Community of Shaktoolik, Alaska

Local Multi-Hazard Mitigation Plan

October 2009

Prepared by:

Native Village & City of Shaktoolik,

WHPacific

and

Bechtol Planning and Development

Acknowledgements

Native Village of Shaktoolik
Tribal Council

Simon Bekoalok Jr., President
Agnes Takak, Vice President
Matilda Hardy, Secretary
Harvey Sookiayak, Sr., Treasurer
Edgar Jackson, Sr.
Randall Takak
Axel Jackson

Native Village of Shaktoolik

Michael Sookiyak, Sr., Grants Coordinator
P.O. Box 100
Shaktoolik, AK 99771
Phone: (907) 955-3701
Fax: (907) 955-2352
Email: kaydess@yahoo.com

Shaktoolik City Council

Edgar Jackson Sr., Mayor
Edna Savetilik, Vice Mayor
Axel Jackson
Agnes Takak
Carole Sookiayak
Franklin Paniptchuk Jr.
Myron Savetilik

City of Shaktoolik

P.O. Box 10
Shaktoolik, AK 99771
Phone: (907) 955-3441
Fax: (907) 955-3221
Email: Rita_Auliye@hotmail.com

Contractor

WHPacific
Suzanne Taylor, Project Manager
300 West 31st Avenue
Anchorage, Alaska 99503
Phone: (800) 478-4153 or (907) 339-6500
Email: staylor@whpacific.com

Bechtol Planning and Development
Eileen R. Bechtol, AICP
P.O. Box 3426
Homer, Alaska 99603
Phone: (907) 399-1624
Email: bechtol@pobox.xyz.net

Technical Assistance

Alaska State Division of Homeland Security and Emergency Management

Ervin Petty
Mark Roberts
Andrew Jones

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Acronyms

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
DHS&EM	(Alaska) Division of Homeland Security and Emergency Management
DMA	Disaster Mitigation Act
DNR	Department of Natural Resources
°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
GO Bonds	General Obligation Bonds
HMP	Hazard Mitigation Plan
HMPG	Hazard Mitigation Planning Grant
IGAP	Indian General Assistance Program
IAW	Immediate Action Workgroup
MHMP	Local Multi-Hazard Mitigation Plan
NFIP	National Flood Insurance Program
NOAA	National Oceanographic and Atmospheric Administration
PDMG	Pre Disaster Mitigation Grant
REAA	Regional Educational Attendance Area
SBA	Small Business Administration
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
VA	Veterans Administration
VPO	Village Police Officer
VPSO	Village Public Safety Officer

Adoption Resolution

Native Village of Shaktoolik

IRA Council
P.O. Box 100
Shaktoolik, Alaska 99771-0100

Phone (907) 955-3701
Fax (907) 955-2352

Resolution No. 10-04

Joint Resolution of the Native Village of Shaktoolik IRA Council and the City of Shaktoolik City Council to Adopt the Community of Shaktoolik Local Multi-Hazard Mitigation Plan

WHEREAS, the community of Shaktoolik recognizes the threat that local natural hazards pose to residents and property; and

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

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

WHEREAS, the Shaktoolik 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; and

NOW, THEREFORE, BE IT RESOLVED, that the Native Village of Shaktoolik and the City of Shaktoolik hereby adopts the Community of Shaktoolik's Local Multi-Hazard Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the community of Shaktoolik will submit the adopted Local Multi-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.

Certification

We, the undersigned members of the Native Village of Shaktoolik IRA Council And the City of Shaktoolik City Council do hereby certify that the IRA Council and the City Council are composed of 7 members each, of whom voted on this 4th day of February, 2010, and the foregoing resolution was adopted by a vote of 11 members.

Yes 11 No 0 Abstain 0 Absent 3

9*

ATTEST:

Simon L. Bekoalok Jr. – President
Native Village of Shaktoolik IRA Council

Karlene D. Sagoonick – Tribal Coordinator

2-05-10

Edgar M. Jackson Sr. – Mayor
City of Shaktoolik

Rita R. Auliye – City Clerk

FEMA Approval Letter

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

FEMA

February 16, 2010

Honorable Edgar M. Jackson, Sr.
Mayor, City of Shaktoolik
P.O. Box 100
Shaktoolik, Alaska 99771-0100

Dear Mayor Jackson:

The U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) has approved the ***Community of Shaktoolik, Alaska Multi-Hazard Mitigation Plan*** as a local plan as outlined in 44 CFR Part 201. With approval of this plan, the Community of Shaktoolik is now eligible to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act's hazard mitigation project grants through February 16, 2015.

The plan's approval provides eligibility to apply for hazard mitigation projects through your State. All requests for funding will be evaluated individually according to the specific eligibility and other requirements of the particular program under which the application is submitted. For example, a specific mitigation activity or project identified in the plan may not meet the eligibility requirements for FEMA funding, and even eligible mitigation activities are not automatically approved for FEMA funding under any of the aforementioned programs.

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

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

Sincerely,

Mark Carey

Mark Carey, Director
Mitigation Division

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

Enclosure

BH:bb

www.fema.gov

Chapter 1. Planning Process and Methodology

Introduction

Hazard mitigation is any sustained action taken to reduce or eliminate long-term risk to human life and property from hazards. Mitigation activities may be implemented prior to, during, or after an incident. However, it has been demonstrated that hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs. (FEMA 386-8)

Local Mitigation Plan regulations are found in the Code of Federal Regulations at 44 CFR Part 201. This plan has been developed using the regulations to ensure compliance with federal criteria.

Federal regulations specify that local mitigation plans be designed to help jurisdictions identify specific actions to reduce loss of life and property from natural hazards. It is not intended to help jurisdictions establish procedures to respond to disasters or write an emergency operations plan. The goal of mitigation is to decrease the need for response as opposed to increasing response capability. (FEMA 386-8)

The scope of this plan is natural hazards present in the community: flooding, erosion, severe weather, wildland fire, and earthquake hazards. However, some of the mitigation projects for the natural hazards would also mitigate impacts from other hazards, such as technological and economic hazards.

The Shaktoolik Local Multi-Hazard Mitigation Plan (MHMP) includes information to assist the local government and residents with planning to avoid potential future disaster losses. The plan provides information on natural hazards that affect Shaktoolik and descriptions of past disasters, and lists projects that may help the community prevent disaster losses. The plan was developed to help the community make decisions regarding natural hazards that affect Shaktoolik.

Plan Development

Location

Shaktoolik is located 125 miles east of Nome and 33 miles north of Unalakleet on the east shore of Norton Sound. The area encompasses 1.1 square miles of land. It lies at approximately 64.333890° north latitude and -161.153890° west longitude. Shaktoolik is located in the Cape Nome Recording District.

Project Staff

The City and Tribe of Shaktoolik designated Tribal grants coordinator, Michael Sookiayak as the primary local staff person on this project. Michael was assisted by Simon Bekoalok, Tribal Council President, and Karlene Sagoonick, Tribal Coordinator.

WHPacific and Bechtol Planning & Development were hired to write the plan with the community. Ervin Petty, Mark Roberts and Andrew Jones of the Division of Homeland Security and Emergency Management (DHS&EM) provided technical assistance and reviewed the drafts of this plan.

Plan Research

The plan was developed utilizing existing Shaktoolik 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 2007*Division of Community and Regional Affairs (DCRA) Community Information*: http://www.commerce.state.ak.us/dca/commdb/CF_BOCK.htm
2. *Shaktoolik Local Economic Development Plan,* prepared by Kawerak, Inc., November 2006.
3. 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)
4. University of Alaska, Fairbanks, and Alaska Earthquake Information Center website at: http://www.giseis.alaska.edu/Seis/
5. USGS Earthquake Probability Mapping: www//eqint.cr.usgs.gov/eqprob/2002/index.php
6. West Coast and Alaska Tsunami Warning Center, (NOAA), http://wcatwc.arh.noaa.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

A public meeting was held at the Annex in Shaktoolik on Tuesday, April 21, 2009. Attendance included representatives of the City Council, the IRA Council, the Shaktoolik Native Corporation, and the Indian General Assistance Program (IGAP), as well as other interested members of the public. Suzanne Taylor of WHPacific and Andrew Jones of the DHS&EM presented information on the MHMP and associated potential funding programs.

Prior to the meeting, a newsletter was distributed and posted throughout the community at the Tribal and City offices, store, post office and annex. The meeting sign in, advertising flyer, and newsletter are contained in the public involvement appendix.

Also on April 21, 2009, Andrew and Suzanne had a table at a job fair at the Shaktoolik public school where they distributed information about the plan and its benefits to the community, as well as about careers in the fields of planning and emergency management.

The draft MHMP was submitted to the City and Tribe for review in August 2009. Comments were incorporated into the document.

A copy of the draft MHMP is available for public review at the City and Tribal Government Offices.

The Shaktoolik City and IRA Councils will review and approve the plan after pre-approval by DHS&EM and FEMA.

Plan Implementation

The Shaktoolik MHMP and all future updates or changes will be adopted through joint resolution of the City and IRA Councils. These governing bodies have the authority to promote sound public policy regarding hazards. The MHMP will be assimilated into other Shaktoolik plans and documents as they come up for review according to each plan's review schedule. Current plans for the community of Shaktoolik are listed in Table 1.

Table 1. Shaktoolik Plans

Document	Completed	Next Review
Shaktoolik Comprehensive Plan	2006	2011
Shaktoolik Erosion Assessment	April 2006	As needed
Local Economic Development Plan	July 2007	2011
Shaktoolik Long Range Transportation Plan	March 2007	As needed
Emergency Operations Plan	2009	As needed

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 Shaktoolik mayor, grants coordinator, Tribal President, or their designees are 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 IRA Councils 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 Shaktoolik mayor, grants coordinator, Tribal President, or their designee will evaluate the plan during the five-year cycle of the plan. 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

The mitigation planning regulations at §201.6(d)(3) direct the update of Mitigation Plans.

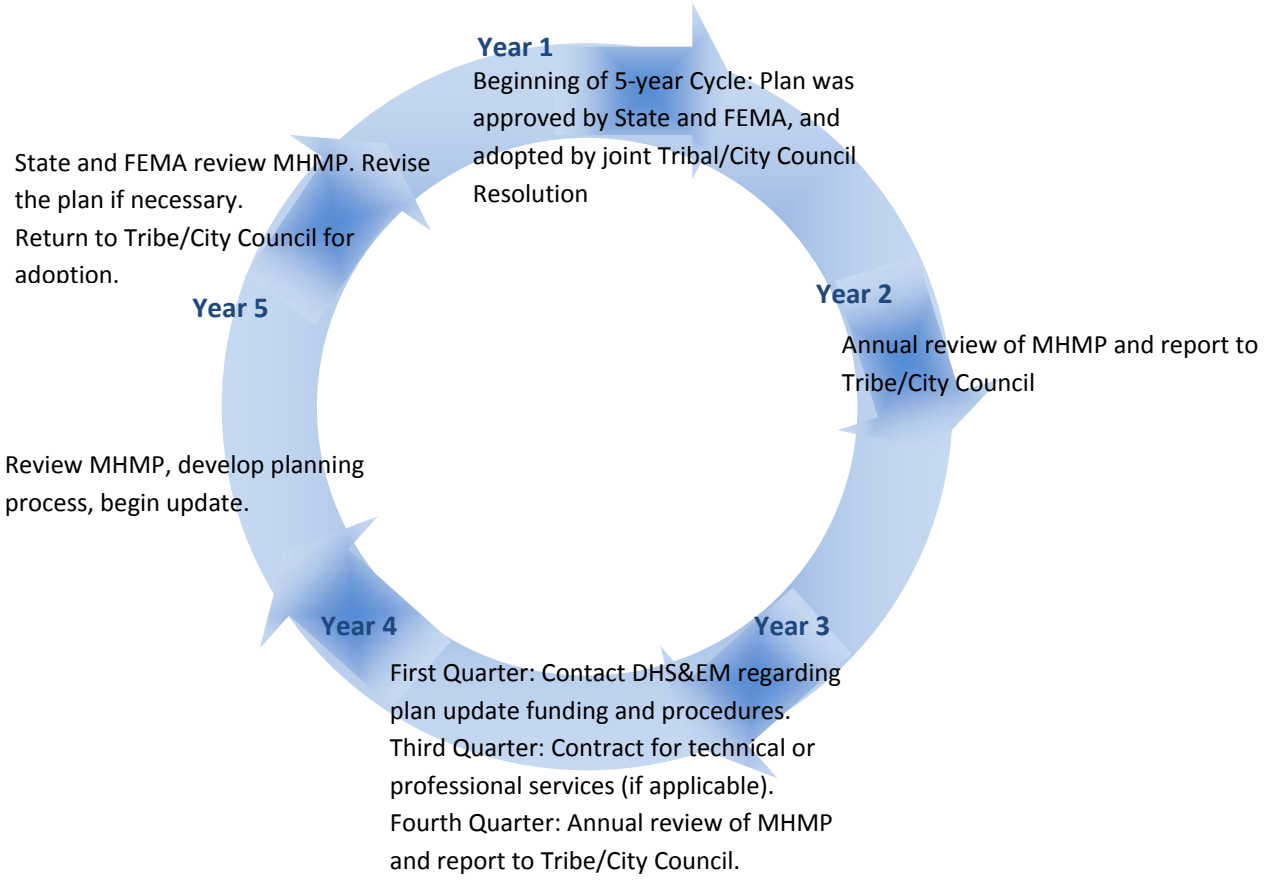
Plans must be updated and resubmitted to FEMA for approval every five years in order to continue eligibility for FEMA hazard mitigation assistance programs. Plan updates must demonstrate that progress has been made in the past five years to fulfill commitments outlined in the previously approved plan. 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 MHMP are illustrated in Figure 1.

Continued Public Involvement

A copy of the MHMP will be kept at City and Tribal offices and will be available for public review. On an annual basis the Tribe and City Councils will review the plan, which will be advertised to the public using the same methods established in the public involvement section of this plan.

Figure 1. Hazard Mitigation Planning Cycle



Chapter 2. Community Profile

Community Overview

Current Population: 223; 2008 Department of Community and Economic Development (DCRA)

Pronunciation: shock-TOO-lick

Incorporation Type: 2nd Class City

Borough: Unorganized

Census Area: Nome

Table 2 provides local and regional contact information for Shaktoolik.

Table 2. Community Information

Community Information	Contact Information
City of Shaktoolik	City of Shaktoolik Edgar Jackson Sr., Mayor P.O. Box 10 Shaktoolik, AK 99771 Phone: (907) 955-3441 Fax: (907) 995-3221 Email:Rita_Auliye@hotmail.com
Borough Located In:	Unorganized
Village Council	Native Village of Shaktoolik Simon Bekoalok Jr., President P.O. Box 100 Shaktoolik, AK 99771 Phone: (907) 955-3701 Fax: (907) 955-2352 Email:Kaydess@yahoo.com
Electric Utility	Alaska Village Electric Cooperative (AVEC) 4831 Eagle St Anchorage, AK 99501 Phone: (907) 561-1818 Web: http://www.avec.org
Regional Native Corporation	Bering Straits Native Corporation P.O. Box 1008 Nome, AK 99762 Phone: (907) 443-2985 Web: http://www.beringstraits.com

Community Information	Contact Information
School District	Bering Straits School District P.O. Box 225 Phone: (907) 624-4309 Fax: (907) 624-3078 Web: http://www.bssd.org
Regional Native Non-Profit	Kawerak, Inc. P.O. Box 948 Nome, AK 99762 Phone: (907) 443-5231 Fax: (907) 443-4452 Web: http://www.kawerak.org

History

Shaktoolik was the first and southernmost Malemiut settlement on Norton Sound, occupied as early as 1839. Twelve miles northeast, on Cape Denbigh, is "Iyatayet," a site that is 6,000 to 8,000 years old. Reindeer herds were managed in the Shaktoolik area around 1905. The village was originally located six miles up the Shaktoolik River, and moved to the mouth of the river in 1933. The 1933 site was prone to severe storms and winds; the village relocated to its present, more sheltered location in 1967. The City was incorporated in 1969.

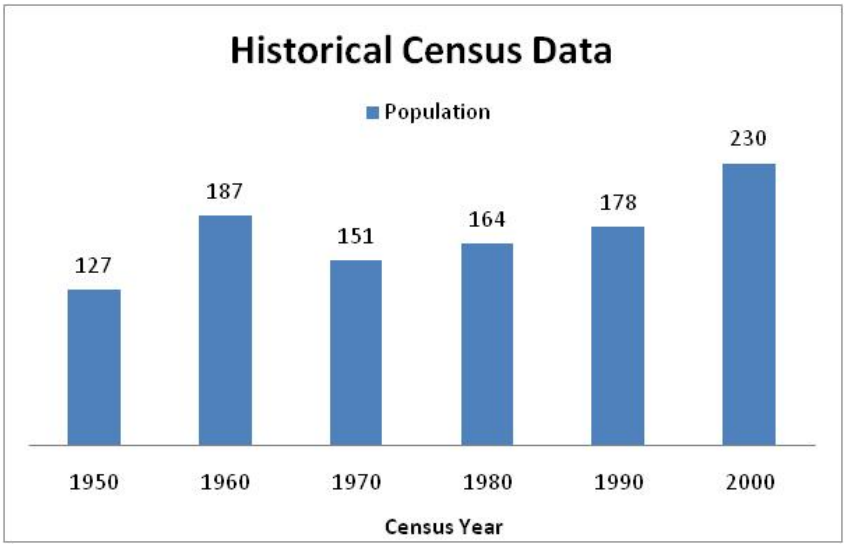
Culture

Shaktoolik is a Malemiut Eskimo village dependent on a subsistence lifestyle. According to the Alaska Department of Fish and Game surveys, the total annual harvest of subsistence foods is about 4.8 million pounds or about 519 pounds per person in villages of the Bering Straits Region. Subsistence is an important part of Shaktoolik's culture.

Population

Shaktoolik has a population of 223 residents. According to the 2000 U.S. Census, nearly 95 percent of residents are all or part Alaska Native. The community has a total of 66 housing units and 60 units are occupied. A total of six housing units are vacant and one is vacant due to seasonal use.

Figure 2. Historic Populations



Economy

Shaktoolik's economy is based on subsistence and supplemented by part-time employment. 33 residents hold commercial fishing permits. Development of a new fish processing facility is a village priority. Reindeer herding also provides income and food.

The total potential work force is 157; 68 residents are employed and 63 adult residents are not in the labor force (not seeking work). The unemployment rate is 27.7 percent and 6.1 percent of residents live below the poverty line. The per capita income is $10,491 with a median household income of $31,875.

Facilities

Water is drawn from the Togoomenik River, treated, stored and piped to nearly 100 percent of Shaktoolik households. The city owns and operates a central washeteria/water treatment plant. Residents not connected to piped water depend on the fill-and-draw system for water. The system is capable of pumping 120 gallons of water per minute. The city charges $60 for residents and $70 for commercial water and sewer services.

Wastewater is piped to steel septic tanks with vertically perforated aluminum culverts serving as seepage pits which facilitate the community's wastewater disposal. The majority of homes in Shaktoolik are connected to multiple dwelling septic systems, which can handle two to four homes per system. A septic sludge disposal site exists, but does not meet the Department of Environmental Conservation standards.

Refuse is burned at a landfill located too close to the airport to meet State standards. A new site selected for the landfill is approximately one and a half miles to the southeast. The electric utility, Alaska Village Electric Cooperative, operates a diesel powered generator.

Shaktoolik School, a kindergarten through 12th grade with 50 students and 7 teachers, is located within the Bering Straits School District. The Shaktoolik School parcel is home to the main school building, a head-start building, shop, play ground and power plant.

The newly-constructed Shaktoolik Clinic is operated by Norton Sound Health. The clinic has five small office areas, one exam room and one trauma room. Shaktoolik is classified as an isolated village, emergency services have coastal and air access.

Transportation

A state-owned 4,000-foot-long by 75-foot-wide gravel airstrip allows regular air service from Nome. Access during the summer is possible by all terrain vehicle (ATV), motorbike, truck or boat; during winter snow machines and dog teams also provide access. The community has no docking facility.

Climate

Shaktoolik is located in a sub-arctic climate with maritime influences. Summer temperatures average between 47 degrees Fahrenheit (°F) and 62°F. Winter temperatures average between -4°F to -11°F. Temperature extremes from -50°F to 87°F have been recorded. The average annual precipitation is 14 inches and 43 inches of snowfall. The Norton Sound is generally ice-free from May to October.

Vegetation and Soils

Shaktoolik is located in coastal lowland region, dotted with small tundra lakes. The landscape surrounding the village is primarily tundra, bare of timber. Willows and shrubs are the predominate vegetation. Foothills located 15 miles inland are surrounded by strands of spruce groves and other deciduous trees.

The community of Shaktoolik is located on a narrow strip of land between the ocean and the Tagoomenik River. The narrow strip is a flat sand bar only 200 feet wide at its northern end. The elevation of the highest ground in the Shaktoolik area is approximately 14 feet above mean high tide. The soils around Shaktoolik are poorly drained with a peaty surface layer. Gray sand and gravel extends below the organic mat to a depth exceeding 100 feet. Drainage on the wave-formed barrier bar where the townsite is located is excellent. The warming effect of water bodies on both sides of Shaktoolik's sand bar combined with the underlying well-drained gravel keeps the area virtually free of permafrost, although it is occasionally present (Rodney P. Kinney Associates, 2008).

Wildlife

The Tagoomenik River and the Shaktoolik River empty into the Norton Sound about two miles northwest of the village; making the village centrally located near the annual herring run. Chinook, chum, coho, pink and sockeye salmon also have local runs. Tideland areas support Belukha, ringed seal, walrus, ducks, and geese. Caribou migrate through inland areas which are also home to moose and brown bear.

Management

Shaktoolik is located in the southern half of the Department of Natural Resources (DNR) Management Unit Six: Norton Sound. Unit Six contains 13 bird rookeries and 23 anadromous streams, including the

Tagoomenik River. Shaktoolik Bay is an enclosed estuary. Known heritage resources along the coast include sites near the City of Shaktoolik, including the historic Iditarod Trail (DNR, 1989).

Shaktoolik Capability Assessment

Government

Shaktoolik is located in an unorganized borough. The City of Shaktoolik was incorporated in 1969. The community has a "strong mayor" form of government. Under Alaska Statute Title 29, the City of Shaktoolik assumes powers including the ability to tax and to administer transportation, police, fire protection and various other services. The City Council has seven members that meet the first Thursday of every month. Regular elections are held on the first Tuesday in October. The city imposes a four percent sales tax.

Community Maps

Community maps were developed using data from the DCRA website, maps from the Corps of Engineers study, and input from residents. Map 1 provides a regional view of Shaktoolik.

Infrastructure

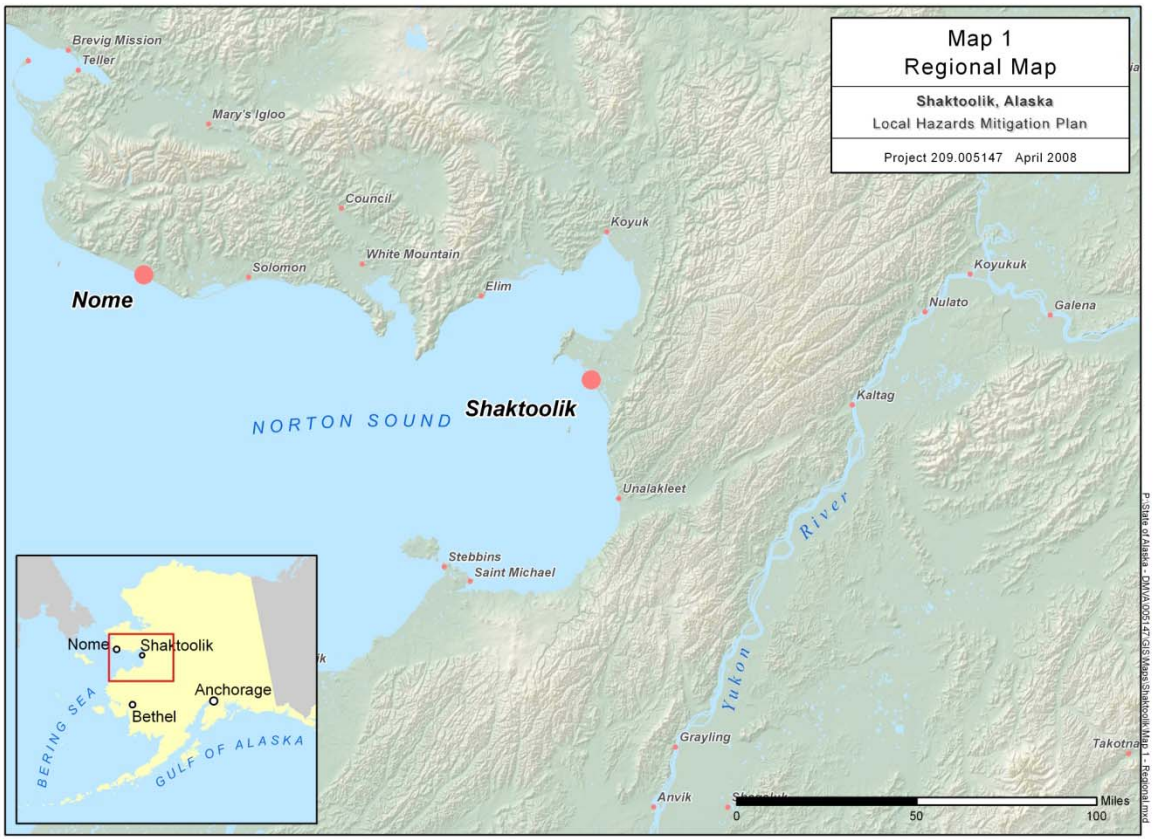
Every jurisdiction is unique. The list of assets that are most important to protect, as well as the criticality of any given facility, can vary widely from community to community. For planning purposes, a jurisdiction should determine criticality based on the relative importance of its various assets 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. The following are examples of these types of facilities.

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. In Shaktoolik, they include:

- Shaktoolik airport
- Shaktoolik clinic
- City Hall/Public Safety building
- Public Works garage (fire equipment)
- Municipal Fire station, new in 2008
- Public utilities

Map 1. Regional Map



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 – Shaktoolik School, National Guard Armory
- Bulk fuel storage tank farms
- Public works complex
- Municipal power plant
- Shaktoolik Native Store

Critical Infrastructure

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

- Telephone lines
- Satellite Communication Tower
- Power lines
- Transportation networks
- Water storage and distribution network
- Wastewater collection and distribution facilities

Vulnerable Populations

Locations within Shaktoolik that serve populations with special needs or requiring special consideration include:

- Schools
- Senior housing
- Head Start preschool
- 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:

- Shaktoolik Covenant Church and cemetery
- Shaktoolik cemetery
- Shaktoolik museum

Federal Resources

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

FEMA, through its Emergency Management Institute, offers training in many aspects of emergency management, including hazard mitigation. FEMA has also developed a large number of documents that address implementing hazard mitigation at the local level. Five key resource documents are available from the FEMA Publication Warehouse (1-800-480-2520) and are briefly described below:

How-to Guides. FEMA has developed a series of how-to guides to assist states, communities, and tribes in enhancing their hazard mitigation planning capabilities. The first four guides mirror the four major phases of hazard mitigation planning used in the development of the Shaktoolik Hazard Mitigation Plan. The last five how-to guides address special topics that arise in hazard mitigation planning such as conducting cost-benefit analysis and preparing multi-jurisdictional plans. The use of worksheets, checklists, and tables make these guides a practical source of guidance to address all stages of the hazard mitigation planning process. They also include special tips on meeting Disaster Mitigation Act (DMA) 2000 requirements (http://www.fema.gov/plan/mitplanning/resources.shtm).

Post-Disaster Hazard Mitigation Planning Guidance for State and Local Governments. FEMA DAP-12, September 1990. This handbook explains the basic concepts of hazard mitigation and shows state and local governments how they can develop and achieve mitigation goals within the context of FEMA's

post-disaster hazard mitigation planning requirements. The handbook focuses on approaches to mitigation, with an emphasis on multi-objective planning.

Mitigation Resources for Success CD. FEMA 372, September 2001. This CD contains a wealth of information about mitigation and is useful for state and local government planners and other stakeholders in the mitigation process. It provides mitigation case studies, success stories, information about Federal mitigation programs, suggestions for mitigation measures to homes and businesses, appropriate relevant mitigation publications, and contact information.

A Guide to Federal Aid in Disasters. FEMA 262, April 1995. When disasters exceed the capabilities of state and local governments, the President's disaster assistance program (administered by FEMA) is the primary source of federal assistance. This handbook discusses the procedures and processes for obtaining this assistance, and provides a brief overview of each program.

The Emergency Management Guide for Business and Industry. FEMA 141, October 1993. This guide provides a step-by-step approach to emergency management planning, response, and recovery. It also details a planning process that businesses can follow to better prepare for a wide range of hazards and emergency events. This effort can enhance a business's ability to recover from financial losses, loss of market share, damages to equipment, and product or business interruptions. This guide could be of great assistance to Shaktoolik businesses.

Other federal resources include:

Department of Agriculture. Assistance provided includes: Emergency Conservation Program, Non-Insured Assistance, Emergency Watershed Protection, Rural Housing Service, Rural Utilities Service, and Rural Business and Cooperative Service.

Department of Energy, Office of Energy Efficiency and Renewable Energy, Weatherization Assistance Program. This program minimizes the adverse effects of high energy costs on low-income, elderly, and handicapped citizens through client education activities and weatherization services such as an all-around safety check of major energy systems, including heating system modifications and insulation checks.

Department of Housing and Urban Development, Office of Homes and Communities, Section 108 Loan Guarantee Programs. This program provides loan guarantees as security for federal loans for acquisition, rehabilitation, relocation, clearance, site preparation, special economic development activities, and construction of certain public facilities and housing.

Department of Housing and Urban Development, Community Development Block Grants. Administered by the Alaska Department of Commerce, Community and Economic Development (DCCED) DCRA. Provides grant assistance and technical assistance to aid communities in planning activities that address issues detrimental to the health and safety of local residents, such as housing rehabilitation, public services, community facilities, and infrastructure improvements that would primarily benefit low- and moderate-income persons.

Department of Labor, Employment and Training Administration, Disaster Unemployment Assistance. Provides weekly unemployment subsistence grants for those who become unemployed because of a major disaster or emergency. Applicants must have exhausted all benefits for which they would normally be eligible.

Federal Financial Institutions. Member banks of the Federal Deposit Insurance Corporation (FDIC) or Federal Home Loan Bank Board (FHLBB) may be permitted to waive early withdrawal penalties for Certificates of Deposit and Individual Retirement Accounts.

Internal Revenue Service, Tax Relief. Provides extensions to current year's tax return, allows deductions for disaster losses, and allows amendment of previous tax returns to reflect loss back to three years.

United States Small Business Administration (SBA). May provide low-interest disaster loans to individuals and businesses that have suffered a loss due to a disaster. Requests for SBA loan assistance should be submitted to the Alaska DHS&EM.

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

Federal Emergency Management Agency, http://www.fema.gov – includes links to information, resources, and grants that communities can use in planning and implementation of sustainable measures.

American Planning Association, http://www.planning.org – is a non-profit professional association that serves as a resource for planners, elected officials, and citizens concerned with planning and growth initiatives.

Institute for Business and Home Safety, http://ibhs.org – an initiative of the insurance industry to reduce deaths, injuries, property damage, economic losses, and human suffering caused by natural disasters. Online resources provide information on natural hazards, community land use, and ways citizens can protect their property from damage.

State Resources

Alaska DHS&EM is responsible for coordinating all aspects of emergency management for the State of Alaska. Public education is one of its identified main categories for mitigation efforts.

Improving hazard mitigation technical assistance for local governments is high priority item for the State of Alaska. Providing hazard mitigation training, current hazard information, and the facilitation of communication with other agencies would encourage local hazard mitigation efforts. DHS&EM provides resources for mitigation planning on their website at http://www.ak-prepared.com.

DCCED DCRA provides training and technical assistance on all aspects of the National Flood Insurance Program (NFIP) and flood mitigation.

Division of Senior Services provides special outreach services for seniors, including food, shelter, and clothing.

Division of Insurance provides assistance in obtaining copies of policies and provides information regarding filing claims.

Department of Military and Veteran's Affairs provides damage appraisals and settlements for Veterans Administration (VA)-insured homes, and assists with filing for survivor benefits.

Other Funding Sources and Resources

Real Estate Business. Real estate disclosure is required by state law for properties within flood plains.

American Red Cross provides for the critical needs of individuals such as food, clothing, shelter, and supplemental medical needs. Provides recovery needs such as furniture, home repair, home purchasing, essential tools, and some bill payment may be provided.

Crisis Counseling Program provides grants to State and Borough mental health departments, which in turn provide training for screening, diagnosing and counseling techniques. Also provides funds for counseling, outreach, and consultation for those affected by disaster.

Local Resources

Shaktoolik is a small community with a very limited number of planning and land management tools. The resources available in these areas have been assessed by the City, and are summarized in Tables 3-5.

Table 3. Legal and Technical Capability

Regulatory Tools (ordinances, codes, plans)	Local Authority (Yes/No)	Comments (Year of most recent update; problems administering it, etc)
Building code	no	
Zoning ordinance	no	
Subdivision ordinance or regulations	yes	
Special purpose ordinances (floodplain management, stormwater management, hillside or steep slope ordinances, wildfire ordinances, hazard setback requirements)	no	
Growth management ordinances (also called "smart growth" or anti-sprawl programs)	no	
Site plan review requirements	no	
Comprehensive plan	yes	City/IRA/Corp combined, but may be outdated
A capital improvements plan	no	
An economic development plan	Yes IRA	Yes City/IRA/Corp combined

Regulatory Tools (ordinances, codes, plans)	Local Authority (Yes/No)	Comments (Year of most recent update; problems administering it, etc)
An emergency response plan	Current project IRA/City/Native Corporation	3 months to 1 year to completion
A post-disaster recovery plan	Current project IRA/City/Native Corporation	6 months to 1 year to completion
Real estate disclosure requirements	no	

Table 4. Administrative and Technical Capability

Staff/Personnel Resources	Y/N	Department/Agency and Position
City or Tribal Administrator	no	
City Clerk	yes	City
Health Officer	yes	Norton Sound Health Corp
City or Tribal Planner	no	Vacant
Public Works Director	no	
Public Safety Director	no	
Librarian	yes	Volunteer Shaktoolik School
Police Officer	yes	VPSO/VPO
Fire Chief	yes	Volunteer
Fire Department	yes	Volunteer
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	no	
Planners or Engineer(s) with an understanding of natural and/or human-caused hazards	no	Contract or request assistance from Kawerak, or Corps of Engineers
Floodplain manager	no	
Surveyors	no	Also contract with private surveyors
Staff with education or expertise to assess the community's vulnerability to hazards	no	Work with Kawerak Inc. and Corps of Engineers thru mitigation plan process of IRA, City and Corporation
Personnel skilled in GIS and/or HAZUS	no	

Table 5. Fiscal Capability

Financial Resources	Accessible or Eligible to Use (Yes or No)
Community Development Block Grants (CDBG)	Yes, both City and IRA
Capital improvements project funding	Yes, both City and IRA
Authority to levy taxes for specific purposes	Yes, City 4% sales tax to assist city administration
Fees for sewer	Yes, City
Impact fees for homebuyers or developers for new developments/homes	no
Incur debt through general obligation bonds (GO Bonds)	no
Incur debt through special tax and revenue bonds	no
Incur debt through private activity bonds	no
Withhold spending in hazard-prone areas	no

Chapter 3. Risk Assessment

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 Requirements for Risk Assessment

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 Shaktoolik MHMP meets those criteria are outlined below

Table 6. Risk Assessment - Federal Requirements

Section §201.6(c)(2) Requirement	Where requirement is addressed in Shaktoolik Multi-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, Section 3 identifies flood/erosion, severe weather, wildland fire and earthquake as natural hazards in Shaktoolik.

Section §201.6(c)(2) Requirement	Where requirement is addressed in Shaktoolik Multi-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 3-6 includes hazard-specific sections of the Shaktoolik MHMP profile the natural hazards that may affect the community. The Plan includes **location, extent, impact** and **probability** for each natural hazard identified. The MHMP also provides hazard specific information on **previous 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, Sections 3-6 contain overall summaries of each hazard and its impact on the community. Summaries are contained in hazard-specific section 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.	There are no repetitively damaged structures in Shaktoolik. Section 3 Flood/Erosion 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 1, Table 12 lists structures, infrastructure and critical facilities located in the identified hazard areas.

Section §201.6(c)(2) Requirement	Where requirement is addressed in Shaktoolik Multi-Hazard Mitigation Plan
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 2, Table 13 estimates potential dollar losses to municipal-owned facilities. This information was derived from insurance values provided by the City.

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 of this hazard plan. A vulnerability matrix table of critical facilities as affected by each hazard is provided in Section 2 of this chapter.

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 Shaktoolik records and land use map.

The following assessment includes the following seven sections:

Section 1. Identifying Hazards

Section 2. Assessing Vulnerability: Overview and Potential Losses

Section 3. Flood/Erosion

Section 4. Severe Weather

Section 5. Wildland Fire

Section 6. Earthquake

Section 7. Hazards Not Profiled in the 2009 Shaktoolik MHMP

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.

The following table 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 previous occurrences and information from the location of the hazard.

Table 7. Extent of Hazard Ranking

Magnitude/Severity	Criteria to Determine Extent
Catastrophic	Multiple deaths Complete shutdown of facilities for 30 or more days More than 50% of property severely damaged
Critical	Injuries and/or illnesses result in permanent disability Complete shutdown of critical facilities for at least 2 week More than 25% of property is severely damaged
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
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 more Less than 10% of property is severely damaged

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.

The following table, 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. Probability Criteria Table

Probability	Criteria Used to Determine Probability
Low	Hazard is present with a low probability of occurrence within the next ten years. Event has up to 1 in 10 years chance of occurring.
Medium	Hazard is present with a moderate probability of occurrence with the next three years. Event has up to 1 in 3 years chance of occurring.
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.

Previous occurrences of hazard events.

The previous 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.

Section 1. Identifying Hazards

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

Alaska All-Hazard Risk Mitigation Plan, 2007 Matrices – Bering Strait Regional Educational Attendance Area (REAA)

Table 9 is taken from the *Alaska All-Hazard Risk Mitigation Plan* of October 2007. Data for the Previous Occurrences Matrix, Table 10, comes from the DHS&EM Disaster Cost Index, including data from 1978 to the 2007 and major events such as the1964 earthquake. It may not include events known to the community or from other sources discussed in the sections describing specific hazards. This table refers to the Bering Strait REAA, a relatively large area, so not all hazards listed as being present necessarily affect Shaktoolik. For example, while ground failure is listed as present, it does not occur within Shaktoolik where the relatively flat terrain is not conducive to this hazard.

Table 9. Hazard Matrix

Hazard Matrix – Bering Strait REAA					
Flood	**Wildland Fire**	**Earthquake**	**Volcano**	**Avalanche**	**Tsunami & Seiche**
Y – H	Y – L	Y – M	N	Y – L	N
Severe Weather	**Ground Failure**	**Erosion**	**Drought**	**Technological**	**Economic**
Y – H	Y – L	Y – M	U	Y – L	Y – L

Hazard Identification:

Y: Hazard is present in jurisdiction but probability unknown

N: Hazard is not present

U: Unknown if the hazard occurs in the jurisdiction

Risk:

L : Hazard is present with a low probability of occurrence (1 in 10 years chance)

M : Hazard is present with a moderate probability of occurrence (1in 3 years chance)

H: Hazard is present with a high probability of occurrence (1 in 1 year chance)

Source: Alaska All-Hazards Mitigation Plan, 2007

Table 10. Previous Occurrences from 1978 to Present

Previous Occurrences - Bering Strait REAA					
Flood	**Wildland Fire**	**Earthquake**	**Volcano**	**Avalanche**	**Tsunami & Seiche**
1 – L	3 – L	None	None	None	None
Severe Weather	**Ground Failure**	**Erosion**	**Drought**	**Technological**	**Economic**
17 – L	None	1 – L	None	3 – L	2 - L

Extent

Z - Zero - Used for historical information. An event occurred but may not have caused damage or loss.

L - Limited – Minimal through maximum impact to part of community. *Falls short of the definition for total extent*.

T - Total – Impact encompasses the entire community.

Number:

Number of occurrences

Source: Alaska All-Hazards Mitigation Plan, 2007

Identification of Natural Hazards Present in Shaktoolik

Based on consultation with the Alaska DHS&EM, Table 11 and Table 12 from the *Alaska All-Hazard Risk Mitigation Plan*, Shaktoolik plans and reports, and interviews Shaktoolik identified the following hazards to be profiled.

Table 11. Hazards Identification and Decision to Profile

Hazard	Yes/No	Decision to Profile Hazard
Flood/Erosion	Yes	Large western storms, resulting in wave run-up extending 30 feet in elevation, have forced the community of Shaktoolik to evacuate in the past.
Severe Weather	Yes	Designated as a hazard in Alaska All-Hazard Risk Mitigation Plan.
Wildland Fire	Yes	Shaktoolik is located in a region where wildland fire is present but at an unknown probability.
Earthquake	Yes	Designated as a moderate hazard in Alaska All-Hazard Risk Mitigation Plan
Ground Failure	No	The terrain in Shaktoolik 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 Shaktoolik.
Volcano	No	The Alaska Volcano Observatory identifies the closest volcano to Shaktoolik as being approximately 100 miles away in the dormant Koyuk-Buckland volcanic field.
Avalanche	No	Shaktoolik's topography is not one likely to produce avalanches.
Tsunami	No	The bathymetry and shallow depth of Norton Sound protect the village from a tsunami hazard.

See Section 8, Hazards not present in Shaktoolik, 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 Shaktoolik's vulnerability to the hazards identified in Table 11. The summary includes type of hazard, the types of structures, infrastructures and critical facilities affected by the hazards. Some hazards are area wide in scope while others impact certain areas of the community to a greater or lesser extent.

Identification of Assets

Because Shaktoolik is a small community of 223 residents, every structure is essential to the sustainability and survivability of Shaktoolik residents. The Hazard Vulnerability Matrix in Table 12 includes a list of facilities, utilities and businesses in Shaktoolik, and whether, based on its location, each has a low, moderate or high vulnerability to specific natural hazards.

Table 12. City of Shaktoolik Asset Matrix – Structures and Infrastructure

Structure	Flood/ Erosion	Earthquake	Severe Weather	Wildland Fire
Clinic	M	L	H	M
Washeteria & Water Treatment Plant	M	L	H	M
Water Tank	M	L	H	M
City Building	L	L	H	M
Post Office	L	L	H	M
Teen Center & Store	L	L	H	M
Shaktoolik School	H	L	H	M
Head Start	H	L	H	M
School Shop	H	L	H	M
School Generator	M	L	H	M
AVEC Tank Farm	H	L	H	M
AVEC Power Plant	H	L	H	M
Armory	H	L	H	M
Corp. Office Store & Housing	H	L	H	M
SNC Fuel Station	H	L	H	M
SNC, City, IRA & BSSD Tank Farm	H	L	H	M
GCI Antenna Site	M	L	H	M
Inupiat Assembly	M	L	H	M
Alascom Building	L	L	H	M
Church Parsonage	M	L	H	M
Covenant Church	M	L	H	M

Table 13 lists the critical facilities in the community, their owners and type of construction. Few replacement values were currently available, but additional information will be added at the next plan review.

Table 13. City-owned Critical Facilities with Replacement Value

Structure	Owner (City or Tribe, etc.)	Construction type	Year Built	Sq Ft	Building Value ($)	Contents Value ($)
Clinic	Tribe	Stick-built	05/2003	1,800	$150,000	$100,000
Washeteria & Water Treatment Plant	City	Stick built	c. 1984	1800		$200,000
Water Tank	City	Steel weld Construction	c. 1984			
City Building		Stick built	c. 1980	1500		
Post Office	City lease			Approx. 200		
Teen Center & Store	City	Stick built	1982	1800		
Shaktoolik School	Bering Straits School District	Concrete foundation/wood steel upper	1982			
Head Start	Kawerak Inc.	Modular trailer court, steel/wood	c. 1975	1800		
School Shop	BSSD	Within school 1000 sq ft?	1982	1000		
School Generator	BSSD	Concrete wood	1982	Approx. 800		
AVEC Tank Farm	AVED	Welded steel	c. 1972			
AVEC Power Plant	AVEC	Steel/wood	c. 1972			
Armory	AK national guard	Wood steel		Approx. 1500		
Corp. Office Store & Housing	Shaktoolik Native Corp	wood	c. 1980	Approx. 2800		
SNC Fuel Station	yes	Steel const	c. 1972	Approx. 700		
SNC, City, IRA & BSSD Tank Farm	Corp	Steel Const	c. 1972		$500,000	
GCI Antenna Site	yes	steel				
Inupiat Assembly	Private - w/parsonage	wood	1984	2200 sq ft combined		
Alascom Building	AT&T	wood				

Structure	Owner (City or Tribe, etc.)	Construction type	Year Built	Sq Ft	Building Value ($)	Contents Value ($)
Church Parsonage	Covenant church w/ parsonage	Wood separate buildings	c. 1980	2400 combined / church / concrete basement		
Covenant Church	private	Concrete /wood	c. 1980			

The community of Shaktoolik has several current planned projects:

The Shaktoolik Clinic – The Native Village of Shaktoolik is working with the Denali Commission and the Norton Sound Health Corporation on revising a business plan for the clinic. The project is being considered for the FY10 funding cycle. The proposed site of the new clinic is in an upland area

The Shaktoolik Community Shelter Center – The community has secured $150,000 from the Alaska Climate Change Impact Mitigation Program, and the Tribe will start working with the Cold Climate Housing Research Center for the conceptual planning phase in the near future. Siting will take into account vulnerable areas of the community as described in this plan.

Power Plant Relocation – AVEC is planning jointly with the City to relocate the power plant to the old Airport on the on/off loading ramp near the old building. The AVEC tank farm will also likely go directly on the old airport.

Also, the Shaktoolik Native Corporation, the Bering Straits School District, the City of Shaktoolik, and the Native Village of Shaktoolik have plans to relocate their tank farm to the same general location as the AVEC tank farm near the proposed power plant site. The community recognizes the need to build up the sites for some of these facilities to mitigate against potential high water issues.

The community provided a map, contained in Appendix B, which shows the proposed clinic site as well as the location of the old airport where the tank farm/power plant projects are planned.

Section 3. Floods and Erosion

The following flood/erosion hazard profile includes a description of the hazard, the location, extent and probability of the hazard and previous occurrences of flooding/erosion in Shaktoolik.

Hazard Description

The primary flooding and erosion hazard in the Shaktoolik is storm surge flooding. Shaktoolik is located on the coast and therefore 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-flooding water'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 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.

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 includes 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

The entire community is vulnerable to erosion and flooding when fall storms hit the sand and gravel spit on which Shaktoolik is located. There is no breakwater to protect the community from destructive waves. In severe storms, the community becomes an island. The beach has historically been susceptible to damage and erosion from storm conditions, tidal surges, and from the sea ice conditions.

Logs that float down the Yukon River change from being protective to becoming destructive during storm surges. Several areas along the coastline used by the community are vulnerable to erosion and flooding during the storm season.

Certain areas have been identified as particularly susceptible to flooding. These are shown on the Area Use Map in Appendix B, page 84.

Extent

The extent (i.e. magnitude or severity) of the flood/erosion hazard is measured in this plan by using historical past events and the *Alaska All-Hazard Risk Mitigation Plan*. Based on these factors and using the criteria established in Table 7 the City of Shaktoolik has a **critical** extent of flooding not due to tsunami.

Impact

Over the past three floods, natural barriers have eroded substantially. Risk includes isolation of the community if a narrow spit that connects Shaktoolik to the mainland becomes eroded, which also would cut the community off from its source of fresh water. Damage is expected in less than 10 years (United States Army Corps of Engineers, 2009). Additionally, while the actual area subject to flooding is limited, the impact of the flooding could affect the entire community; even those properties unaffected directly, will suffer due to road closures, impacts to public safety (access and response capabilities), limited availability of perishable commodities, and isolation. The greatest potential impact would be the loss of fresh water.

As a result of flooding and erosion village officials have considered relocating, indentifying the Foothills area approximately 14 miles east of the present location as a potential site. The village intends to first use this site for emergency evacuation while developing a relocation plan (United States Government Accountability Office, 2009).

The United States Army Corps of Engineers (USACE) *Continuing Authorities Project Fact Sheet (Preliminary)*, dated October 1, 2009 states:

"Lacking any action to protect the community from erosion, Shaktoolik is expected to experience a 1- to 2-foot shoreline retreat each year under current climate conditions. Total erosion damages in Shaktoolik over a 15-year period of analysis are estimated to be $7.8 million with a net present value of $6.0 million and an average annual value of $583,400."

Probability

Based on the *Alaska All-Hazard Risk Mitigation Plan*, the 2009 Corps of Engineers study, City records and past historical events Shaktoolik has a **high** probability of flooding and erosion. Table 8 defines criteria used for determining high probability, as the hazard is present with a high probability of occurrence within the calendar year. Event has up to 1 in 1 year chance of occurring.

The *Alaska All-Hazard Risk Mitigation Plan* lists Shaktoolik as having flood hazard present with a high probability of occurrence.

Current Mitigation Projects

Currently, the USACE is investigating erosion in Shaktoolik; the study is estimated to cost approximately $500,000. A reconnaissance study for an evacuation road was completed in 2009. The State is partially funding the design and engineering of the evacuation road. Development of an evacuation shelter within the existing community is also being considered as a cost effective and near-term action (USACE, 2009).

Previous Occurrences

Shaktoolik was declared a State flood disaster area in 2004 and 2005. The 2005 storm cut off the village evacuation route to the south, inundating the road with floodwater. Storm surge propelled large driftwood close to buildings, creating huge debris piles on the shoreline (United States Army Corps of Engineers, 2009).

05-211 2004 Bering Strait Sea Storm declared October 28, 2004 by Governor Murkowski then FEMA declared (DR-1571) on November 15, 2004. Amended declaration to extend incident to October 24, 2004: Between October 18 and 20, 2004, a severe winter storm with strong winds and extreme tidal surges occurred along the Western Alaska coastline, which resulted in severe damage and threat to life and property, specifically in the **Bering Strait Regional Educational Attendance Area (REAA)**, including Elim, Nome, Koyuk, **Shaktoolik**, Unalakleet, and other communities; in the Northwest Arctic Borough, including Kivalina, Kotzebue, and other communities; and in the City of Mekoryuk; with potentially unidentified damages in adjacent areas, and additional storm surges likely from continuing weather patterns in this area Alaska. Conditions that exist in the coastal communities of the Northwest Arctic Borough as a result of this disaster: severe damage to roadways, power distribution systems, and drain fields. Conditions that exist in the coastal communities of the Bering Strait REAA as a result of this disaster: severe damage to gabions (used to protect shoreline), major damage to coastal highways and roads, damage to water and septic systems, damage to a bridge, damage to power distribution systems,

damage to fuel storage tanks, fuel spills, and property damage. Conditions that exist in the City of Mekoryuk as a result of this disaster: major damage to sea wall and damage to roadways. On November 16, 2004, the declaration was amended to reflect a more accurate timeframe of the disaster. The City of St. George appealed the denial of funding decision for the breakwater. The appeal was granted, which increased the original estimate for total funding of this disaster by more than $3 million. The dates of the severe storm were changed to October 18 through October 24, 2004. Individual assistance totaled $1 million for 271 applicants. Public Assistance total $13 million for 60 potential applicants. Hazard Mitigation totaled $800,000. The total for this disaster is $17 million.

06-215 2005 West Coast Storm declared October 24, 2005 by Governor Murkowski then FEMA declared (DR-1618) on December 9, 2005: Beginning on September 22, 2005 and continuing through September 26, 2005, a powerful fall sea storm produced high winds combined with wind-driven tidal surges resulting in severe and widespread coastal flooding and a threat to life and property in the Northwest Arctic Borough, and **numerous communities within the Bering Strait** (REAA 7), the Kashunamiut (REAA 55), the Lower Yukon (REAA 32) and the Lower Kuskokwim (REAA 31) Rural Education Attendance Areas including the cities of Nome, Kivalina, Unalakleet, Golovin, Tununak, Hooper Bay, Chevak, Mekoryuk and Napakiak. The following conditions existed as a result of this disaster: sever damage to personal residences requiring evacuation and sheltering of the residents; to businesses; to drinking water systems, electrical distribution systems, local road systems, airports, seawalls, and other public infrastructure; and to individual personal and real property; necessitating emergency protective measures and temporary and permanent repairs. On October 25, 2005, a request for a federal time extension was submitted. On December 9, 2005 a presidential disaster was declared (DR-1618) for Public Assistance for the Northwest Arctic Boro, Bering Strait REAA, Kashunamiut REAA (Chevak) and the Lower Kuskokwim REAA however, they failed to include the Lower Yukon REAA in the federal declaration. The State will write Project Worksheets for the Lower Yukon REAA under or State Public Assistance Declaration. Individual Assistance total is estimated at $209K, with 220 applicants. Public Assistance is around $3.63 million for 16 potential applicants. Hazard Mitigation total is $254,000. The total cost for disaster is estimated at $5.33 million.

Community Participation in the NFIP

The City of Shaktoolik does not participate in the National Flood Insurance Program (NFIP), but may want to consider joining.

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 Shaktoolik would agree to regulate new development and 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 on 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 14 describes the FIRM zones.

Table 14. 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 Federal Emergency Management Agency 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.

Currently, no floodplain mapping is available for Shaktoolik; consequently, it is unknown whether any households are situated in a floodplain.

Table 15. Housing Stock

Housing Types	Number of Structures
Total Housing Units	66
Occupied Housing (Households)	60
Vacant Housing	6
Vacant Due to Seasonal Use	1
Households located in the flood plain	unknown

Table 16. Local and State Floodplain Coordinator Contact Information

Shaktoolik Floodplain Coordinator	City Contact Person – Vacant position Address Phone: Email:
State of AK Floodplain Coordinators	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) 269-4567 (907) 269-4563 (fax) Email: taunnie_boothby@commerce.state.ak.us Web: http://www.commerce.state.ak.us/dca/nfip/nfip.htm

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 Shaktoolik there have been ***zero*** properties that meet the FEMA definition of repetitive loss.

Flood and Erosion Mitigation Goals and Projects

Flood and Erosion Goals

Goal 1. Reduce or prevent future flood damage.

Support elevation, flood proofing, buyout or relocation of structures that are in danger of flooding or are located on eroding banks.

Consider the benefits and costs of joining the National Flood Insurance Program.

Goal 2. Increase public awareness

Increase public knowledgeable about mitigation opportunities, floodplain functions, emergency service procedures, and potential hazards.

Flood and Erosion Projects

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

See Table 19, Mitigation Project Plan for specific projects to mitigate flooding and erosion.

FLD-1. Structure Elevation and/or Relocation (Goal 1)

A list of homes, commercial structures and critical facilities that are in danger of flooding and in erosion danger should be identified and mitigation projects for elevating and/or relocating the structures determined.

FLD-2. Investigate the Benefits of Joining the NFIP Program

Through the NFIP, property owners in participating communities are able to insure against flood losses. By employing wise floodplain management, a participating community can protect its citizens against much of the devastating financial loss resulting from flood disasters. Careful local management of development in the floodplains results in construction practices that can reduce flood losses and the high costs associated with flood disasters to all levels of government.

FLD-3. Shoreline Protection (Goal 1)

Protect critical infrastructure, including fuel tank farms, sewer lines and public buildings, through construction/installation of shoreline protection measures.

FLD-4. Water Source Protection (Goal 1)

Construction of the evacuation road and attendant shoreline erosion protection will serve to reinforce the narrow strip of land at First Bend thus protecting the community's water source from saltwater intrusion.

If for some reason the evacuation road is not constructed, the water intake structure should be relocated to a site where breaching and saltwater contamination is not an imminent threat. This could entail piping water across the slough from an alternate fresh water river source or moving the water intake further up the Tagoomenik River to a point upriver from the potential breach site.

FLD-5. Clearly Mark Navigable Waterway for Evacuation (Goal 1, 2)

If floodwaters cover the southern portion of the spit of land where Shaktoolik is located, the community is cut off from overland evacuation. A clearly marked navigable waterway could be critical in the safe evacuation of residents, particularly in the dark.

FLD-6. Public Education (Goal 1, 2)

Increase public knowledgeable 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 Shaktoolik could be developed and distributed to all households.

Youth should be trained in camping skills such as tent raising and camp cooking to reduce injury or loss of life in case of emergency evacuation.

Section 4. 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.

Weather issues in Shaktoolik include severe winds, winter storms, extreme cold, and dense fog.

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 cities and towns. 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 °F. 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 interior Alaska 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 northern villages.

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 Shaktoolik 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.

Location

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

Extent

Extreme weather could result in a **critical** situation in Shaktoolik. Injuries and/or illness could result from extreme cold, high winds and blowing snow that causes disorientation.

The *Alaska All-Hazard Risk Mitigation Plan, 2007* lists severe weather as creating one limited-damage event in Shaktoolik.

Impact

Because of its remote location, Shaktoolik must be very self reliant. Severe weather can cut off air access limiting medevac availability and access to goods and services, including groceries and medical supplies. Extremely cold temperatures, storms that limit visibility, and dense fog all cause flights into or out of the community to be cancelled for days at a time.

Another major weather factor in the community is high winds. The wind chill factor can bring temperatures down to -60 °F creating dangerous conditions for necessary outdoor activities. Severe winds cause damage to structures in Shaktoolik on a regular basis. Siding and roofing materials can be ripped away leaving utilities such as water pipes vulnerable to freezing. While most home and business owners are prepared for high winds and low temperatures, building practices must be followed to mitigate against potential damage.

Probability

Tribal staff and other residents describe severe weather as a serious natural hazard risk in Shaktoolik, due to extreme cold, snow, fog, and high winds. As shown in the data from nearby Unalakleet presented in Table 17, Shaktoolik has a high probability of severe weather, which is defined, as the hazard is present with a **high** probability of occurrence within the calendar year. Event has up to a 1 in 1 chance of occurring.

Previous Occurrences of Severe Weather Hazards

2004 Bering Strait Sea Storm *declared October 28, 2004 by Governor Murkowski then FEMA declared (DR-1571) on November 15, 2004*. Amended declaration to extend incident to October 24, 2004: Between October 18 and 20, 2004, a severe winter storm with strong winds and extreme tidal surges occurred along the Western Alaska coastline, which resulted in severe damage and threat to life and property, specifically in the Bering Strait Regional Educational Attendance Area (REAA), including Elim, Nome, Koyuk, **Shaktoolik**, Unalakleet, and other communities; in the Northwest Arctic Borough, including Kivalina, Kotzebue, and other communities; and in the City of Mekoryuk; with potently unidentified damages in adjacent areas, and additional storm surges likely from continuing weather patterns in this area Alaska. Conditions that exist in the coastal communities of the Northwest Arctic

Borough as a result of this disaster: severe damage to roadways, power distribution systems, and drain fields. Conditions that exist in the coastal communities of the Bering Strait REAA as a result of this disaster: severe damage to gabions (used to protect shoreline), major damage to coastal highways and roads, damage to water and septic systems, damage to a bridge, damage to power distribution systems, damage to fuel storage tanks, fuel spills, and property damage. Conditions that exist in the City of Mekoryuk as a result of this disaster: major damage to sea wall and damage to roadways. On November 16, 2004, the declaration was amended to reflect a more accurate timeframe of the disaster. The City of St. George appealed the denial of funding decision for the breakwater. The appeal was granted, which increased the original estimate for total funding of this disaster by more than $3 million. The dates of the severe storm were changed to October 18 through October 24, 2004. Individual assistance totaled $1 million for 271 applicants. Public Assistance total $13 million for 60 potential applicants with 125 PWs. Hazard Mitigation totaled $800,000. The total for this disaster is $17 million.

Historic weather data is not available for Shaktoolik but is available for Unalakleet, a community just south of Shaktoolik. That data is presented in Table 17.

Table 17. Unalakleet Weather Summary

Station:(509564) UNALAKLEET WSO AIRPORT															
From Year=1949 To Year=1998															
	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	9.9	-3.7	3.1	47	21/1961	-59	28/1989	20.8	1977	-10.1	1971	0	28.5	30.7	17.2
February	10.3	-5.1	2.9	46	Dec-80	-50	28/1956	17.3	1977	-11.4	1954	0	26.3	28	15.8
March	16.9	-0.5	8.2	47	29/1954	-50	Nov-71	24.9	1965	-7.3	1972	0	26.5	30.8	15.4
April	29.3	12.7	21	62	30/1960	-30	Dec-77	31.6	1957	9.8	1977	0	16.8	28.7	6.4
May	45.8	30.4	38.1	78	24/1969	-6	Jul-52	44.5	1951	30.8	1952	0	2.6	18.3	0.1
June	54.6	41.4	48	86	26/1951	25	Jun-52	54.9	1957	43.2	1955	0	0	1.8	0
July	61	47.6	54.3	87	Jul-72	32	16/1953	59.4	1972	50.2	1959	0	0	0.1	0
August	59.8	46.1	52.9	85	Jun-68	28	16/1953	58.5	1977	46.4	1969	0	0	0.7	0
September	51.2	36.7	43.9	75	Jan-81	6	30/1957	50.6	1974	38.4	1970	0	0.1	7.9	0
October	33	20.8	26.9	57	Jan-50	-20	30/1953	34.3	1969	19.5	1956	0	14.2	26.7	1.7
November	19.1	7.3	13.2	48	Jan-95	-36	23/1994	22	1949	-3.5	1956	0	26.3	29.8	8.4
December	8.4	-4.8	1.8	43	Aug-83	-52	31/1974	18.4	1960	-12.7	1959	0	29	30.9	18
Annual	**33.3**	**19.1**	**26.2**	**87**	**19720707**	**-59**	**19890128**	**29.6**	**1957**	**21.1**	**1956**	**0**	**170.4**	**234.2**	**83**
Winter	9.5	-4.6	2.6	47	19610121	-59	19890128	15.1	1977	-5.6	1971	0	83.8	89.5	51
Spring	30.7	14.2	22.4	78	19690524	-50	19710311	29.8	1957	13.5	1971	0	45.9	77.8	21.9
Summer	58.5	45.1	51.8	87	19720707	25	19520606	55	1977	49.2	1955	0	0	2.6	0
Fall	34.4	21.6	28	75	19810901	-36	19941123	34.2	1949	19.6	1956	0	40.6	64.3	10.1

Table Updated 11/05/2006, Source: Western Regional Climate Center, http://wrcc.dri.edu

Severe Weather Mitigation Goals and Projects

Severe Weather Goals

Goal 1: Reduce severe weather damage.

Encourage weather resistant building construction materials and practices.

Goal 2: Increase public awareness

Educate people about the dangers of extreme weather and how to prepare.

Goal 3: Prevent future severe weather damage.

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

Severe Weather Projects

SW-1. Storm Ready (Goal 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.

SW-2. Conduct severe weather awareness activities. (Goal 1, 2, 3)

Activities may include events such as Winter Weather Awareness Week, Flood Awareness Week, etc.

SW-3. NOAA Weather Radio. (Goal 1, 2, 3)

Expand public awareness about NOAA Weather Radio for continuous weather broadcasts and warning tone alert capability.

SW-4. Encourage weather resistant building construction materials and practices. (Goal 1)

Section 5. Wildland Fire

Hazard Description and Characterization

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 burning 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.

Location

The hazards of wildland fire impact Shaktoolik on an area-wide basis. A wildland fire event could damage structures, and smoke could potentially isolate Shaktoolik from the rest of the state by reducing visibility and grounding flights. Driftwood piles up along the beaches on the west side of the community providing potential fuel for fires, which could spread rapidly if conditions are right.

Extent

A wildland fire could result in a **critical** situation in Shaktoolik. Injuries and/or illness could result from excessive smoke and fire damage could shutdown critical facilities, damage property and isolate Shaktoolik.

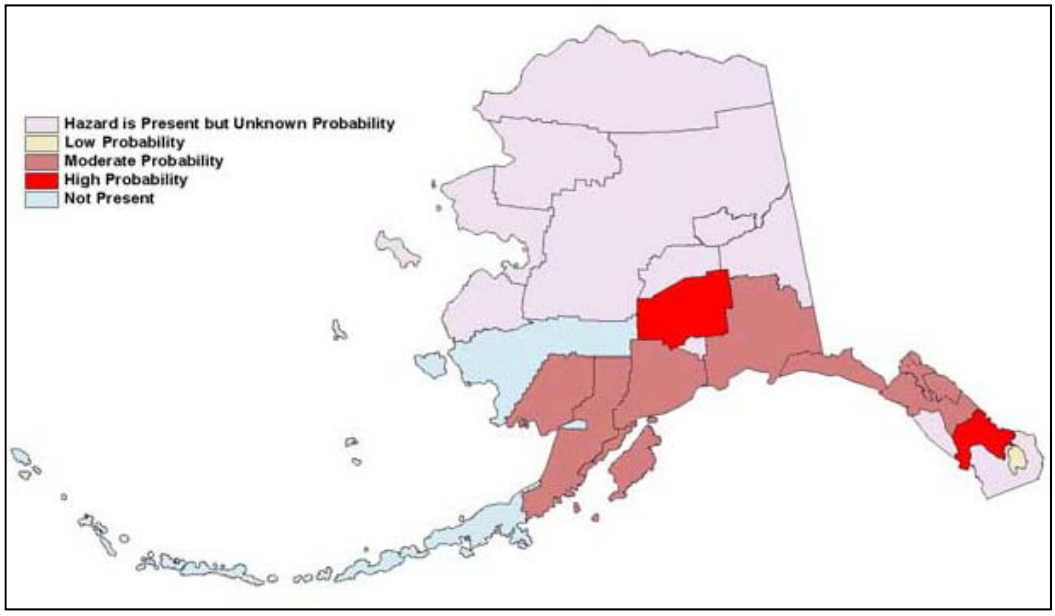
The *Alaska All-Hazard Risk Mitigation Plan, 2007* lists wildland fires as creating one limited-damage event in Shaktoolik.

Impact

Wildland fire could destroy the entire community of Shaktoolik, especially if the fire is wind driven. Fire or smoke impacting the airport could cut-off access to the community preventing the transportation of goods. Additionally, the loss of any structures is devastating to such a small community where services and housing are limited and prohibitively expensive to replace.

Probability

The following map from the *Alaska All-Hazards Risk Mitigation Plan* depicts Shaktoolik as being in an area where the hazard is present but at an unknown probability. Based on previous occurrences of wildland fire in the vicinity of Shaktoolik, most caused by lightning strikes, and based on the assessment in the *Alaska All-Hazard Risk Mitigation Plan, 2007*, Shaktoolik has a low probability of wildland fire.



Map 2. Alaska All-Hazards Mitigation Plan - Fire Risk Map

Source: ***Alaska All-Hazard Risk Mitigation Plan, 2007***

Previous Occurrences

Ten wildland fires have burned an estimated 20,765.1 acres of land within a 25 mile radius of Shaktoolik.

Christmas Mountain: burned an estimated 73 acres over three days, started June 12, 2007, by lightning strike.

Shaktoolik River: burned an estimated 1 acre in one day, started June 18, 2003, by lightning strike.

UNK NW 10: burned an estimated 20 acres in one day, started June 8, 1994, by lightning strike.

UNK N 35: burned an estimated 10 acres in one day, started June 22, 1993, by lightning strike.

UNK NW 40: burned an estimated 1 acre in one day, started June 5, 1993, by lightning strike.

UNK NW 25: burned an estimated 0.1 acres in one day, started June 8, 1991, by lightning strike.

Tag River: burned an estimated 2,500 acres over two days, started July 10, 1972, by lightning strike.

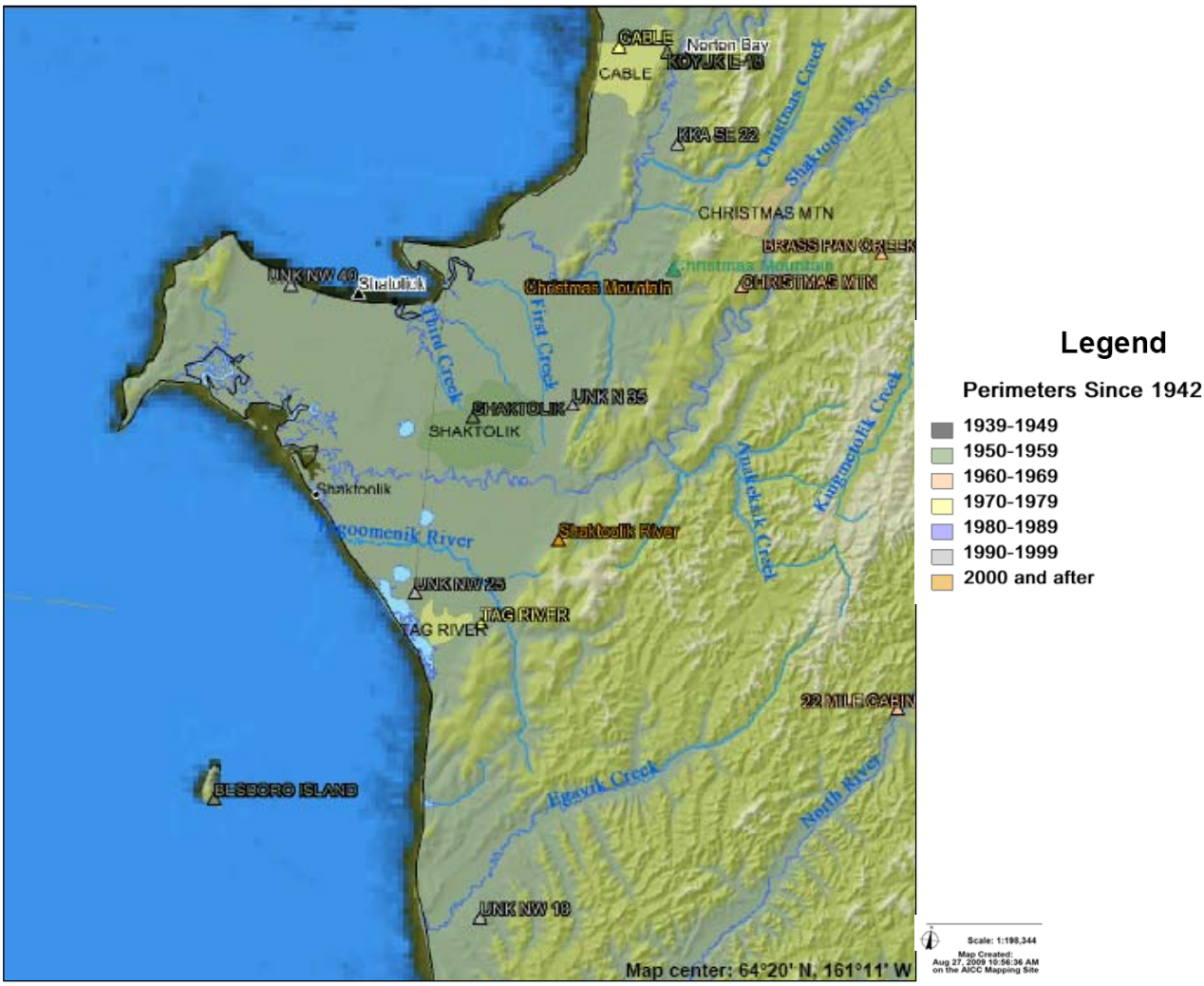
Christmas MTN: burned an estimated 2,350 acres, started May 19, 1960, by human recreation.

Shaktoolik: burned an estimated 15,700 acres over 83 days, started June 10, 1957, by lightning strike.

Besboro Island: burned an estimated 10 acres, started June 11, 1956, by human recreation.

Shaktoolik: burned an estimated 100 acres, started June 23, 1943, by lightning strike.

Figure 3. Historical Wildland Fire Burn Perimeters 1942-2008



Wildland Fire Mitigation Goals and Projects

Wildland Fire Goals

Goal 1: Mitigate against fire damage.

Establish building regulations to mitigate against fire damage.

Goal 2: Public awareness and preparedness.

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

Goal 3: Evaluate emergency plans.

Encourage the evaluation of emergency plans with respect to wildland fire assessment.

Goal 4: Prevent future wildland fire damage.

Acquire information on the danger of wildland fires and how best to prepare.

Wildland Fire Projects

WF-1: Promote Fire Wise building design, siting, and materials for construction. (Goal 1, 2)

WF-2: Join the Alaska Fire Wise Program (Goal 1, 2)

The Alaska Fire Wise Program is designed to educate people about wildland fire risks and mitigation opportunities. It is part of a national program that is operated in the State by the Alaska Wildfire Coordinating Group (AWCG).

WF-3: Encourage development of building codes and requirements. (Goal 1, 2)

WF-4: Enhance public awareness of potential risk to life and personal property. (Goal 1, 2)

WF-5: Encourage mitigation measures in the immediate vicinity of residential and business property. (Goal 1, 2, 4)

Section 6. Earthquake

Hazard Description and Characterization

Approximately eleven 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 seven or greater occur in Alaska on average of about once a year; magnitude eight 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.

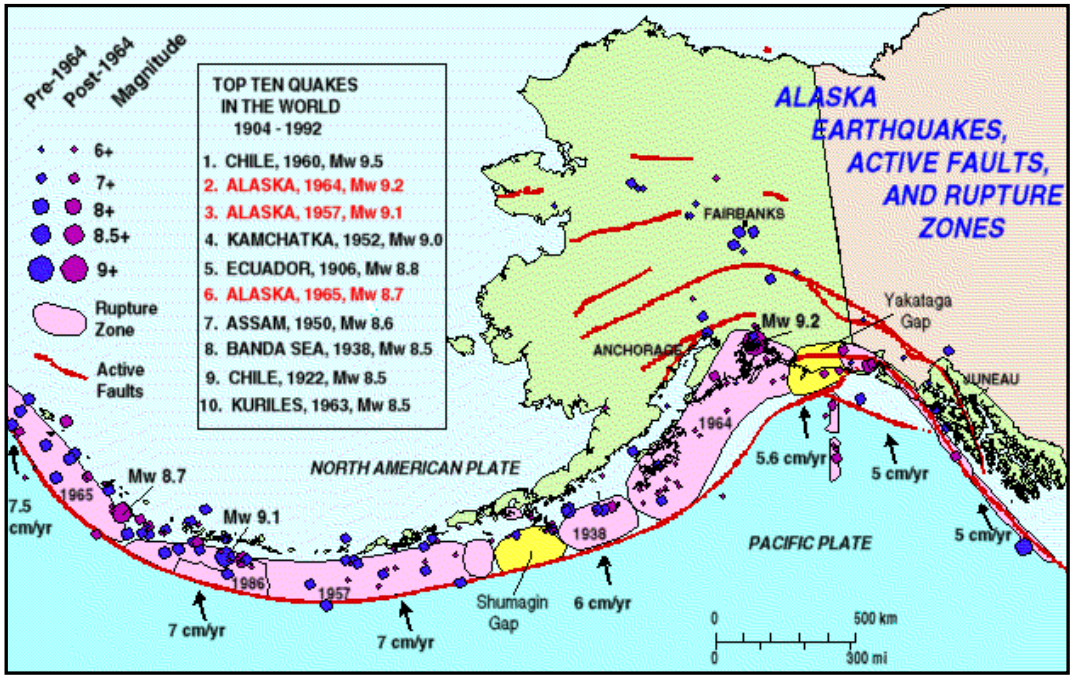
Strike-slip faults are where each side of the fault moves horizontally. Normal faults have one side dropping down relative to the other side. Thrust (reverse) faults have one side moving up and over the fault relative to the other side.

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.

Map 3. AEIS Earthquake Active Faults



Source: University of Alaska, Fairbanks, and Alaska Earthquake Information Center (AEIC) website at: http://www.giseis.alaska.edu/Seis/.

Location

An earthquake hazard event could potentially impact any part of Shaktoolik. Earthquake damage would 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 Shaktoolik to determine structural integrity following earthquake damage. Priority would have to be given critical infrastructure to include: public safety facilities, health care facilities, shelters and potential shelters, and finally public utilities.

Extent

The extent of an earthquake in Shaktoolik could be ***critical*** Table 7 uses the following criteria to determine the extent of possible damage: Injuries and/or illnesses result in permanent disability,

complete shutdown of critical facilities for at least two weeks, more than 25 percent of property is severely damaged.

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.

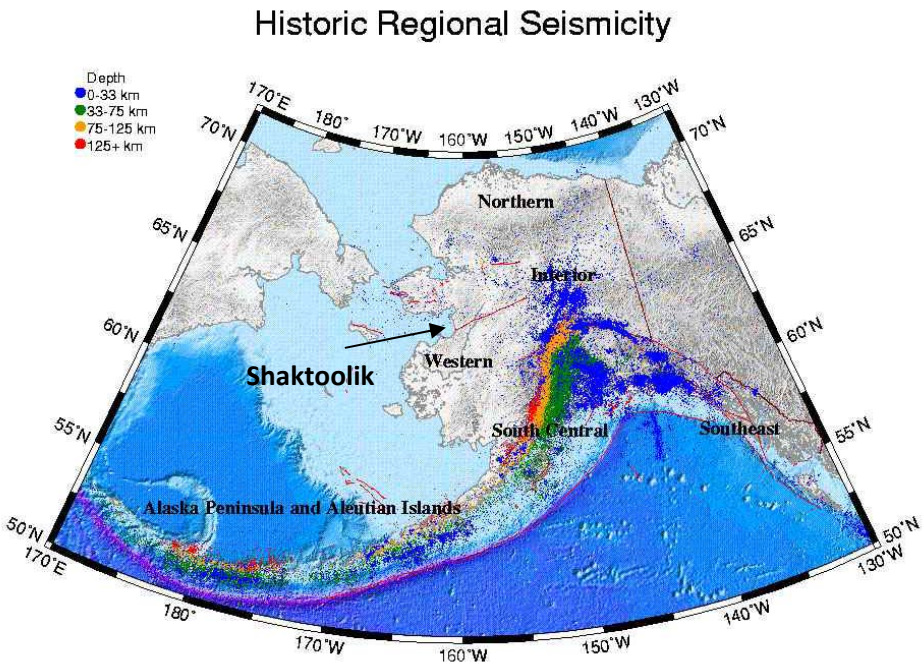
The "intensity" reported at different points generally decreases away from the earthquake epicenter. Local geologic conditions strongly influence the intensity of an earthquake; commonly, sites on soft ground or alluvium have intensities two to three units higher than sites on bedrock.

The Richter scale expresses magnitude as a decimal number. A 5.0 earthquake is a moderate event, 6.0 characterize 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 2007*)

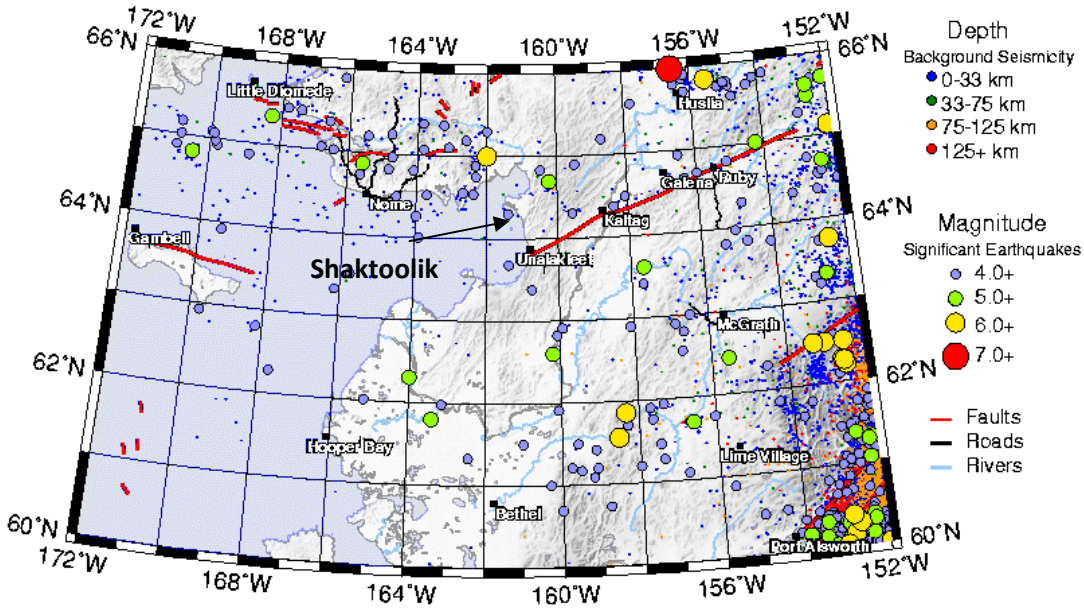
A magnitude of 2 or less is called a microearthquake, they cannot even be felt by people and are recorded only on local seismographs. Events with magnitudes of about 4.5 or greater are strong enough to be recorded by seismographs all over the world. But the magnitude would have to be higher than 5 to 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.

Map 4 and Map 5, which shows active fault lines in western Alaska. The figures and other information at the website list the Shaktoolik area as having a low probability of an earthquake. However, since all of Alaska is at risk for an earthquake event Shaktoolik could be at risk for an earthquake or have secondary impact from an earthquake in the region.

Map 4. Alaska Earthquake Information System Historic Regional Seismicity



Map 5. Western Alaska Seismicity



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

Impact

The impact on the community of Shaktoolik of a severe earthquake could be extensive. Portions of the community could be cut off from critical facilities and infrastructure and services could be disrupted for an extended period.

Earthquake damage would 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 Shaktoolik to determine structures integrity following earthquake damage. Priority would have to be given critical infrastructure to include: public safety facilities, health care facilities, shelters and potential shelters, and finally public utilities.

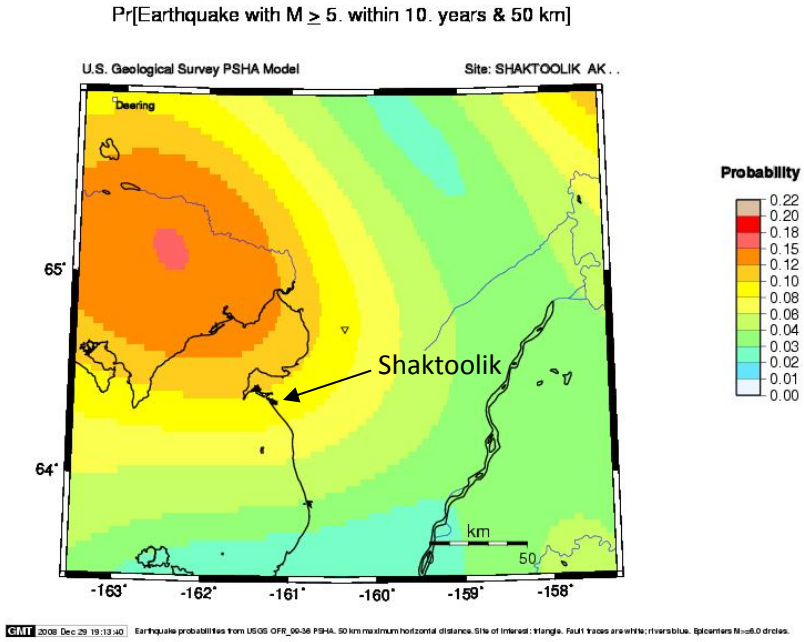
Probability

Shaktoolik has a low probability of earthquake hazard. Table 8 lists the following criteria for a moderate probability: hazard is present with a low probability of occurrence with the next ten years. Event has up to 1 in 10 years chance of occurring.

While it is not possible to predict an earthquake, the United States Geological Survey (USGS) has developed Earthquake Probability Maps that use the most recent earthquake rate and probability models. These models are derived from earthquake rate, location and magnitude data from the USGS National Seismic Hazard Mapping Project.

Map 6 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 Shaktoolik is 8 to 10 percent.

Map 6 USGS Shaktoolik Earthquake Probability Map



Previous Occurrences

There have been no reports of earthquake damage in Shaktoolik.

Earthquake Mitigation Goal and Projects

Earthquake Goals

Goal 1: Mitigate against earthquake damage.

Obtain funding to protect existing critical infrastructure from earthquake damage

Earthquake Projects

E-1: Identify critical facilities. (Goal 1)

Identify buildings and facilities that must be able to remain operable during and following an earthquake event.

E-2: Improve earthquake resistance. (Goal 1)

If funding is available, perform an engineering assessment of the earthquake vulnerability of each identified critical infrastructure owned by the City of Shaktoolik.

E-3: Nonstructural Mitigation Projects (Goal 1)

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

Section 7. Hazards Not Profiled in the 2009 Shaktoolik MHMP

Ground Failure

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.

Ground Failure Vulnerability Assessment

Shaktoolik is located on relatively flat terrain. No previous occurrences of ground failure have been reported.

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 Shaktoolik does not provide the necessary conditions for avalanche. No threat from avalanche is present on Shaktoolik.

Volcano

Alaska is home to more than 40 historically active volcanoes stretching across the entire southern portion of the state, from the Wrangell Mountains to the far western Aleutians. On average, one to two eruptions occur per year in Alaska. In 1912, the largest eruption of the twentieth century occurred at Novarupta and Mound Katmai, located in what is now Katmai National Park and Preserve on the Alaska Peninsula.

A volcano is a vent at the Earth's surface through which magma and associated gases erupt, and also the landform built by effusive and explosive eruptions. Volcanoes display a wide variety of shapes, sizes, and behavior; however, they are commonly classified among three main types: cinder cone, composite and shield.

Cinder Cones

A cinder cone is the simplest type of volcano. They are built from particles and blobs or congealed lava ejected from a single vent. As the lava is blown into the air, it breaks into small fragments that solidify and fall as cinders and bombs around the vent to form a circular or oval cone. Cinder cones are found on Shaktoolik Island.

Composite Volcanoes

Composite volcanoes, sometimes called stratovolcanoes, are typically steep-sided, symmetrical cones of large dimension built of alternating layers of lava flows, volcanic ash, blocks, and bombs, and may rise as much as 8,000 feet above their bases.

Shield Volcanoes

Shield volcanoes are formed by lava flowing in all directions from a central summit vent, or group of vents, or rift zones building a broad, gently sloping cone with a dome shape. They are built up slowly by the accumulation of thousands of highly fluid lava flows that spread widely over great distances, and then cool in thin layers. Some of the largest volcanoes in the world are shield volcanoes.

Volcanic eruptions create several types of hazards:

- Lava flows
- Pyroclastic flows
- Pyroclastic surges
- Lava Domes
- Volcanic ash and bombs
- Volcanic gases
- Lateral blasts
- Debris avalanches
- Lahars and debris flows

Volcano Vulnerability Assessment

The Alaska Volcano Observatory identifies the closest active volcano to Shaktoolik as being Mount Spurr, approximately 350 miles away.

Tsunamis and Seiches

Historic tsunami information and ongoing numeric studies indicate that tsunami flood threat along this region of the western Alaska coast. In preliminary tsunami propagation models two hypothetical tsunami sources (earthquakes of Mw 9.0) were placed in the eastern and western parts of the Aleutian chain. The tsunami waves propagated through the Northern Pacific and into the Bering Sea.

Tsunamis and Seiches Vulnerability Assessment

The continental shelf in the Bering Sea substantially dissipates tsunami energy and slows down the waves. As a result, tsunami waves arrive at Hawaii before they reach the Bering Sea coastline, which gives sufficient warning time to those communities.

Chapter 4. Mitigation Strategy

Benefit - Cost Review

This chapter of the plan outlines Shaktoolik'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 and earthquake; however the mitigation strategy will be regularly updated as additional hazard information is added and new information becomes available.

The projects listed on Table 18, 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 Shaktoolik 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.

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

Other criteria that were used to developing the benefits – costs listing depicted in Table 18:

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.

After the MHMP 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 on how to perform a BCA. The complete guidelines document, a BCA document, and BCA technical assistance is available online http://www.fema.gov/government/grant/bca.

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 (866) 222-3580.

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 PDM (Grant Program) is federally funded through FEMA at 75% of the plan or project and requires a 25% local fund match. 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 is only available for communities 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
- 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 **are not** eligible under the HMGP:

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

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 of Projects

The first section of Table 18 lists the projects developed by the Immediate Action Workgroup (IAW) a multi-agency panel organized to deal with the early assessment and development of an action plan to address climate change impacts on coastal communities in Alaska. Shaktoolik was one of the first six high priority communities studied by this group. The remainder of Table 18 lists other mitigation projects and their benefits, costs and prioritization.

Table 18. Benefit - Costs Review Listing Table

Mitigation Projects	Benefits (pros)	Costs (cons)	Priority
Shaktoolik IAW Projects			
IAW-1. State funding for partial funding of Evacuation Road design and engineering.	This will leverage funds from Kawerak, Denali Commission and BIA**.**	$500,000 in State funding, leveraging $2.5m in other cooperating organizations' funds. Not yet in Governor's budget.	High
IAW-2. Shaktoolik should request from Congress to be added to the Alaska Coastal Erosion Program..	Benefit to entire community	Undetermined	High
IAW-3. DNR – Division of Geological & Geophysical Surveys (DGGS) Geologic and Hazardous Mapping to identify sites acceptable for evacuation road, site and identifying relocation sites.	Benefit to entire community. $180k Funded through Federal Coastal Impact Assistance Program (CIAP).	Funds now available at DGGS; however, hiring freeze precludes having human resource capacity needed to do the work.	High
Flood/Erosion (FLD)			
FLD-1. Structural elevation or relocation	Life/Safety project. Benefit to government and private properties.	Definite cost unavailable. Could exceed $50,000.	Medium
FLD-2. Investigate the benefits of joining NFIP	Provides reasonable flood insurance for structures in floodplain, floodplain mapping and eligibility for Flood Mitigation Assistance grant program.	Staff time. Community support required. Would require changes in ordinances and enforcement.	High

Mitigation Projects	Benefits (pros)	Costs (cons)	Priority
FLD-3. Shoreline protection	Life/safety issue Benefit to entire community through protection of tank farms, utility lines, etc. USACE currently studying project.	Costs are high: c $3,300,000 ($12,700 per foot) for articulated concrete mat, the revetment of choice.	High
FLD-4. Water source protection	Life/safety issue, as it provides fresh water for the entire community. Benefit to entire community. May be accomplished as part of another project, or as a separate, stand alone project.	Evacuation road and shoreline reinforcement will protect water source, but is very expensive. Relocation of freshwater intake provides a less expensive alternative, but does not address the issue of evacuation capability.	High
FLD-5. Clearly mark navigable waterway for evacuation	Life/safety project. Benefit to entire community. Relatively inexpensive.	Channel marker buoys can range in cost from $50 to $200 per buoy. Unknown how markers will stand up to freeze up or if they will have to be deployed annually.	High
FLD-6. Public education	Life/safety project. Benefit to entire community. Inexpensive.	Volunteer and staff time	High
Severe Weather (SW)			
SW-1. Research and consider implementation of "Storm Ready", a National Weather Service program.	Life/Safety issue Risk reduction Benefit to entire community Inexpensive State assistance available	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)	Priority
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-5. Encourage weather resistant building construction materials and practices.	Risk and damage reduction. Benefit to entire community.	Could require ordinance change. Potential for increased staff time. Research into feasibility necessary. Political and public support not determined.	Medium
Wildland Fire (WF)			
WF-1. 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
WF-2. Join Alaska Fire Wise program.	Life/Safety issue Risk reduction Benefit to entire community State assistance available Annual project.	Dollar cost not determined. Staff time to research grants	High
WF-3. Encourage development of building codes relating to fire safety.	Life/Safety issue Risk reduction Benefit to entire community Inexpensive	Staff time Community support not determined	Medium

Mitigation Projects	Benefits (pros)	Costs (cons)	Priority
WF-4. Enhance public awareness of potential risk to life and personal property.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available Could be implemented annually	Staff time	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
Earthquake (E)			
E-1. 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	Staff time	High
E-2. If funding is available, perform an engineering assessment of the earthquake vulnerability of each identified critical infrastructure owned by the City of Shaktoolik	Life/Safety issue/Risk reduction Benefit to entire community	No local capacity for assessment External contractor would be required 1-5 years implementation	Medium
E-3. Nonstructural mitigation projects	Inexpensive. Reduces property damage and reduces risk of injury from falling objects	Staff or volunteer 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 Projects

Table 19 presents Shaktoolik'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. The final column allows the community to make note of specific progress on projects during the 5-year life of the plan.

Table 19. Mitigation Strategy

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Project Status (for local review)
Shaktoolik IAW Projects					
IAW-1. State funding for partial funding of Evacuation Road design and engineering.	DOT&PF	$3m	DOT&PF Kawerak Denali Commission BIA	IAW recommendation for 2010 budget.	
IAW-2. Shaktoolik should request from Congress to be added to the Alaska Coastal Erosion Program..	City/Tribe	Undetermined	Congressional designation.	IAW recommendation for 2010 budget.	
IAW-3. DNR – Division of Geological & Geophysical Surveys (DGGS) Geologic and Hazardous Mapping to identify sites acceptable for evacuation road, site and identifying relocation sites.	Alaska DGGS	$180k	State	IAW recommendation for 2010 budget.	
Flood/Erosion (FLD)					
FLD-1. Structural elevation or relocation	City/Tribe, DCRA, DHS&EM, FEMA	TBD	PDM, HMGP	1-5 years	
FLD-2. Investigate the benefits of joining the NFIP program	City/Tribe, DCRA, FEMA	Staff time		1 year	
FLD-3. Shoreline protection	USACE	$3.3m	USACE	1 year	

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Project Status (for local review)
FLD-4. Water source protection	DOT&PF or BIA for road development. Or, DHS&EM for water source relocation.	TBD	DOT&PF, BIA, Kawerak PDM, HMGP	1 year	
FLD-5. Clearly mark navigable waterway for evacuation	Tribe	$50-$200/buoy	PDM, HMGP	1 year	
FLD-6. Public education	City/Tribe	Staff time		1 year	
Severe Weather (SW)					
SW-1. Research and consider instituting the National Weather Service program of *"Storm Ready"*.	City/Tribe	Staff Time	City/Tribe	1 year	
SW-2. Conduct special awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, etc.	City/Tribe	Staff Time	City/Tribe	Ongoing	
SW-3. Expand public awareness about NOAA Weather Radio for continuous weather broadcasts and warning tone alert capability	City/Tribe	Staff Time	City/Tribe	Ongoing	
SW-4. Encourage weather resistant building construction materials and practices.	City/Tribe	Staff Time	City/Tribe	1-5 years	
Wildland Fire (WF)					
WF-1. Promote Fire Wise building design, siting, and materials for construction.	DHS&EM, City/Tribe	Staff Time	City/Tribe	Ongoing	

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe	Project Status (for local review)
WF-2. Join Alaska Fire Wise program.	DHS&EM, City/Tribe	TB	City/Tribe	1 year	
WF-3. Encourage development of building codes relating to fire safety.	DHS&EM, City/Tribe	Staff Time	City/Tribe	1-5 years	
WF-4. Enhance public awareness of potential risk to life and personal property.	DHS&EM, City/Tribe	Staff Time	City/Tribe	Ongoing	
WF-5. Encourage mitigation measures in the immediate vicinity of residential and business property.	DHS&EM, City/Tribe	Staff Time	City/Tribe	Ongoing	
Earthquake (E)					
E-1. Identify buildings and facilities that must be able to remain operable during and following an earthquake event.	City/Tribe, DHS&EM, DCRA	Staff Time	PDM, State Grants	1 year	
E-2. If funding is available, perform an engineering assessment of the earthquake vulnerability of each identified critical infrastructure owned by the City of Shaktoolik.	City/Tribe, DHS&EM	TBD	PDM, State Grants	1-5 years	
E-3. Nonstructural mitigation projects	City/Tribe, DHS&EM	Staff Time, approximately $5k	PDM	1 year and ongoing	

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 Program

The Federal program, created by an act of Congress in 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. *Alaska All-Hazard Risk Mitigation Plan*, prepared by and for DHS&EM, October 2007.
2. *DCRA Community Information*: http://www.commerce.state.ak.us/dca/commdb/CF_BOCK.htm.
3. *Federal Aviation Administration, Alaska* website: http://www.alaska.faa.gov/fai/afss/index.html
4. *FEMA Benefit-Cost Analysis Website:* http://www.fema.gov/government/grant/bca.
5. FEMA How to Guides

   Getting Started: Building Support for Mitigation Planning (FEMA 386-1)

   Understanding Your Risks: Identifying Hazards and Estimating Losses (FEMA 386-2)

   Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies (FEMA 386-3)

   Bringing the Plan to Life: Implementing the Hazard Mitigation Plan (FEMA 386-4)

   Using Benefit-Cost Review in Mitigation Planning (FEMA 386-5)
6. *Shaktoolik Local Economic Development Plan* prepared by Kawerak, Inc., November 2006.
7. *Shaktoolik Comprehensive Community Development Plan*, Prepared by Gerald Pilot, September 2007
8. *Shaktoolik Community Profile, Draft*. Prepared by Fison and Associates. June 1987.
9. *Shaktoolik Draft Flood Mitigation Plan,* 2003, Prepared Tanana Chiefs Conference
10. USACE Draft Section 117 Project Fact Sheet for Shaktoolik, Prepared by Alaska USACE
11. USACE Continuing Authorities Project Fact Sheet (Preliminary), Prepared by Alaska USACE, October 1, 2009.

Web Sites with General Hazard Planning Information

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
FEMA: Mitigation Planning	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

Appendix A: Public Involvement

Informational Meeting

When? Why? Where?

At the Annex

April 21, 2009
1:00 pm

Multi-Hazard Mitigation Plan

Your questions, comments and input are welcomed!

This will be an informal meeting to talk about this planning project and its benefit to the community. All are welcome.

Come and provide input:

- What natural hazards threaten the community?
- What are the facilities that need to be preserved in case of a natural disaster?
- What projects could be done to make Shaktoolik safer from natural disasters?

If you have questions contact:

Suzanne Taylor
WHPacific, Inc.
907.339.6570
staylor@whpacific.com

WHPacific

The Planning Process

The Disaster Mitigation Act of 2000 requires the plan to follow and record the following elements:

1. Planning process
2. Hazard Identification
3. Risk Assessment
4. Mitigation Strategy with Goals, Objectives and Actions
5. Plan Maintenance
6. Adoption by local government
7. Approval from FEMA, and the State Department of Homeland Security and Emergency Management

For more information on mitigation planning you can visit FEMA's website at http://www.fema.gov/plan/mitplanning/index.shtm

Local Multi-Hazard Mitigation Planning

Disasters, such as avalanches, coastal erosion, earthquakes, floods, high winds, landslides, tsunamis, wildfires, and severe weather, are events beyond human control. However, reducing the risks and damage from these events through mitigation efforts is possible.

The Federal Emergency Management Agency (FEMA) wants to ensure that each community's critical facilities and services will continue to function after a natural disaster. FEMA has funds available for projects that help to do this.

Preparing a Local Multi-Hazard Mitigation Plan (MHMP) is the first step in this process. Through the planning process, risks from each type of hazard are assessed, critical facilities are identified within the community and their vulnerability to hazard is determined, potential losses are estimated, and community land use is considered.

With this information, a mitigation strategy will be developed, including mitigation goals, objectives and actions to reduce or avoid long-term risk or damage from disaster events. Projects will be identified, evaluated and prioritized, and an implementation strategy developed.

The plan must be approved by the local government, FEMA, and the state Division of Homeland Security and Emergency Management (DHS&EM) before it is official.

Once the plan is finalized, the community is eligible to apply to FEMA and DHS&EM for funds for the community's identified mitigation projects.

State DHS&EM sponsors planning effort in Shaktoolik

The Alaska Division of Homeland Security and Emergency Services has funded a local hazards mitigation plan for the Community of Shaktoolik. WHPacific, Inc. and Bechtol Planning and Development (BP&D) have been hired to help the community to prepare the plan.

The MHMP will include information specific to Shaktoolik, including critical facilities, potential threats from natural hazards, and strategies to minimize the risk to people and property.

Strategies may be for immediate implementation or long term activities, and can range from educating residents about what to do in the event of a natural disaster to relocating structures away from high-risk areas.

To Get Involved

The most practical plans are ones that have local public input. Your ideas are valuable to the planning team and to the usefulness of the plan.

A **public presentation about the MHMP process is planned for Shaktoolik on Tuesday, April 21 at 1 p.m.** At this meeting planning Suzanne Taylor, from WHPacific will share information about the plan and its value to Shaktoolik.

She will also be meeting with people in the community to gather information the hazards that threaten Shaktoolik and what projects the community would like to complete to make it safer from natural hazards.

Your comments are welcome!

The planning team hopes that you will take an active role in the Shaktoolik MHMP development. If you would like more information or have questions or comments, you can reach the planning team by phone or email:

City of Shaktoolik
Edgar Jackson, mayor
907.955.3441
Rita_Auliye@hotmail.com

Suzanne Taylor
WHPacific, Inc.
907.339.6570
Staylor@whpacific.com

Native Village of Shaktoolik
Michael Sookiayak
907.955.3701
mss4404@yahoo.com

Erv Petty
DHS&EM Mitigation Section
907.428.7015 or 1.800.478.2337
Ervin.Petty@alaska.gov

Planning Goals and Objectives

Mitigation is any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.

Primary goals of hazard mitigation are to:

- Minimize loss of life and injuries
- Minimize damages
- Restore public services
- Promote economic development

To attain these goals the Local Multi-Hazard Mitigation Plan will include measures to:

- Save lives and reduce injuries
- Prevent or reduce property damage
- Reduce economic losses
- Minimize social dislocation and stress
- Maintain critical facilities in functional order
- Protect infrastructure from damage
- Protect legal liability of government and public officials.

Awareness, education and preparedness, together with prediction and warning systems can reduce the disruptive impacts of natural disasters on communities.

Mitigation is any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event.

Further information may also be found on the DHS&EM website at:
http://www.ak-prepared.com/plans/mitigation/mitplanresourcesa.htm

WHPacific

Hazard Plan Mtg 4/21/2009

Name	Organization	Contact info. (phone or email)
Andy Jones	State of Alaska DHS&EM	907-428-7022 andy.jones@alaska.gov
Simon Bekoalok	Shaktoolik IRA Council sbekoalok@yahoo.com	
Van Katchatag	Shaktoolik City Council	
Matilda Hardy	SKK IRA Council	907-955-3381
Agnes R. Takak	SKK City Council	907-955-3441
Randy Takak	SKK IRA	955-2523
Betsy Bekoalok		955-2833
Michael Sookiayak	Shaktoolik IRA Grants Admin	955-3701
Clarice Hardy	Shaktoolik IRA IGAP	955-3701
Myron Sovetlik	SKK City Council	955-2487
Gloria Wilson	Shaktoolik IRA	955-3701
Leann	Shaktoolik	955-2518
George Sookiayak	SKKNC	955-2518
Fred Sagoonick	SNC	955-3241
Carole Sookiayak	City	955 3441
Ernest Sagoonick		
Ed Bekoalok	—	
AXEL JACKSON	IRA	955 2516
Ellen Hunt	Corp.	955-3601
Helen Parker	SK	
Ralph Takak		—
Walter Toolsind	Corp	955-3484
[illegible]	IRA	956 1018

Multi-Hazard Mitigation Meeting at the Annex 04/21/08 2:45 p.m.

Simon did an introduction and introduced Suzanne and Andy to the community members that were there. It is Suzanne's eighth year working for WH Pacific and working for the surrounding six villages here in Alaska.

WH Pacific is paid for by FEMA grant and held by NANA Corporation. Suzanne has been doing projects on what can be done in the future and what things are necessary and how the village can be safe. And stated that he is looking for funding, combining sources for the communities. Shaktoolik is the top six i the state that is eligible for the FEMA grant. But will be a qualifying process. He also talked about emergency evacuation shelters, new building techniques. Suzanne added that one village marked the river channel (if they were to evacuate by boat). They will be coming back in November, maybe sooner Simon asked if there is any funding for water source? Andy will look into it. Also we need to figure out how we are going to protect our septic tanks.

Mike stated that it is good to see a lot of people here and participating in this important meeting. Also with the houses here, is there a way to elevate the homes? Andy stated that some are too old and would fall apart.

CHRC will be here this summer in June or July for a meeting with the community, but are waiting on the grant agreement.

Simon mentioned too about the three organizations here (IRA, City, & Corp.), that we have documents that need to be protected also.

Someone from the community mentioned about a wooden seawall. And also that we get a lot of driftwood here on the beach during our storms. Betsy had asked if there is a grant under the Dept. of Forestry of some kind? Andy said that he would look into that.

Mike stated about how our three organizations can get us started so that other state grants can see ho serious and how much we need support so that they can help us.

Fred asked why can't we just use sand bags like other communities? Good possibility…

Then the fencing project came up…on how it never stays up. We got to find a way for it to stay up!

Mike stated that WH Pacific should do an assessment on our homes here in Shaktoolik, and which buildings can be moved. We need to get much needed information to better our decisions today and i the future.

Several topics that were said on the importance of the community were beach protection, drills (community readiness), relocation, and putting trees on the beach… and that we should join the National Fundage Tourist Program. There are five cabins up the river but don't know how safe that would be. That would be one option to run up to. Land Fires was mentioned also which is also hazardous. A lot of our wood would burn if fire was to ever come due to the hotness.

Appendix B: Shaktoolik Area Use Map

AREA USE MAP
SHAKTOOLIK
64° 21' 15" N 161° 11' 40" W (NAD 83)
Approximate Elevation: 20'
Township 13 South, Ranges 12 & 13 West, K.R.M., AK
U.S.G.S. Quadrangle "Norton Bay B-5" Alaska
CAPE NOME RECORDING DISTRICT
SEE SHEETS 1 & 2 FOR DETAILED COMMUNITY MAPS
0 500 1000 1500
SCALE IN FEET
SCALE: 1"=500'
Date of Photography: June 27, 2004
Magnetic Declination computed by U.S.G.S. Geomag Program using AK-2000.COF model as of August 16, 2004.
SHEET 3 of 3
Legend & Notes
Berrypicking
Cultural Site
Periodic Flooding
Hazardous Materials Site
Future Proposed Site
Specified Land Use
MAP NOTES
This map was prepared by Kawerak Inc. in cooperation with the Alaska Department of Commerce, Community and Economic Development (Commerce) using funding from Commerce, the Bureau of Indian Affairs, the Alaska Native Tribal Health Consortium, (Village of Shaktoolik) and funding from the Initiative for Accelerated Infrastructure Development (IAID). The IAID is supported by grants from the Denali Commission, USDA Rural Development, Alaska Department of Transportation and Public Facilities and Commerce. Preparation of this map was financed in part by the Mini-Grant Program with funds from the U.S. Forest Service. The Mini-Grant Program is administered by the Department of Commerce, Community, and Economic Development, Division of Community Advocacy. Kawerak Inc. contracted with Global Positioning Services, Inc. in May of 2004 to prepare the map.
This map should not be construed as a survey. In-site surveys should be conducted prior to engineering or construction.
SHAKTOOLIK AREA USE MAP SHEET 3 1"=500' (2004 PHOTOGRAPHY)
SHAKTOOLIK RIVER
SECOND CREEK
FIRST CREEK
SHAKTOOLIK BAY
TAGOOMENIK RIVER
MYRON'S LAKE
NORTON SOUND
ENTIRE COAST IS SUBJECT TO EROSION
SHAKTOOLIK CITY BOUNDARY
FLOOD PLAIN
DUCK HUNTING & BERRY PICKING AREA
DUCK HUNTING AREA
DUCK HUNTING & EGG GATHERING AREA
BERRY PICKING
Subsistence Fishing
TIDAL WATER
HUMPBACK SALMON (HIGH TIDE)
TOM COD
LING COD
TROUT
SALMON
GRAYLING
Summer Recreation
Snow Fence
Winter Water Source
Archeological Site
Old Landfill & Hazardous Materials
Nesting Area
Subsistence Gathering Area
Preferred New Landfill Site
Alternate New Landfill Site
Approx. Location Fuel Line
BERRIES & GREENS PICKING
Barge Landing
Boat Landing
Boat Ramp
Drying Racks
Cemetery
Proposed Clinic Site
Current Landfill
Sewage Disposal Site
Old Airport Runway
Gravel Source
Archeological Site Found Ruins
Subsistence & Sport Fishing
TO NEW AIRPORT
SEALS
BELUGA WHALES
KING & SILVER SALMON
APPROXIMATE LOCATION
Dog Staking Area
US SURVEY No. 4085 SHAKTOOLIK TOWNSITE
Trustee Deed to City of Shaktoolik
MUNICIPAL RESERVE
US SURVEY No.11615 Lot 3 NA Apin FO23261
REPLAT OF SHAKTOOLIK VILLAGE SITE ADDITION No.1 Plat No. 2003-63
SHAKTOOLIK AIRPORT TRACT IV PARCEL B
SHAKTOOLIK AIRPORT TRACT IV PARCEL C
TRACT III PARCEL A
Land Mngt. Assign. to Ak. DOT & PF
Warranty Deed to Ak. DOT & PF 10/06/97 Sec.10, Lot 4, Sec.15, Lot 1, T13S, R13W
Corporate Warranty Deed to Ak. DOT & PF 10/06/97 Bk.347, Pgs.559-568 TR.IV, Par. A-C
SEC. 11 IC No. 719 SNC
SEC. 12 IC No. 719 SNC
SEC. 13 IC No. 719 SNC
SEC. 14 IC No. 719 SNC
SEC. 15 IC No. 719 SNC
SEC. 18 IC No. 719 SNC
SEC. 19
SEC. 23 IC No. 719 SNC
SEC. 24 IC No. 719 SNC
SEC. 25 IC No. 719 SNC
SEC. 30 IC No. 719 SNC
R. 12 W.
R. 13 W.
TOP OF MAP IS 13° 7' W