7	61	19740907	-18	19681130	30.6	1978	23.2	1975	0	45.4	62.5	5

Section 7. Earthquakes

Hazard Description

Approximately 11 percent of the world's earthquakes occur in Alaska, making it one of the most seismically active regions in the world. Three of the ten largest quakes in the world since 1900 have occurred here. Earthquakes of magnitude 7 or greater occur in Alaska on average of about once a year; magnitude 8 earthquakes average about 14 years between events.

Most large earthquakes are caused by a sudden release of accumulated stresses between crustal plates that move against each other on the earth's surface. Some earthquakes occur along faults that lie within these plates. The dangers associated with earthquakes include ground shaking, surface faulting, ground failures, snow avalanches, seiches, and tsunamis. The extent of damage is dependent on the magnitude of the quake, the geology of the area, distance from the epicenter, and structure design and construction. A main goal of an earthquake hazard reduction program is to preserve lives through economical rehabilitation of existing structures and constructing safe new structures.

Ground shaking is due to the three main classes of seismic waves generated by an earthquake. Primary waves are the first ones felt, often as a sharp jolt. Shear or secondary waves are slower and usually have a side to side movement. They can be very damaging because structures are more vulnerable to horizontal than vertical motion.

Surface waves are the slowest, although they can carry the bulk of the energy in a large earthquake. The damage to buildings depends on how the specific characteristics of each incoming wave interact with the buildings' height, shape, and construction materials.

Earthquakes are usually measured in terms of their magnitude and intensity. Magnitude is related to the amount of energy released during an event while intensity refers to the effects on people and structures at a particular place. Earthquake magnitude is usually reported according to the standard Richter scale for small to moderate earthquakes.

Large earthquakes, like those that commonly occur in Alaska, are reported according to the moment-magnitude scale because the standard Richter scale does not adequately represent the energy released by these large events.

Intensity is usually reported using the Modified Mercalli Intensity Scale. This scale has 12 categories ranging from not felt to total destruction. Different values can be recorded at different locations for the same event depending on local circumstances such as distance from the epicenter or building construction practices. Soil conditions are a major factor in determining an earthquake's intensity, as unconsolidated fill areas will have more damage than an area with shallow bedrock. Surface faulting is the differential movement of the two sides of a fault. There are three general types of faulting.

Strike-slip faults are where each side of the fault moves horizontally. Normal faults have one side dropping down relative to the other side. Thrust (reverse) faults have one side moving up and over the fault relative to the other side.

Earthquake-induced ground failure is often the result of liquefaction, which occurs when soil (usually sand and course silt with high water content) loses strength as a result of the shaking and acts like a viscous fluid.

Liquefaction causes three types of ground failures: lateral spreads, flow failures, and loss of bearing strength. In the 1964 earthquake, over 200 bridges were destroyed or damaged due to lateral spreads. Flow failures damaged the port facilities in Seward, Valdez, and Whittier.

Similar ground failures can result from loss of strength in saturated clay soils, as occurred in several major landslides that were responsible for most of the earthquake damage in Anchorage in 1964. Other types of earthquake-induced ground failures include slumps and debris slides on steep slopes.

Location

Shishmaref is located north of the Kigluak and Bendeleben faults; however, it is unclear whether any seismic activity centers on these faults. An earthquake hazard event could potentially impact any part of Shishmaref. Since the community is dependent on air transportation for delivery of food, fuel, medical services, etc., airport facilities are of particular concern, both in Shishmaref and in the transportation hubs that serve the community.

Extent

The extent of an earthquake in Shishmaref would have a **limited** extent. Per the community, an earthquake has not been felt for at least 15 years.

Table 8 uses the following criteria to determine the extent of possible damage: 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.

Intensity is a subjective measure of the strength of the shaking experienced in an earthquake. Intensity is based on the observed effects of ground shaking on people, buildings, and natural features. It varies from place to place within the disturbed region depending on the location of the observer with respect to the earthquake epicenter.

The "intensity" reported at different points generally decreases away from the earthquake epicenter. Local geologic conditions strongly influence the intensity of an earthquake; commonly, sites on soft ground or alluvium have intensities two to three units higher than sites on bedrock.

The Richter scale expresses magnitude as a decimal number. A 5.0 earthquake is a moderate event, 6.0 characterizse a strong event, 7.0 is a major earthquake and a great earthquake exceeds 8.0. The scale is logarithmic and open-ended. (*Alaska All-Hazard Risk Mitigation Plan*, 2013)

A magnitude of 2 or less is called a microearthquake; they cannot even be felt by people and are recorded only on local seismographs. Events with magnitudes of about 4.5 or greater are strong enough to be recorded by seismographs all over the world. But the magnitude would have to be higher than 5 to be considered a moderate earthquake, and a large earthquake might be rated as magnitude 6 and major as 7. Great earthquakes (which occur once a year on average) have magnitudes of 8.0 or higher (British Columbia 1700, Chile 1960, Alaska 1964). The Richter Scale has no upper limit, but for the study of massive earthquakes, the moment magnitude scale is used. The modified Mercalli Intensity Scale is used to describe earthquake effects on structures.

Figure 3 shows historic seismicity and also provides additional details of interest. The figures and other information at the Alaska Earthquake Information Center (AEIC) website list the Shishmaref area as having a low probability of an earthquake. However, since all of Alaska is at risk for an earthquake event, Shishmaref could be at risk for an earthquake or have secondary impact from an earthquake in the region.

Impact

The impact on the community of Shishmaref of a severe earthquake event occurring near the town site would be limited. The impact of a severe earthquake event impacting Nome, Fairbanks, or Anchorage (vital transportation hubs) could potentially have a greater impact on Shishmaref.

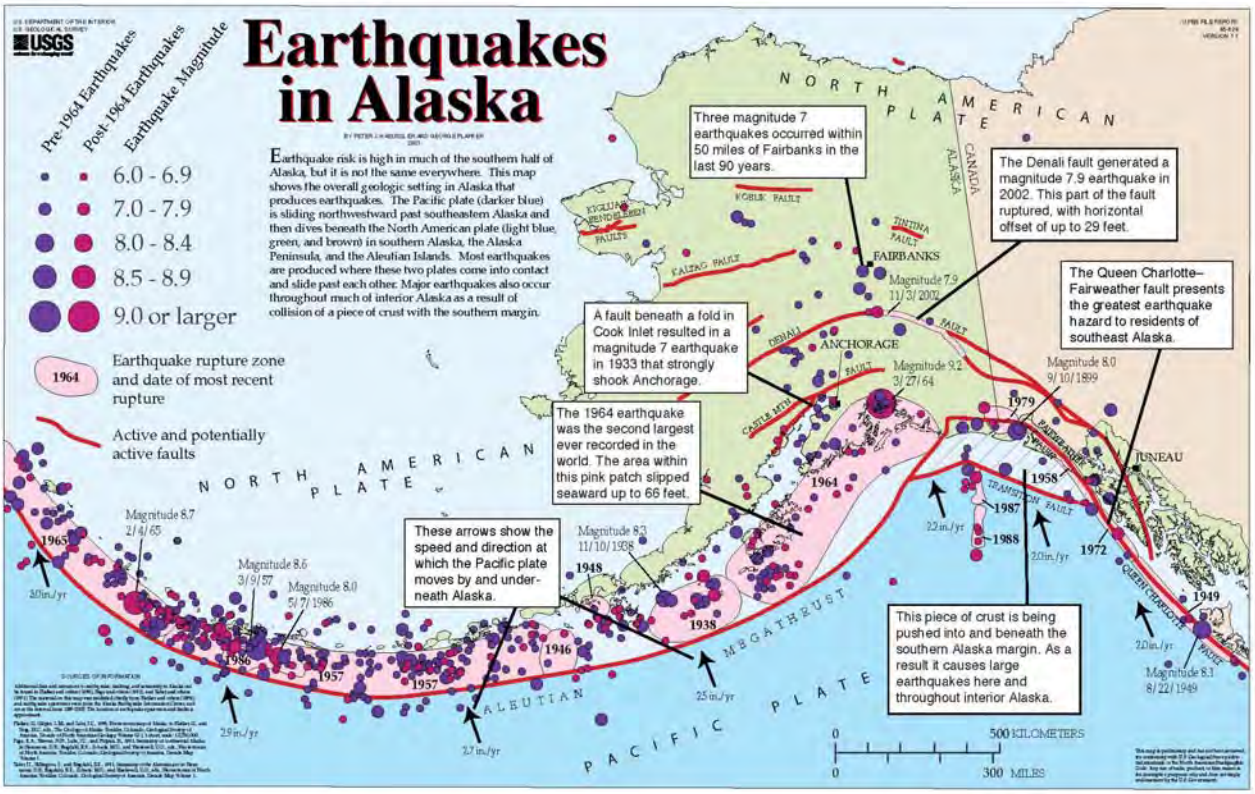
Earthquake damage could be area-wide with potential damage to critical infrastructure up to and including the complete abandonment of key facilities. Limited building damage assessors are available in Shishmaref to determine the integrity of structures following earthquake damage. Priority would have to be given to critical infrastructure to include: public safety facilities, health care facilities, shelters and potential shelters, and public utilities.

Probability

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.

Shishmaref has a **likely** probability of earthquake hazard. Table 9 lists the following criteria for a likely probability: hazard is present with a probability of occurrence with the next three years. Event has up to 1 in 3 years chance of occurring. Figure 4 indicates that the USGS earthquake probability model places the probability of an earthquake with an intensity of 5.0 or greater occurring within the next ten years within 50 kilometers (31 miles) of Shishmaref at three to four percent.

Figure 3. AEIS Historic Earthquakes in Alaska



Source: http://www.aeic.alaska.edu/html_docs/information_releases.html

Previous Occurrences

The USGS earthquake database does not contain any previous occurrences of earthquakes in Shishmaref greater than an intensity of 5.0.

Earthquake Mitigation Goal and Projects

Earthquake Goals

Goal 1: Obtain funding to protect existing critical infrastructure from earthquake damage.

Earthquake Projects

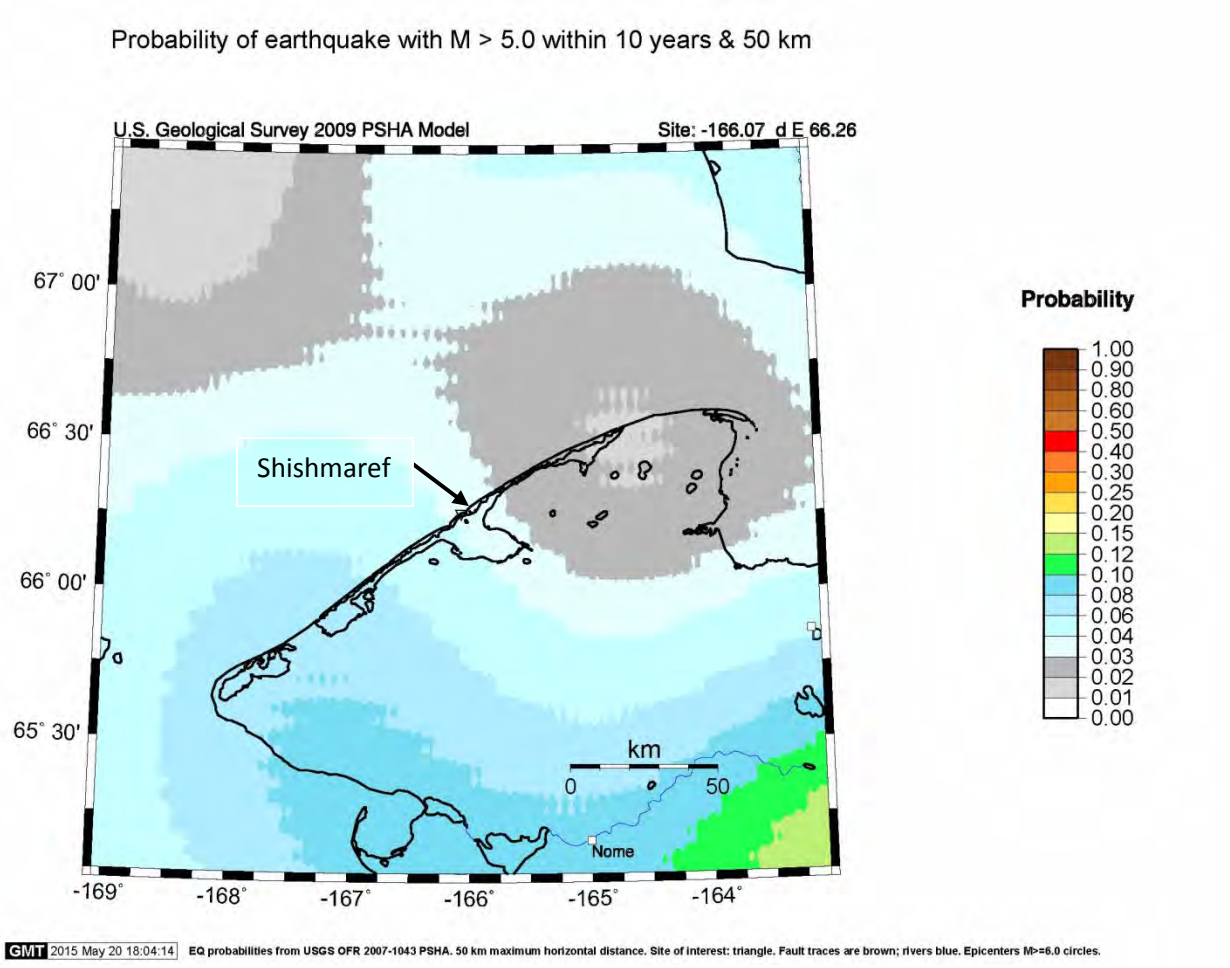
E1. If funding is available, perform an engineering assessment of the earthquake vulnerability of each identified critical infrastructure owned by the City of Shishmaref. (Goal 1)

E2. Identify buildings and facilities that must be able to remain operable during and following an earthquake event. (Goal 1)

E3. Contract a structural engineering firm to assess the identified buildings and facilities to determine their structural integrity and strategy to improve their earthquake resistance. (Goal 1)

E4. Assess facilities and improve earthquake preparedness through such measures as installing bookshelf tie-downs, improving computer servers' resistance to earthquakes, and moving heavy objects to lower shelves, etc.

Figure 4. USGS Earthquake Probability Map



Section 8. Wildland Fire

Hazard Description

Wildland fires occur in every state in the country and Alaska is no exception. Each year, between 600 and 800 wildland fires, mostly between March and October, burn across Alaska causing extensive damage.

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. 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. 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. Firefighter and public safety is always the first and overriding priority for all fire management activities.

Fires can be divided into the following categories:

Structure fires – originate in and burn a building, shelter, or other structure.

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

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

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

Wildland-Urban Interface Fires - fires that burn within the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. The potential exists in areas of wildland-urban interface for extremely dangerous and complex fire conditions, which pose a tremendous threat to public and firefighter safety.

Fuel, weather, and topography influence wildland fire behavior. Wildland fire behavior can be erratic and extreme causing firewhirls and firestorms that can endanger the lives of the firefighters trying to suppress the blaze. 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. Temperature and humidity also affect fire behavior. High temperatures and low humidity encourage fire activity while low temperatures and high humidity help retard fire behavior. Wind affects the speed and direction of a fire. Topography directs the movement of air, which can also affect fire behavior. When

the terrain funnels air, like what happens in a canyon, it can lead to faster spreading. Fire can also travel up slope quicker than it goes down.

Community members in Shishmaref stated wildland fires were a concern due to the close proximity of buildings. Fire could easily spread throughout the town site devastating the community. However, the saturated soil which characterizes the island often prevents wildland fires. During times of severe droughts the possibility of wildland fires exists; however, it is considered a low risk.

Location

The hazard of a wildland fire would impact Shishmaref's town site. Many structures within the community are situated very close together.

Extent

A structural fire event could result in a **critical** situation in Shishmaref. Injuries and/or illness could result from excessive smoke and damage the shutdown of critical facilities, damage to property, and isolating Shishmaref from the mainland. The *Alaska All-Hazard Risk Mitigation Plan, 2013* lists wildland fires as creating three limited-damage events in Shishmaref.

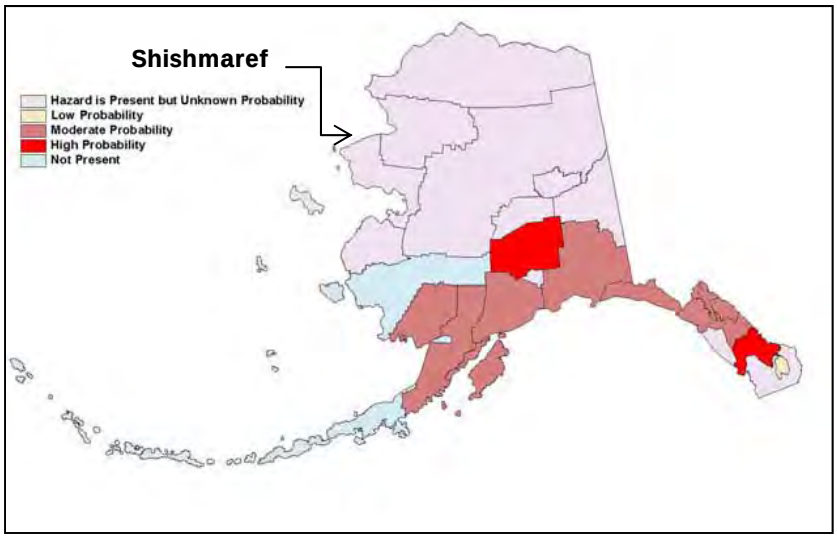
Impact

Shishmaref residents must be fairly self-reliant because of the community's remote location. A fire event could leave community residents homeless and damage critical structures. Fires could also cause a severe air quality issue as the result of smoke.

Probability

The following map from the Alaska State Hazard Plan depicts Shishmaref as being in an area where

Figure 5. Alaska All-Hazards Mitigation Plan - Fire Risk Map

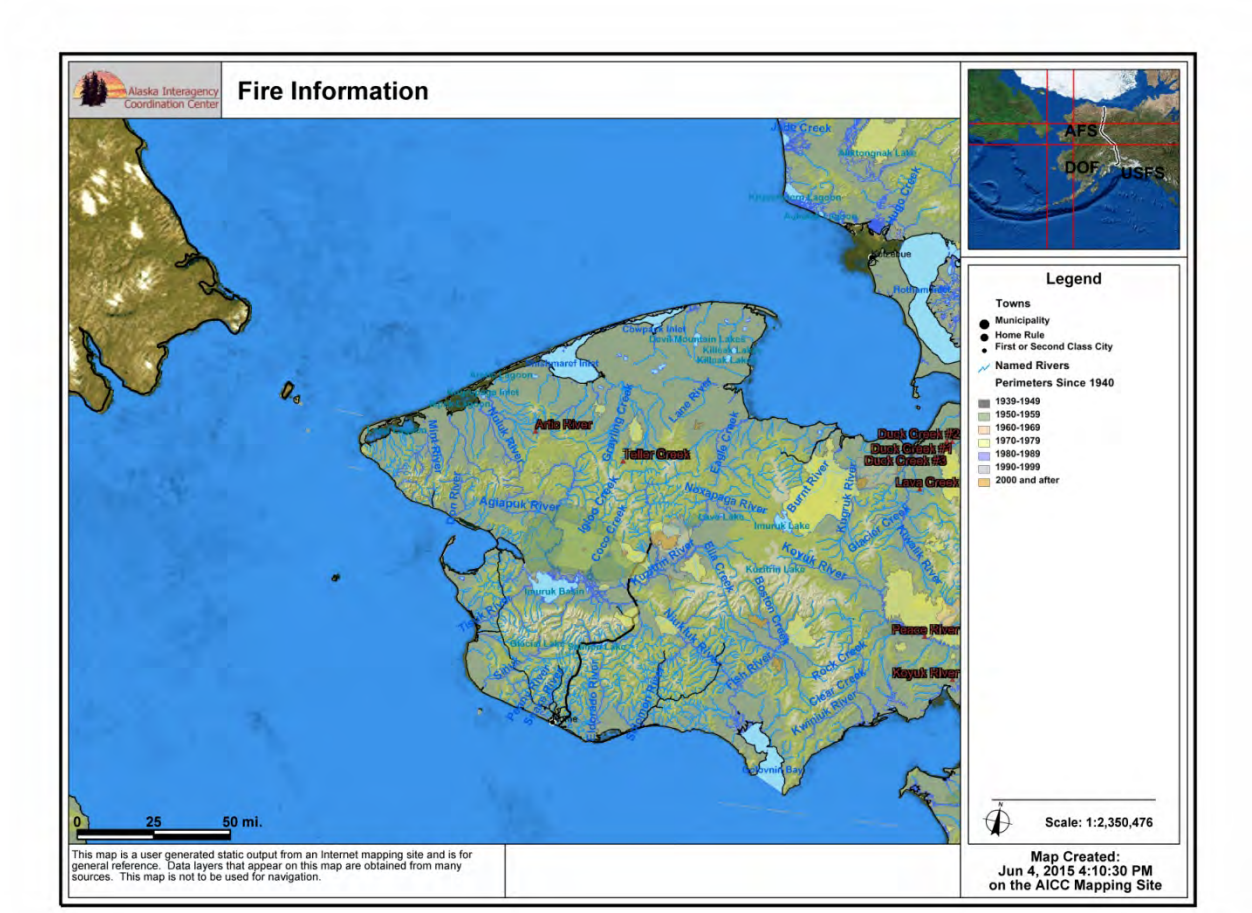


wildland fire hazards are present but of an unknown probability.

Previous Occurrences

There have been no reports of wildland fire damage in Shishmaref (Figure 6).

Figure 6. Historic Wildland Fires



Climatic Influence

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

Wildland Fire Mitigation Goals and Projects

Wildland Fire Goals

Goal 1: Establish building regulations to mitigate against fire damage.

Goal 2: Conduct outreach activities to encourage the use of Fire Wise development techniques.

Goal 3: Standardize, repair, and/or replace firefighting equipment.

Projects

WF1: Support the fire department with adequate firefighting equipment and training.

WF2: Promote Fire Wise building design, siting, and materials for construction.

WF3: Continue to enforce building codes and requirements for new construction.

WF4: Enhance public awareness of potential risk to life and personal property. Encourage mitigation measures in the immediate vicinity of their property.

WF5: Encourage mitigation measures in the immediate vicinity of residential and business property.

Section 9. Climate Change

Hazard Description

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

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

Location

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

Extent

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

Local Impact

Climate change has the potential to aggravate natural disasters along the coastline, particularly flooding and permafrost degradation. Shishmaref already has been identified as a community requiring relocation. Climate change will continue to exacerbate the issue.

Global Impact

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

Probability

Given the Earth's history of mass extinctions attributed to climate change, the current observed changes in the atmosphere, and the criteria identified in Table 3-2, it is "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.

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.

Section 10. Description of Hazards Not Profiled in the 2015 Shishmaref MHMP

Avalanche

Alaska experiences many snow avalanches every year. The exact number is undeterminable as most occur in isolated areas and go unreported. Avalanches tend to occur repeatedly in localized areas and can sheer trees, cover communities and transportation routes, destroy buildings, and cause death. Alaska leads the nation in avalanche accidents per capita.

Avalanche Vulnerability Assessment

The terrain surrounding Shishmaref does not provide the necessary conditions for avalanche. No threat from avalanche is present in Shishmaref.

Ground Failure Hazard

Ground failure is a problem throughout Alaska with landslides presenting the greatest threat. Ground failure hazards exist to some degree in all areas of the state.

Landslides are described as downward movement of a slope and materials under the force of gravity. The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Landslides are influenced by human activity (mining and construction of buildings, railroads, and highways) and natural factors (geology, precipitation, and topography). They are common all over the United States and its territories.

Landslides occur when masses of rock, earth, or debris move down a slope. Therefore, gravity acting on an overly steep slope is the primary cause of a landslide. They are activated by storms, fires, and by human modifications to the land. New landslides occur as a result of rainstorms, earthquakes, volcanic eruptions, and various human activities.

Mudflows (or debris flows) are flows of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt, changing the earth into a flowing river of mud or "slurry." Slurry can flow rapidly down slopes or through channels and can strike with little or no warning at avalanche speeds. Slurry can travel several miles from its source, growing in size as it picks up trees, cars, and other materials along the way.

Other types of landslides include: rock slides, slumps, mudslides, and earthflows. All of these differ in terms of content and flow.

Ground Failure Vulnerability Assessment

The terrain surrounding Shishmaref does not provide the necessary conditions for landslides or mudflows.

Tsunamis and Seiches

A ***tsunami*** is a series of ocean waves generated by any rapid large-scale disturbance of the seawater. These waves can travel at speeds of up to 600 miles per hour in the open ocean. Most tsunamis are generated by earthquakes, but they may also be caused by volcanic eruptions, landslides (above or under sea in origin), undersea slumps, or meteor impacts.

Tsunami damage is a direct result of three factors:

1. *Inundation* (the extent to which the water covers the land).

2. *Wave action* that will impact structures and moving objects that become projectiles.

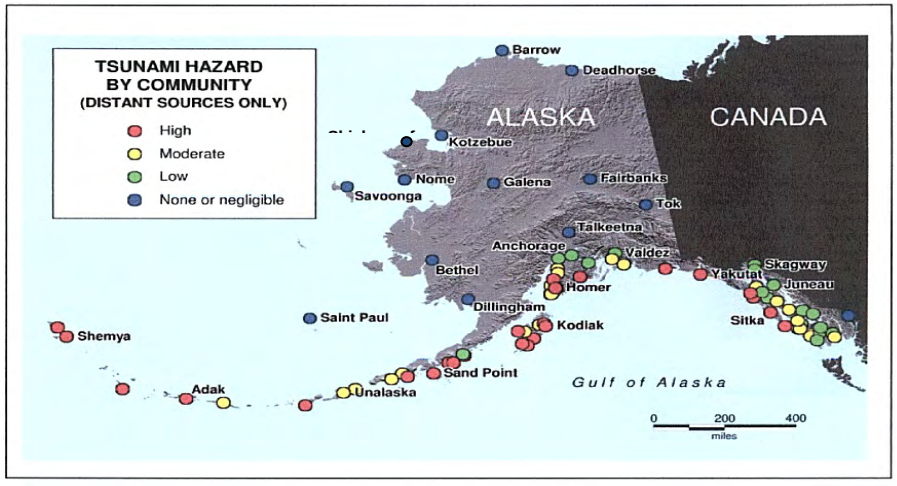
3. Coastal erosion.

A ***seiche*** is a wave that oscillates in partially or totally enclosed bodies of water. They can last from a few minutes to a few hours as a result of an earthquake, underwater landslide, atmospheric disturbance, or avalanche. The resulting effect is similar to bathtub water sloshing repeatedly from side to side. The reverberating water continually causes damage until the activity subsides. The factors for effective warning are similar to a local tsunami, in that the onset of the first wave can be a few minutes, giving little warning.

Tsunamis and Seiches Vulnerability Assessment

There is no danger of tsunamis and seiches since the topography of the Chukchi Sea and the Norton Sound do not allow tsunamis to form and travel far enough toward the coast to threaten the community.

Figure 7. Tsunami Hazard by Community



Chapter 4. Mitigation Strategy

Benefit - Cost Review

This chapter outlines Shishmaref's overall strategy to reduce its vulnerability to the effects of the hazards studied. Currently the planning effort is limited to the hazards determined to be of the most concern; flooding, erosion, severe weather, earthquakes, and wildland fire; however, the mitigation strategy will be regularly updated as additional hazard information is added and new information becomes available.

The projects listed in Table 21 were prioritized using a listing of benefits and costs review method as described in the FEMA *How-To-Guide Benefit-Cost Review in Mitigation Planning* (FEMA 386-5).

Due to monetary as well as other limitations, it is often impossible to implement all mitigation actions. Therefore, the most cost-effective actions for implementation will be pursued for funding first, not only to use resources efficiently, but also to make a realistic start toward mitigating risks.

The City of Shishmaref considered the following factors in prioritizing the mitigation projects. Due to the dollar value associated with both life-safety and critical facilities, the prioritization strategy represents a special emphasis on benefit-cost review because the factors of life-safety and critical facilities steered the prioritization towards projects with likely good benefit-cost ratios.

1. Extent to which benefits are maximized when compared to the costs of the projects, the Benefit Cost Ratio must be 1.0 or greater.
2. Extent the project reduces risk to life-safety.
3. Project protects critical facilities or critical city functionality.
    A. Hazard probability.
    B. Hazard severity.

Other criteria that were used to developing the benefits – costs listing are:

1. Vulnerability before and after Mitigation
    - Number of people affected by the hazard, area-wide, or specific properties.
    - Areas affected (acreage) by the hazard
    - Number of properties affected by the hazard
    - Loss of use
    - Loss of life (number of people)
    - Injury (number of people)

2. List of Benefits
    - Risk reduction (immediate or medium time frame)
    - Other community goals or objectives achieved
    - Easy to implement
    - Funding available
    - Politically or socially acceptable
3. Costs
    - Construction cost
    - Programming cost
    - Long time frame to implement
    - Public or political opposition
    - Adverse environmental effects

This method supports the principle of benefit-cost review by using a process that demonstrates a special emphasis on maximization of benefits over costs. Projects that demonstrate benefits over costs and that can start immediately were given the highest priority. Projects that the costs somewhat exceed immediate benefit and that can start within five years (or before the next update) were given a description of medium priority, with a timeframe of one to five years. Projects that are very costly without known benefits, probably cannot be pursued during this plan cycle, but are important to keep as an action were given the lowest priority and designated as long term.

The Shishmaref City Council will hold another public meeting on the LHMP Update. The plan is subject to final Shishmaref City Council approval after pre-approval is obtained by DHS&EM.

After the LHMP Update has been approved, the projects must be evaluated using a Benefit-Cost Analysis (BCA) during the funding cycle for disaster mitigation funds from DHS&EM and FEMA.

A description of the BCA process follows. Briefly, BCA is the method by which the future benefits of a mitigation project are determined and compared to its cost. The result is a Benefit-Cost Ratio (BCR), which is derived from a project's total net benefits divided by its total cost. The BCR is a numerical expression of the cost-effectiveness of a project. Composite BCRs of 1.0 or greater have more benefits than costs, and are, therefore, cost-effective.

Benefit-Cost Review vs. Benefit-Cost Analysis (FEMA 386-5) states in part:

Benefit-Cost Review for mitigation planning differs from the benefit cost analysis (BCA) used for specific projects. BCA is a method for determining the potential positive effects of a mitigation action and comparing them to the cost of the action. To assess and demonstrate the cost-effectiveness of mitigation actions, FEMA has developed a suite of BCA software, including hazard-specific modules. The analysis determines whether a mitigation project is technically cost-effective. The principle behind the BCA is that the benefit of an action is a reduction in future damages.

DMA 2000 does not require hazard mitigation plans to include BCA's for specific projects, but does require that a BCR be conducted in prioritizing projects.

Benefit-Cost Analysis

The following section is reproduced from a document prepared by FEMA, which demonstrates how to perform a Benefit–Cost Analysis. The complete guidelines document, a benefit-cost analysis document and benefit-cost analysis technical assistance is available online http://www.fema.gov/government/grant/benefit-cost-analysis.

Facilitating BCA

Although the preparation of a BCA is a technical process, FEMA has developed software, written materials, and training that simplify the process of preparing BCAs. FEMA has a suite of BCA software for a range of major natural hazards: earthquake, fire (wildland/urban interface fires), flood (riverine, coastal A-Zone, Coastal V-Zone), hurricane wind (and typhoon), and tornado.

Sometimes there is not enough technical data available to use the BCA software mentioned above. When this happens, or for other common, smaller-scale hazards or more localized hazards, BCAs can be done with the Frequency Damage Method (i.e., the Riverine Limited Data module), which is applicable to any natural hazard as long as a relationship can be established between how often natural hazard events occur and how much damage and losses occur as a result of the event. This approach can be used for coastal storms, windstorms, freezing, mud/landslides, severe ice storms, snow, tsunami, and volcano hazards.

Applicants and Sub-Applicants must use FEMA-approved methodologies and software to demonstrate the cost-effectiveness of their projects. This will ensure that the calculations and methods are standardized, facilitating the evaluation process. Alternative BCA software may also be used, but only if the FEMA Regional Office and FEMA Headquarters approve the software.

To assist Applicants and Sub-applicants, FEMA has prepared the *FEMA Mitigation BCA Toolkit* CD. This CD includes all of the FEMA BCA software, technical manuals, BC training courses, Data-Documentation Templates, and other supporting documentation and guidance.

The *Mitigation BCA Toolkit* CD is available free from FEMA Regional Offices or via the BC Helpline (at bchelpline@dhs.gov or toll free number at (855) 540-6744.

The BC Helpline is also available to provide BCA software, technical manuals, and other BCA reference materials as well as to provide technical support for BCA.

For further technical assistance, Applicants or Sub-Applicants may contact their State Mitigation Office, the FEMA Regional Office, or the BC Helpline. FEMA and the BC Helpline provide technical assistance regarding the preparation of a BCA.

Eligible Projects for PDM Funding

The Pre-Disaster Mitigation (PDM) Grant Program is federally funded through FEMA at 75% of the plan or project and requires a 25% local fund match. Small, impoverished communities may be eligible for up to a 90 percent Federal cost share in accordance with the Stafford Act. The program is annual, nationally competitive, and is intended to reduce overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants include Hazard Mitigation Planning Grants and Hazard Mitigation Project Grants.

- A Hazard Mitigation Planning Grant are available for communities to either update or create who do not have a FEMA/State approved and community adopted All-Hazard Mitigation Plan.
- A Hazard Mitigation Project Grant is only available for communities who have a FEMA/State approved and community adopted Hazard Mitigation Plan.

Hazard Mitigation Projects are intended to reduce risk to life and property and examples include:

- Elevation of flood prone structures;
- Structural and non-structural seismic retrofits of public facilities;
- Voluntary acquisition or relocation of structures out of the floodplain;
- Natural hazard protective measures for utilities, water and sanitary sewer systems; and
- Localized storm water management and flood control projects.

Eligible Projects for HMGP Funding

These criteria are designed to ensure that the most appropriate projects are selected for funding. Projects may be of any nature that will result in protection of public or private property from natural hazards. Some types of projects that **may be eligible** include:

- Acquisition of hazard prone property and conversion to open space;
- Retrofitting existing buildings and facilities;
- Elevation of flood prone structures;
- Vegetative management/soil stabilization;
- Infrastructure protection measures;
- Stormwater management;
- Minor structural flood control projects; and
- Post-disaster code enforcement activities.

The following types of projects **may not be eligible** under the HMGP:

- Retrofitting places of worship (or other projects that solely benefit religious organizations); and
- Projects in progress.
- New structures or infrastructure.

There are five minimum criteria that all projects must meet in order to be considered for funding:

- Conforms with the State Hazard Mitigation Plan;
- Provides beneficial impact upon the designated disaster area;
- Conforms with environmental laws and regulations;
- Solves a problem independently or constitutes a functional portion of a solution; and,
- Is cost-effective.

Benefit – Costs Review Listing

Table 21 lists mitigation projects and their benefits, costs, and prioritization. Results from the risk assessment in Sections 4-10 from Chapter 3 were used to develop mitigation goals and actions. Referencing the Shishmaref City Council's 2009 Hazard Mitigation Plan, most of their goals were not accomplished as mitigation funds were appropriated to other communities involved in a disaster. The City Council has selected and prioritized their goals and actions. Goals and projects were described in Sections 4-10 in Chapter 3.

Upon adoption of their LHMP, the City Council of Shishmaref will incorporate it into existing planning mechanisms using the following methods:

- Use the City of Shishmaref's regulatory tools to integrate the mitigation goals and actions. These regulatory tools are identified in Section 2.3 *Capability Assessment*.
- Encourage relevant departments and authorities to implement LHMP goals and actions into relevant planning mechanisms.
- Update or amend specific planning mechanisms to integrate LHMP goals and principles.

The City is responsible for prioritizing their mitigation projects and submitting them for grant programs outlined in Chapter 2.4, "Resources".

Table 21. Benefit Cost Review Listing

Mitigation Projects	Benefits (pros)	Costs (cons)	High
Flood/Erosion (FLD)			
FLD-1. Training/Drills of Suite of Emergency Plans and	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available 1 – 5 years, or as needed. IAWG Recommendation	Staff time	High
FLD-2. Community Mitigation and Relocation Planning and Coordination	Life/Safety issue/Risk reduction Benefit the entire community State assistance available IAWG Recommendation	Staff time	High
FLD-3. ADOT/PF Preliminary Engineering & Early Coordination	Life/Safety issue/Risk reduction Benefit the entire community IAWG Recommendation	Expensive	High
FLD-4. Letter of Map Revision for Flood Insurance Rate Maps	No direct cost Benefit to city and private properties within floodplain.	Staff time	High
FLD-5. Structure Elevation and/or Relocation	Life/Safety project Benefit to government facilities and private properties.	Dollar cost unknown, >$50k 1 – 5 year implementation	Medium

Mitigation Projects	Benefits (pros)	Costs (cons)	High
FLD-6. Updated FIRM Shishmaref Maps	FEMA, PDM**, HMGP*** and State DCRA funding available. USACE facilitated project. Completed in 2010 but will need to be updated periodically as conditions change.	Expensive, at least $100,000	High
FLD-7. Pursue obtaining a CRS Rating	High capability by city to do on an annual basis Will reduce NFIP insurance for entire community. <$1,000/year	Staff time.	High
FLD-8. Continue to obtain flood insurance for all City structures, and continue compliance with NFIP.	High capability by city to do on an annual basis. Public benefit to have public buildings insured through NFIP. Inexpensive, approx.$3,000/year.	Staff time	High
FLD-9. Require that all new structures be constructed according to NFIP requirements and set back from the river shoreline to lessen future erosion concerns and costs.	High capability by city to do on an annual basis. Public benefit to have public buildings insured through NFIP. Inexpensive, approx.$3,000/year.	Staff time	High
FLD-10. Public Education	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive	Staff time	High
FLD-11. Emergency Shelter Upgrade	Life/Safety issue Benefit to entire community	Expensive	Medium

Mitigation Projects	Benefits (pros)	Costs (cons)	High
Erosion (E)			
E-1. Beach Erosion Control Phase 3: 550 feet of rock revetment under design in 2009; construction funding needed. Phase 4: 1,225 feet to be surveyed in 2009; of this 325 feet will be new rock revetment and 900 feet will be raising existing revetments when funding is provided.	Life/Safety issue Risk reduction Benefit to entire community State assistance available	Expensive, at least $10,500,000	High
Severe Weather (SW)			
SW-1. Research and consider instituting the National Weather Service program of *"Storm Ready"*.	Life/Safety issue Risk reduction Benefit to entire community Inexpensive State assistance available Could be implemented annually	Staff time	High
SW-2. Conduct special awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, etc.	Life/Safety issue Risk reduction Benefit to entire community Inexpensive State assistance available Could be an annual event	Staff time	High

Mitigation Projects	Benefits (pros)	Costs (cons)	High
SW-3. Expand public awareness about NOAA Weather Radio for continuous weather broadcasts and warning tone alert capability	Life/Safety issue Risk reduction Benefit to entire community Inexpensive State assistance available Could be an annual event	Staff time	High
SW-4. Encourage weather resistant building construction materials and practices.	Risk and damage reduction. Benefit to entire community.	Would require ordinance change. Potential for increased staff time. Research into feasibility necessary. Political and public support not determined. 1 – 5 year implementation	Medium
SW-5. Install a City-wide warning sirens	Life/Safety issue Benefit to entire community	Expensive	Medium
SW-6. Develop a policy with local mail and freight carriers to ensure groceries, medical supplies and other necessities are delivered before non-essential mail after periods of limited air service.	Life/Safety issue Benefit to entire community Inexpensive	Staff time	High

Mitigation Projects	Benefits (pros)	Costs (cons)	High
Earthquake (EQ)			
EQ-1. If funding is available, perform an engineering assessment of the earthquake vulnerability of each identified critical infrastructure owned by the City of Shishmaref.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available Could be an annual event	Staff time	High
EQ-2. Identify buildings and facilities that must be able to remain operable during and following an earthquake event.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available Could be an annual event	Staff time	High
EQ-3. Contract a structural engineering firm to assess the identified buildings and facilities.	Benefit to entire community Risk reduction	Feasibility and need analysis needed. 1 – 5 years	Medium
EQ-4. Nonstructural mitigation projects	Inexpensive. Reduces property damage and reduces risk of injury from falling objects	Staff or volunteer time	High

Mitigation Projects	Benefits (pros)	Costs (cons)	High
Wildland Fire (WF)			
WF1: Support the fire department with adequate firefighting equipment and training.	Life/Safety issue Risk reduction Benefit to entire community	Dollar cost not determined. Staff time to research grants	Medium
WF2: Promote Fire Wise building design, siting, and materials for construction.	Life/Safety issue Risk reduction Benefit to entire community Annual project. State assistance available	Dollar cost not determined. Staff time to research grants	High
WF3: Continue to enforce building codes and requirements for new construction.	Life/Safety issue Risk reduction Benefit to entire community Inexpensive State assistance available Could be implemented annually	Staff time	High
WF4: Enhance public awareness of potential risk to life and personal property. Encourage mitigation measures in the immediate vicinity of their property.	Life/Safety issue Risk reduction Benefit to entire community Inexpensive State assistance available Could be implemented annually	Staff time	High

Mitigation Projects	Benefits (pros)	Costs (cons)	High
WF-5. Encourage mitigation measures in the immediate vicinity of residential and business property.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available Could be implemented annually	Staff time	High

*Priorities: High A life/safety project or benefits clearly exceed the cost or can be implemented 0 – 1 year.

Medium More study required to designate as a life/safety project, or benefits may exceed the cost, or can be implemented in 1 – 5 years.

Low More study required to designate as a life/safety project, or not known if benefits exceed the costs, or long-term project, implementation will not occur for over 5 years

Mitigation Project Plan

Table 22 presents Shishmaref's strategy for mitigation of the natural hazards faced by the community and includes a brief description of the projects, lead agencies, costs, potential funding sources and an estimated timeframe for each project.

Table 22. Mitigation Project Plan

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe
Flood (FLD)				
FLD -1. Training/Drills on Suite of Emergency Plans and	City State FEMA	$10,000+	PDM* USACE	These plans have been developed and need to be exercised.
FLD-2. Community Mitigation and Relocation Planning and Coordination	City State DCRA FEMA	$10,000+	City State PDM	On hold until FLD-3 is completed.
FLD-3. ADOT/PF Preliminary Engineering & Early Coordination	State	$10,000+	State	>1 year
FLD-4. Letter of Map Revision for Flood Insurance Rate Maps	City DCRA FEMA	Staff Time	City/State Budgets	Ongoing
FLD-5. Structure Elevation and/or Relocation	FEMA DHS&EM	N/A	PDM	>1 year

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe
FLD-6. Updated FIRM Shishmaref Maps	DCRA	>$100,000	PDM	2010
FLD-7. Pursue obtaining a CRS rating to lower flood insurance rates.	City	Staff Time	City	In Progress
FLD-8. Continue to obtain flood insurance for all City structures, and continue compliance with NFIP.	City	$1,500	City	Ongoing
FLD-9. Require that all new structures be constructed according to NFIP requirements and set back from the river shoreline to lessen future erosion concerns and costs.	City	Staff Time	City Budget	Ongoing
FLD-10. Public Education	City DHS&EM	Staff Time	City	Ongoing
FLD-11. Emergency Shelter Upgrade	City	$5,000+	City	In Progress
Erosion (E)				
E-1 Beach Erosion Control Phase 3: 550 feet of rock revetment under design in 2009; construction funding needed. Phase 4: 1,225 feet to be surveyed in 2009; of this 325 feet will be new rock revetment and 900 feet will be raising existing revetments when funding is provided.	DCCED USACE	$10,500,000	State USACE	Unknown depending on funding
Severe Weather (SW)				

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe
SW-1. Research and consider instituting the National Weather Service program of *"Storm Ready"*.	City	Staff Time	City	<1 year
SW-2. Conduct special awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, etc.	City DCRA DHS&EM	Staff Time	City DCRA DHS&EM	<1 year
SW-3. Expand public awareness about NOAA Weather Radio for continuous weather broadcasts and warning tone alert capability	City	Staff Time	NOAA	Ongoing
SW-4. Encourage weather resistant building construction materials and practices.	City	Staff Time	City	<1 year
SW-5. Install a City-wide warning sirens	City	$10,000+	City	Plan is to ring church bell
SW-6. Develop a policy with local mail and freight carriers to ensure groceries, medical supplies and other necessities are delivered before non-essential mail after periods of limited air service.	City	Staff Time	City	<1 year; would like to improve
Earthquake (E)				
E-1. If funding is available, perform an engineering assessment of the earthquake vulnerability of each identified critical infrastructure owned by the City of Shishmaref.	City DHS&EM	To be determined	State Grants	>1 year

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe
E-2. Identify buildings and facilities that must be able to remain operable during and following an earthquake event.	City DHS&EM DCRA	Staff Time	State Grants	>1 year
E-3. Contract a structural engineering firm to assess the identified buildings and facilities.	City DHS&EM	>$10,000	PDM	>5 years
E-4. Nonstructural mitigation projects	City/Tribe, DHS&EM	Staff Time, approximately $5k	PDM	1 year and ongoing
Wildland Fire				
WF-1. Support the fire department with adequate firefighting equipment and training.	DHS&EM, City/Tribe	To be determined	City/Tribe	1-5 years
WF-2. Promote Fire Wise building design, siting, and materials for construction.	DHS&EM, City/Tribe	Staff Time	City/Tribe	Ongoing
WF-3. Consider development of building codes and requirements for new construction.	DHS&EM, City/Tribe	Staff Time	City/Tribe	Need to be developed when funding is available.
WF-4. Enhance public awareness of potential risk to life and personal property.	DHS&EM, City/Tribe	Staff Time	City/Tribe	1 year/ongoing
WF-5. Encourage mitigation measures in the immediate vicinity of residential and business property	DHS&EM, City/Tribe	Staff Time	City/Tribe	1 year/ongoing

*PDM = Pre-Disaster Mitigation Grant

Glossary of Terms

A-Zones

Type of zone found on all Flood Hazard Boundary Maps (FHBMs), Flood Insurance Rate Maps (FIRMs), and Flood Boundary and Floodway Maps (FBFMs).

Acquisition

Local governments can acquire lands in high hazard areas through conservation easements, purchase of development rights, or outright purchase of property.

Asset

Any manmade or natural feature that has value, including, but not limited to people; buildings; infrastructure like bridges, roads, and sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands, or landmarks.

Base Flood

A term used in the National Flood Insurance Program to indicate the minimum size of a flood. This information is used by a community as a basis for its floodplain management regulations. It is the level of a flood, which has a one-percent chance of occurring in any given year. Also known as a 100-year flood elevation or one-percent chance flood.

Base Flood Elevation (BFE)

The elevation for which there is a one-percent chance in any given year that floodwater levels will equal or exceed it. The BFE is determined by statistical analysis for each local area and designated on the Flood Insurance Rate Maps. It is also known as 100-year flood elevation.

Base Floodplain

The area that has a one percent chance of flooding (being inundated by flood waters) in any given year.

Building

A structure that is walled and roofed, principally above ground and permanently affixed to a site. The term includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.

Building Code

The regulations adopted by a local governing body setting forth standards for the construction, addition, modification, and repair of buildings and other structures for the purpose of protecting the health, safety, and general welfare of the public.

Community

Any state, area or political subdivision thereof, or any Indian tribe or tribal entity that has the authority to adopt and enforce statutes for areas within its jurisdiction.

Community Rating System (CRS)

The Community Rating System is a voluntary program that each municipality or county government can choose to participate in. The activities that are undertaken through CRS are awarded points. A community's points can earn people in their community a discount on their flood insurance premiums.

Critical Facility

Facilities that are critical to the health and welfare of the population and that are especially important during and after a hazard event. Critical facilities include, but are not limited to, shelters, hospitals, and fire stations.

Designated Floodway

The channel of a stream and that portion of the adjoining floodplain designated by a regulatory agency to be kept free of further development to provide for unobstructed passage of flood flows.

Development

Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or of equipment or materials.

Digitize

To convert electronically points, lines, and area boundaries shown on maps into x, y coordinates (e.g., latitude and longitude, universal transverse Mercator (UTM), or table coordinates) for use in computer

Disaster Mitigation Act (DMA)

DMA 2000 (public Law 106-390) is the latest legislation of 2000 (DMA 2000) to improve the planning process. It was signed into law on October 10, 2000. This new legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur.

Earthquake

A sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of the earth's tectonic plates.

Elevation

The raising of a structure to place it above flood waters on an extended support structure.

Emergency Operations Plan

A document that: describes how people and property will be protected in disaster and disaster threat situations; details who is responsible for carrying out specific actions; identifies the personnel, equipment, facilities, supplies, and other resources available for use in the disaster; and outlines how all actions will be coordinated.

Erosion

The wearing away of the land surface by running water, wind, ice, or other geological agents.

Federal Disaster Declaration

The formal action by the President to make a State eligible for major disaster or emergency assistance under the Robert T. Stafford Relief and Emergency Assistance Act, Public Law 93-288, as amended. Same meaning as a Presidential Disaster Declaration

Federal Emergency Management Agency (FEMA)

A federal agency created in 1979 to provide a single point of accountability for all federal activities related to hazard mitigation, preparedness, response, and recovery.

Flood

A general and temporary condition of partial or complete inundation of water over normally dry land areas from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.

Flood Disaster Assistance

Flood disaster assistance includes development of comprehensive preparedness and recovery plans, program capabilities, and organization of Federal agencies and of State and local governments to mitigate the adverse effects of disastrous floods. It may include maximum hazard reduction, avoidance, and mitigation measures, as well policies, procedures, and eligibility criteria for Federal grant or loan assistance to State and local governments, private organizations, or individuals as the result of the major disaster.

Flood Elevation

Elevation of the water surface above an establish datum (reference mark), e.g. National Geodetic Vertical Datum of 1929, North American Datum of 1988, or Mean Sea Level.

Flood Hazard

Flood Hazard is the potential for inundation and involves the risk of life, health, property, and natural value. Two reference base are commonly used: (1) For most situations, the Base Flood is that flood which has a one-percent chance of being exceeded in any given year (also known as the 100-year flood); (2) for critical actions, an activity for which a one-percent chance of flooding would be too great, at a minimum the base flood is that flood which has a 0.2 percent chance of being exceeded in any given year (also known as the 500-year flood).

Flood Insurance Rate Map

Flood Insurance Rate Map (FIRM) means an official map of a community, on which the Administrator has delineated both the special hazard areas and the risk premium zones applicable to the community.

Flood Insurance Study

Flood Insurance Study or Flood Elevation Study means an examination, evaluation and determination of flood hazards and, if appropriate, corresponding water surface elevations, or an examination, evaluations and determination of mudslide (i.e., mudflow) and/or flood-related' erosion hazards.

Floodplain

A "floodplain" is the lowland adjacent to a river, lake, or ocean. Floodplains are designated by the frequency of the flood that is large enough to cover them. For example, the 10-year floodplain will be covered by the 10-year flood. The 100-year floodplain by the 100-year flood.

Floodplain Management

The operation of an overall program of corrective and preventive measures for reducing flood damage, including but not limited to emergency preparedness plans, flood control works and floodplain management regulations.

Floodplain Management Regulations

Floodplain Management Regulations means zoning ordinances, subdivision regulations, building codes, health regulations, special purpose ordinances (such as floodplain ordinance, grading ordinance and erosion control ordinance) and other applications of police power. The term describes such state or local regulations, in any combination thereof, which provide standards for the purpose of flood damage prevention and reduction.

Flood Zones

Zones on the Flood Insurance Rate Map (FIRM) in which a Flood Insurance Study has established the risk premium insurance rates.

Flood Zone Symbols

A - Area of special flood hazard without water surface elevations determined.

A1-30 - AE Area of special flood hazard with water surface elevations determined.

AO - Area of special flood hazard having shallow water depths and/or unpredictable flow paths between one and three feet.

A-99 - Area of special flood hazard where enough progress has been made on a protective system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes.

AH - Area of special flood hazard having shallow water depths and/or unpredictable flow paths between one and three feet and with water surface elevations determined.

B - X Area of moderate flood hazard.

C - X Area of minimal hazard.

D - Area of undetermined but possible flood hazard.

Geographic Information System (GIS)

A computer software application that relates physical features of the earth to a database that can be used for mapping and analysis.

Governing Body

The legislative body of a municipality that is the assembly of a borough or the council of a city.

Hazard

A source of potential danger or adverse condition. Hazards in the context of this plan will include naturally occurring events such as floods, earthquakes, tsunami, coastal storms, landslides, and wildfires that strike populated areas. A natural event is a hazard when it has the potential to harm people or property.

Hazard Event

A specific occurrence of a particular type of hazard.

Hazard Identification

The process of identifying hazards that threaten an area.

Hazard Mitigation

Any action taken to reduce or eliminate the long-term risk to human life and property from natural hazards. (44 CFR Subpart M 206.401)

Hazard Mitigation Grant Program

The program authorized under section 404 of the Stafford Act, which may provide funding for mitigation measures identified through the evaluation of natural hazards conducted under §322 of the Disaster Mitigation Act 2000.

Hazard Profile

A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.

Hazard and Vulnerability Analysis

The identification and evaluation of all the hazards that potentially threaten a jurisdiction and analyzing them in the context of the jurisdiction to determine the degree of threat that is posed by each.

Mitigate

To cause something to become less harsh or hostile, to make less severe or painful.

Mitigation Plan

A systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in the State and includes a description of actions to minimize future vulnerability to hazards.

National Flood Insurance

The Federal program, created by an act of Congress in Program (NFIP) 1968 that makes flood insurance available in communities that enact satisfactory floodplain management regulations.

One Hundred (100)-Year

The flood elevation that has a one-percent chance of occurring in any given year. It is also known as the Base Flood.

Planning

The act or process of making or carrying out plans; the establishment of goals, policies, and procedures for a social or economic unit.

Repetitive Loss Property

A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least $1000 each have been paid within any 10-year period since 1978.

Risk

The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It can also be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Riverine

Relating to, formed by, or resembling rivers (including tributaries), streams, creeks, brooks, etc.

Riverine Flooding

Flooding related to or caused by a river, stream, or tributary overflowing its banks due to excessive rainfall, snowmelt or ice.

Runoff

That portion of precipitation that is not intercepted by vegetation, absorbed by land surface, or evaporated, and thus flows overland into a depression, stream, lake, or ocean (runoff, called immediate subsurface runoff, also takes place in the upper layers of soil).

Seiche

An oscillating wave (also referred to as a seismic sea wave) in a partially or fully enclosed body of water. May be initiated by landslides, undersea landslides, long period seismic waves, wind and water waves, or a tsunami.

Seismicity

Describes the likelihood of an area being subject to earthquakes.

State Disaster Declaration

A disaster emergency shall be declared by executive order or proclamation of the Governor upon finding that a disaster has occurred or that the occurrence or the threat of a disaster is imminent. The state of disaster emergency shall continue until the governor finds that the threat or danger has passed or that the disaster has been dealt with to the extent that emergency conditions no longer exist and terminates the state of disaster emergency by executive order or proclamation. Along with other provisions, this declaration allows the governor to utilize all available resources of the State as reasonably necessary, direct and compel the evacuation of all or part of the population from any stricken or threatened area if necessary, prescribe routes, modes of transportation and destinations in connection with evacuation and control ingress and egress to and from disaster areas. It is required before a Presidential Disaster Declaration can be requested.

Topography

The contour of the land surface. The technique of graphically representing the exact physical features of a place or region on a map.

Tribal Government

A Federally recognized governing body of an Indian or Alaska native Tribe, band, nation, pueblo, village or community that the Secretary of the Interior acknowledges to exist as an Indian tribe

under the Federally Recognized Tribe List Act of 1994, 25 U.S.C. 479a. This does not include Alaska Native corporations, the ownership of which is vested in private individuals.

Tsunami

A sea wave produced by submarine earth movement or volcanic eruption with a sudden rise or fall of a section of the earth's crust under or near the ocean. A seismic disturbance or landslide can displace the water column, creating a rise or fall in the level of the ocean above. This rise or fall in sea level is the initial formation of a tsunami wave.

Vulnerability

Describes how exposed or susceptible to damage an asset it. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. The vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power – if an electrical substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Other, indirect effects can be much more widespread and damaging than direct ones.

Vulnerability Assessment

The extent of injury and damage that may result from hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.

Watercourse

A natural or artificial channel in which a flow of water occurs either continually or intermittently.

Watershed

An area that drains to a single point. In a natural basin, this is the area contributing flow to a given place or stream.

Bibliography

1. ADF&G Community Subsistence Information System: http://subsistence.adfg.state.ak.us/CSIS/index.cfm/FA/main.home
2. *Alaska All-Hazard Risk Mitigation Plan*. Prepared by and for DHS&EM. October 2007
3. Alaska Volcano Observatory website: http://www.avo.alaska.edu/volcanoes/volcinfo.php?volcname=Buzzard%20Creek
4. Bering Straits Coastal Resource Service Area Coastal Management Plan. Prepared by Glenn Gray and Associates September, 2006.
5. DCRA Community Information: http://www.dcra.state.ak.us/dca/commdb/CF_COMDB.htm.
6. Immediate Action Workgroup. (2009). *Recommendations to the Governor's Subcabinet on Climate Change. Juneau: State of Alaska.*
7. *Shishmaref Economic Development Plan.* Prepared by Kawerak Incorporated for the City of Shishmaref. December 12 - 14, 2012.
8. University of Alaska, Fairbanks, and Alaska Earthquake Information Center website at: http://www.giseis.alaska.edu/Seis/
9. U.S. Army Corps of Engineers. "Section 117 Shoreline Erosion Protection, Shishmaref, Alaska." May, 2008.
10. USGS Earthquake Probability Mapping: www//eqint.cr.usgs.gov/eqprob/2002/index.php
11. Wheaton, Scott. *Ponds as Potable Water Sources.* Shishmaref: United States Public Health Service Environmental Health Branch, 1980.
12. Ahmasuk, Austin and Eric Trigg. Alaska Department of Fish and Game Final Report Cooperative Agreement #00-037: A Comprehensive Subsistence Use Study of the Bering Strait Region, 2006.
13. Chapin, F.S., III, S.F. Trainor, P. Cochran, H. Huntington, C. Markon, M. McCammon, A.D. McGuire, and M. Serreze, 2014: Ch. 22: Alaska. Climate Change Impacts in the United States: The Third National Climate Assessment, J.M. Melillo, Terese (T.C.) Richmond, and G.W. Yohe, Eds., U.S. Global Change Research Program, 514-536. doi:10.7930/J00Z7150.
14. Alaska Chapter of the Climate Change Impacts in the United States: The Third National Climate Assessment, 2014.
15. USACE Alaska Baseline Erosion Assessment: http:www.poa.usace.army.mil/Library/ReportsandStudies/AlaskaBaselineErosionAssessments.aspx. March 2009.
16. USACE Floodplain Manager's Report: http://206.174.16.211/floodplain_data/Shishmaref/Documents/Shishmaref.pdf
17. USACE Hydraulics and Hydrology Section, October 2, 2014 Letter Report from David Spence to Mayor Stanley Tocktoo describing annual inspection of the Shishmaref Emergency Bank Stabilization Project.

Web Sites with General Hazard Planning Information

American Planning Association:	http://www.planning.org
Association of State Floodplain Managers:	http://www.floods.org
Federal Emergency Management Agency:	http://www.fema.gov
Community Rating System:	http://www.fema.gov/national-flood-insurance-program-community-rating-system
Flood Mitigation Assistance Program:	https://www.fema.gov/flood-mitigation-assistance-grant-program
Hazard Mitigation Grant Program:	http://www.fema.gov/hazard-mitigation-grant-program
Individual Assistance Program:	http://www.fema.gov/individual-assistance-program-tools
Interim Final Rule:	https://www.fema.gov/media-library/assets/documents/4590
National Flood Insurance Program:	http://www.fema.gov/national-flood-insurance-program
Public Assistance Program:	http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit/

Appendix A: Public Involvement

Contact the Planning Team!

Jennifer LeMay, PE, PMP, Lead Planner
907-350-6061
jlemay@lemayengineering.com

Scott Nelsen, State of Alaska DHS&EM Emergency Management Specialist
907-428-7010
Scott.nelsen@alaska.gov

Zena Barr, City Clerk
907-649-3781
Cityofshhclerk@gci.net

Howard Weyiouanna, Sr. Mayor
907-649-3781
cityofshhclerk@gci.net

We're Updating Our Plan!

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

Join The Planning Team

Any interested community member may join the plan update team.

To join, contact the City Clerk.

Offer Your Advice

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

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

Public Meeting

We will hold a council meeting on June 16, 2015 at noon to discuss updates for the Mitigation Plan.

For a copy of the current Hazard Mitigation Plan, visit the City of Shishmaref Office or:

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

Importance to the Community

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

What We're Updating

- Community Demographics
- Planning Process
  - New Planning Team
  - Expert Contributors
  - Public Involvement Strategy
- Maps, Figures, and Tables
- New or Revised Publications
- Hazard Profiles
  - Incident History
  - New Hazards
- Any Changes in Land Status
  - Revised Ordinances
  - Boundary or Zone Revisions
  - New Construction or Demolition
- Vulnerability and Risk Assessment
  - Has development changed our vulnerability and risk?
- Critical Facility and Infrastructure Inventory
- Mitigation Strategy
  - Progress toward Hazard Mitigation Goal Achievement
  - Progress Review of our Hazard Mitigation Projects
- NFIP Information

Mitigation Planning Resources

Hazard Mitigation

Alaska State Hazard Mitigation Plan
http://ready.alaska.gov/plans/documents/Alaska%20HMP%202013%20reduced%20file%20size.pdf

FEMA Mitigation Planning Guidance
http://www.fema.gov/plan/mitplanning/resources.shtm

Floods

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

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

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

Alaska Department of Commerce, Community and Economic Development Floodplain Management
http://commerce.state.ak.us/dnn/dcra/PlanningLandManagement/FloodplainManagement.aspx

U.S. Army Corps of Engineers -
2204 3rd Street, Elmendorf AFB,
AK 99506 – phone: 907-753-2610 http://www.poa.usace.army.mil/

Wildfires

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

Fire Ready - http://fireready.com/

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

US Geological Survey (USGS)
http://www.usgs.gov/natural_hazards/#fire

Alaska Dept. of Natural Resources – Division of Forestry
http://forestry.alaska.gov/fire/current.htm

Erosion

US Army Corps of Engineers Alaska Baseline Erosion Assessments
http://www.poa.usace.army.mil/Library/ReportsandStudies/AlaskaBaselineErosionAssessments.aspx

Earthquakes

United States Geological Survey – USGS http://www.usgs.gov/natural_hazards/#eq

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

Alaska Earthquake Information Center
http://www.aeic.alaska.edu/

Tsunami

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

National Oceanic Atmospheric Administration (NOAA)
http://ptwc.weather.gov/

Univ. of Washington -
http://earthweb.ess.washington.edu/tsunami/index.html

National Weather Service/West Coast and Alaska Tsunami Warning Center
http://wcatwc.arh.noaa.gov/

Severe Weather

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

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

National Weather Service (Fairbanks)
http://pafg.arh.noaa.gov/
http://pafg.arh.noaa.gov/

Shishmaref Multi-Hazard Mitigation Plan Meeting

June 16, 2015

12 pm

Name	Organization	Contact Information (phone or email)
[signature]	City MAYOR	907-649-8145
Donna Barr	Secretary	907-639-1096
[signature]	treasurer	907-639-1040
William P Jones Sr	member	907-639-1136 907-649-8499
Alice Schulte	City member	(907) 639-1003
[signature]	City Member	(907) 6498452
[signature]	CITY CLERK	907 6493781
JENNIFER LeMAY	LeMay Engineering & Consulting, Inc.	907 350-6061

City of Shishmaref

Regular Meeting Minutes
June 16, 2015
12:00PM
City Conference Room

Mayor Howard P. Weyiouanna Sr. called the regular meeting to Order at 12:10pm

Roll Call: City Council present: Howard P. Weyiouanna Sr., Mayor
Donna Barr, Secretary
Ruth Nayokpuk, Treasurer
William P. Jones Sr., Member
Alice Schultze, Member
Edwin Weyiouanna, Member

City Council absent and excused: Stella Havatone, Vice-Mayor

City Staff present: Zena Barr, City Clerk

Agenda Review:

William P. Jones Sr. made a motion to keep the June 16, 2015 regular meeting agenda open. Edwin Weyiouanna seconded. Question called. Motion carried.

VPSO Report:

VPSO Barrett Eningowuk will be on leave July 2 to the 24th, 2015 and also July 28 until August 3, 2015. He had asked what's the status of the jail restroom project. Mayor responded that Ken Orrison was working on the project and needed to work on the pipes. The VPSO Rhino needs to be fixed for the City VPO William P. Jones Sr. to use for the time being. VPSO will check with the Kawerak VPSO program if the City VPO needs to be on the insurance for using the vehicle. Next week, the church will hold talking circles for those who want to talk about grieving and suicide prevention.

Hazard Mitigation-Jennifer LeMay:

Jennifer Lemay, with LeMay Engineering and Consulting needs an update for the City of Shishmaref Hazard Mitigation Plans. Once this information has been updated, approved by the Council, it then will be approved by FEMA and the State. The most recent information was found from the Local Economic Development Plans from back in 2012 for the years 2013-2018. To add to the project list in the Hazard Mitigation plan is the Washeteria upgrade. ANTHC was here recently too to look at the City water source pond. The Baseline Protection Project was reviewed for the Sewall Inspection report that was submitted by the Army Corp. of Engineers. Kawerak Transportation is proposing new paved roads in the community. The Sanitation road project should start this summer by DOT. Resurfacing of the Airport project should happen this summer as well. In the updates for the Emergency Response Plan, waves generally reach 8-10 feet high when Shishmaref experiences storm surges. With all this new information, Ms. LeMay will submit a new copy of the Hazard Mitigation Plan to the City upon approval this fall.

1

VPSO Annual Evaluation-

Donna Barr made a motion to go into executive session at 12:56pm. William P. Jones Sr. seconded. Question called. Motion carried. Donna Barr made a motion to get out of executive session at 1:00pm. William P. Jones Sr. seconded. Question called. Motion carried.

Ruth Nayokpuk made a motion to accept the VPSO's Annual Evaluation. William P. Jones Sr. seconded. Question called. Motion carried.

William P. Jones Sr. made a motion to recess the meeting until Thursday the 18th of June at 2pm. Edwin Weyiouanna seconded.

Thursday June 18, 2015 2pm Regular meeting resumed.

Ratify Telephone Polls:

Edwin Weyiouanna made a motion to approve the June 3-10, 2015 telephone polls. Alice Schultze seconded. Question called. Motion carried.

Leave Requests: NONE

Minutes: a.) June 2, 2015, Regular Meeting Minutes:

Corrections made. Edwin Weyiouanna made a motion to approve the June 2, 2015 regular meeting minutes with corrections. Alice Schultze seconded. Question called. Motion carried.

b.) June 5, 2015 Energy Outreach Meeting Minutes:

Corrections made. William P. Jones Sr. made a motion to approve the June 5, 2015 special meeting minutes with corrections. Edwin Weyiouanna seconded. Question called. Motion carried.

c.) June 9, 2015 AML/JIA Safety Teleconference Minutes:

Corrections made. Ruth Nayokpuk made a motion to approve the June 9, 2015 AML/JIA safety teleconference meeting minutes with corrections. William P. Jones Sr. seconded. Question called. Motion carried.

d.) June 11, 2015 Utility Meeting Minutes:

Corrections made. Edwin Weyiouanna made a motion to approve the June 11, 2015 utility meeting minutes with corrections. Ruth Nayokpuk seconded. Question called. Motion carried.

Reports: a.) May 2015 City Bingo Financial Report:

William P. Jones Sr. made a motion to approve the May 2015 City Bingo Financial report with exceptions. Donna Barr seconded. Question called. Motion carried.

b.) Raymond O'Neill ANTHC Trip Report: Informational.

c.) 2015 Waste Erosion Assessment and Review Final Report: Informational.

Old Business: a.) NONE

New Business: a.) City/IRA/SDMA August 2015 Bingo & Pull Tab requests: NONE

b.) AML Membership Due FY 2016: Revisit this next month.

c.) ANTHC statement billing:

William P. Jones Sr. made a motion to approve the City Clerk to pay this billing statement in the amount $12,423.52 with the City credit card. Ruth Nayokpuk seconded. Question called. Motion carried. Supplies are needed for the Water Plant Operator, orders needs to be placed.

Correspondence:

*Source Water Assessment from the Alaska Drinking Water Protection Program: Informational.

*Alaska Association of Municipal Clerks conference November 15, 2015 in Anchorage, AK.: Informational.

*Tim Sandstrom, Project Manager Alaska Energy Authority: A Contractor will be selected in August for the Bulk Tank Farm.

*Departmental Environmental Conservation posted a situation report of the fuel contamination by the Native Store headers.

Comments and Concerns:

There will be a Wellness picnic meeting scheduled for Friday the 19th to discuss the picnic dates and funding. A concern was addressed that the Washeteria staying open late at times. The Council discussed this and it is up to the Washeteria attendants to stay open late.

Adjournment:

Alice Schultze made a motion to adjourn. William P. Jones Sr. seconded. Meeting adjourned at 2:59pm

_____ _____

Mayor Howard P. Weyiouanna Sr. **Date**

_____ _____

Attest: Zena Barr, City Clerk **Date**