City of Cordova, Alaska

Local Hazards Mitigation Plan

Cover Photo: October 10, 2006 Flood- Six Mile Subdivision Area

Date of Plan March 8, 2008
Adopted August 6, 2008

Prepared by:
City of Cordova
WHPacific Incorporated
Bechtol Planning and Development

Acknowledgements

<u>Cordova City Council</u>

Tim Joyce, Mayor
Robert Henrichs
James Kallander
Robert Rodrigues
Michael Anderson
E.J. Cheshier
Michael O'Leary
James Kasch

<u>Cordova Planning Commission</u>

Richard Collins, Chair
Tom Bailer
Dan McDaniel
Wade Buscher
Don Sjostedt
Gene Wooden
Mike Anderson

<u>City Staff</u>

Jim Goossens, AICP, City Planner
P.O. Box 3426
Cordova, Alaska 99574
Phone: (907) 424-6233
Email: planning@cityofcordova.net
City Website: http://www.cityofcordova.net

<u>Contractor</u>

WHPacific Incorporated
Nicole McCullough, Project Manager
300 West 31st Avenue
Anchorage, Alaska 99503
Phone: (800) 478-4153 or (907) 339-6500
Email: nmccullough@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

<u>Technical Assistance</u>

Ervin Petty, Alaska State DHS&EM
Andrew Jones, Alaska State DHS&EM

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Acronyms

AEIS	Alaska Earthquake Information System
AWCG	Alaska Wildfire Coordinating Group
BCA	Benefit- Cost Analysis
BCR	Benefit-Cost Review
BFE	Base Flood Elevation (100 year flood)
CDBG	Community Development Block Grant
CFR	Code of Federal Regulations
CMP	Coastal Management Plan
DCRA	(Alaska) Department of Commerce, Community and Economic Development
DHS&EM	(Alaska) Division of Homeland Security and Emergency Management
FBFM	Flood Boundary and Floodway Maps
FDIC	Federal Deposit Insurance Corporation
FEMA	Federal Emergency Management Agency
FHLBB	Federal Home Loan Bank Board
FIRM	Flood Insurance Rate Maps
FLD	Flood Projects
fps	feet per second
FLD	Flood Projects
HMP	Hazard Mitigation Plan
HMPG	Hazard Mitigation Planning Grant
LHMP	Local Hazard Mitigation Plan
NFIP	National Flood Insurance Program
NOAA	National Oceanographic and Atmospheric Administration
PDMG	Pre Disaster Mitigation Grant
SBA	Small Business Administration
STIP	Statewide Transportation Improvement Program
T/S	Tsunami/Seiche Projects
USCOE	United States Army Corps of Engineers
USGS	United States Geological Survey
UTM	Universal Transverse Mercator

CITY OF CORDOVA, ALASKA
RESOLUTION 08-08-33

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF CORDOVA, ALASKA, ADOPTING THE LOCAL HAZARDS MITIGATION PLAN

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

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

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

WHEREAS, the Cordova Local Hazards Mitigation Plan has been sent to the Alaska Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency and it has received their approval.

NOW, THEREFORE, BE IT RESOLVED, that the Cordova City Council, hereby adopts the City of Cordova Local Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the City of Cordova will provide this resolution to the Alaska Division of Homeland Security and Emergency Management and the Federal Emergency Management Agency officials.

ADOPTED BY THE CITY OF CORDOVA THIS 6TH DAY OF AUGUST, 2008

CITY OF CORDOVA CORPORATE SEAL JULY 8, 1909 ALASKA

Timothy L. Joyce, Mayor

ATTEST:

Lila J. Koplin, CMC, City Clerk

Chapter 1. Planning Process and Methodology

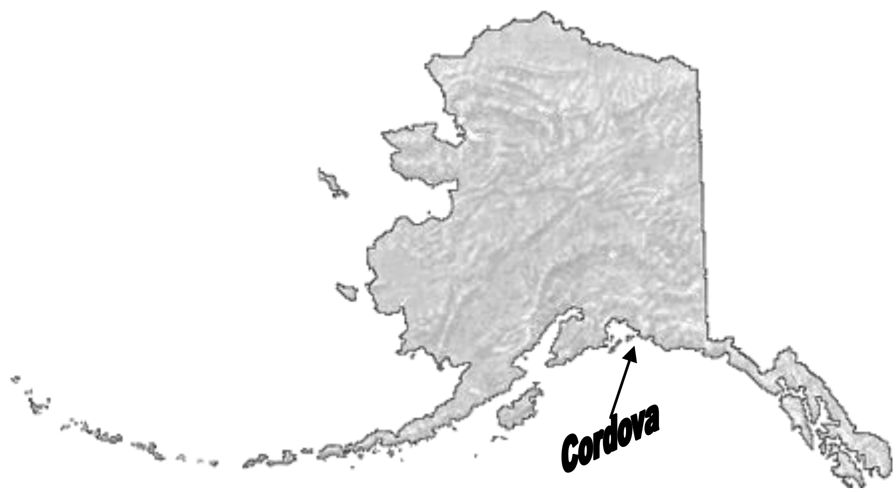
Introduction

The scope of this plan is natural hazards: flooding, erosion, severe weather, wildland fire, avalanche, tsunami and earthquake hazards. However, some of the mitigation projects for the natural hazards would also mitigate impacts from other hazards.

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

Plan Development

Location



Cordova is located at the southeastern end of Prince William Sound in the Gulf of Alaska. The community was built on Orca Inlet, at the base of Eyak Mountain. It lies 52 air miles southeast of Valdez and 150 miles southeast of Anchorage. The community lies at approximately 60.542780° North Latitude and -145.757500° (West) Longitude. (Sec. 28, T015S, R003W, Copper River Meridian.) Cordova is located in the Cordova Recording District. The area encompasses 61.4 sq. miles of land and 14.3 sq. miles of water.

Project Staff

The Cordova LHMP City staff included City Planner Jim Goossens, AICP (LHMP Project Manager), Todd Cook, Water/Sewer Superintendent, Gary Squires, Public Works Director. The Cordova Planning Commission was the lead public body, held public meetings on the plan and provided revisions.

WHPacific, Incorporated and Eileen R. Bechtol, AICP, of Bechtol Planning & Development were hired to write the plan with the City.

Ervin Petty and Andrew Jones of the Division of Homeland Security & Emergency Management (DHS&EM) provided technical assistance and reviewed the drafts of this plan.

Plan Research

The plan was developed utilizing existing Cordova 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. Please see the bibliography for additional sources.

1. *Alaska State Hazard Plan*. Prepared by and for DHS&EM. September 2004

2. *Cordova Comprehensive Plan, Draft*. Prepared by and for City of Cordova. October 20, 2006.

3. *Cordova Coastal Management Plan 2007 Amendment*. Prepared by Bristol Engineering for the Cordova Coastal District, 2007.

4. *DCED Community Information*: http://www.dced.state.ak.us/dca/commdb/CF_COMDB.htm.

5. *Eyak River Flood Control Study.* Prepared by USCOE for the City of Cordova. July 14, 2003.

6. *FEMA Benefit-Cost Analysis Website:* http://www.fema.gov/government/grant/bca.

7. *Flood Mitigation Plan*. Prepared by and for the City of Cordova. 1996.

8. *Flood Insurance Study.* Prepared by U.S. Department of Housing & Urban Development Federal Insurance Administration (now FEMA) for the City of Cordova. October 1978.

9. 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)

10. *Evaluation of Recent Channel Changes on the Scott River Near Cordova, Alaska.* Prepared by USDA-Forest Service Chugach National Forest Anchorage, Alaska, Blanchet, Hydrologist. December 1983.

Web Sites

American Planning Association:	http://www.planning.org
Association of State Floodplain Managers:	http://www.floods.org
Developing the Implementation Strategy:	www.pro.gov.uk
Federal Emergency Management Agency: 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

Public Involvement

Site visits were conducted on May 3, 2007 and August 1, 2007. The Planning Commission held public meetings on input into the plan and provided revisions on August 1, 2007 and on October 17, 2007.

The meetings were advertised using usual city meeting notices and the attendances at these meetings were the Planning Commission, City Staff, and members of the public. In addition to all the City Departments the City emailed notices of the meetings and the plan to various organizations in town including but not limited to:

- Eyak Preservation Council
- Cordova Times
- Chugach Alaska Corporation, Regional Native Corporation
- Eyak Corporation, Village Corporation
- Traditional Village of Eyak, Village Council

- Prince William Sound Research Center

A copy of the draft LHMP is available for public perusal at the Planning Department, Public Works Department, City Library and online at the city website: http://www.ci.cordova.ak.us.

The Cordova Planning Department and City Council will review and approve the plan after pre-approval by DHS&EM and FEMA.

Plan Implementation

The City Council of Cordova will be responsible for adopting the Cordova LHMP and all future updates or changes. This governing body has the authority to promote sound public policy regarding hazards. The Hazards Mitigation Plan will be assimilated into other Cordova plans and documents as they come up for review according to each plans' review schedule.

Please see the following table for plan review schedules.

Table 1. Cordova Plans

Continuing Review Process

The Cordova LHMP will be reviewed on an annual basis to determine whether the plan reflects the current situation in regards to natural hazards. The City Planner is the responsible City employee assigned to this task, as time and funding allow.

Document	Completed	Next Review
Cordova Comprehensive Plan	Draft Plan -2006	5 years from adoption
Emergency Operations Plan	Yes	2007
Comprehensive Economic Development Strategy Plan	2003	As Needed
Avalanche Hazard Plan	Date	As Needed
Tourism Plan	1999	As Needed
Parks and Recreation Plan	2000	As Needed
Waterfront Plan	2000	As Needed

Continued Plan Development

The Cordova LHMP will be further developed as funding and time allow. Additional hazards not currently covered in the plan, including technological and manmade hazards, will be added, if funding becomes available during the next five-year update cycle.

If funding is available, the plan will be updated every 5 years, after a Federally Declared Disaster, or as required by DHS&EM.

The City Planner will be responsible for updating and maintaining the plan by adding additional hazards and completing vulnerability assessments for existing hazard chapters.

The following table lists the schedule for completion of these tasks, provided that funds are available to do so:

Table 2. Continued Plan Development

Hazard	Status	Hazard Identification Completion Date	Vulnerability Assessment Completion Date
Floods	Completed	2008	2008
Erosion	Completed	2008	2008
Severe Weather	Completed	2008	2008
Wildland Fire	Completed	2008	2008
Earthquake	Completed	2008	2008
Tsunami/Seiche	Completed	2008	2008
Avalanche	Completed	2008	2008
Economic	Future Addition	2010	2011
Technological	Future Addition	2010	2011
Public Health Crisis	Future Addition	2010	2011

Continued Public Involvement

The following methods will be used for continued public involvement.

City website: http://www.ci.cordova.ak.us.

Places where the hazard plan will be kept:

Planning Department
City Fire Department
City Public Works Department
City Clerk's Office

City Library

On an annual basis the Planning Commission will review the plan at an annual basis, which will be advertised to the public using the same method established under the public involvement section of this plan.

Risk Assessment Methodology

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 people, buildings, and infrastructure. It identifies the characteristics and potential consequences of hazards and their impact on community assets.

A risk assessment typically consists of three components; hazards identification, vulnerability assessment and risk analysis.

1. *Hazards Identification* - The first step in conducting a risk assessment is to identify and profile hazards and their possible effects on the jurisdiction. This information can be found in Chapter 3: Hazards.

2. *Vulnerability Assessment* – Step two is to identify the jurisdiction's vulnerability; the people, infrastructure and property that are likely to be affected. It includes everyone who enters the jurisdiction including employees, commuters, shoppers, tourists, and others.

Populations with special needs such as children, the elderly, and the disabled should be considered; as should facilities such as the hospital, health clinic, senior housing and schools because of their additional vulnerability to hazards.

Inventorying the jurisdiction's assets to determine the number of buildings, their value, and population in hazard areas can also help determine vulnerability. A jurisdiction with many high-value buildings in a high-hazard zone will be extremely vulnerable to financial devastation brought on by a disaster event.

Identifying hazard prone critical facilities is vital because they are necessary during response and recovery phases. Critical facilities include:

- Essential facilities, which are necessary for the health and welfare of an area and are essential during response to a disaster, including hospitals, fire stations, police stations, and other emergency facilities;

- Transportation systems such as highways, airways and waterways;
- Utilities, water treatment plants, communications systems, power facilities;
- High potential loss facilities such as bulk fuel storage facilities; and
- Hazardous materials sites.

Other items to identify include economic elements, areas that require special considerations, historic, cultural and natural resource areas and other jurisdiction-determined important facilities.

3. *Risk Analysis* – The next step is to calculate the potential losses to determine which hazard will have the greatest impact on the jurisdiction. Hazards should be considered in terms of their frequency of occurrence and potential impact on the jurisdiction. For instance, a possible hazard may pose a devastating impact on a community but have an extremely low likelihood of occurrence. Such a hazard must take lower priority than a hazard with only moderate impact but a very high likelihood of occurrence.

For example, there might be several schools exposed to one hazard but one school may be exposed to four different hazards. A multi-hazard approach will identify such high-risk areas and indicate where mitigation efforts should be concentrated.

Currently there are insufficient funds and data with which to conduct an accurate risk analysis for all the hazards affecting Cordova. However, risk analysis information will be added as it is completed.

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 Profiles Section of this hazard plan. A vulnerability matrix table of critical facilities as affected by each hazard is provided in Chapter 3 of this document.

Facilities were designated as critical if they are: (1) vulnerable due to the type of occupant (children, disabled 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 (museum, 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 the records and land use map.

Federal Requirement for Risk Assessment

Recent federal regulations for hazard mitigation plans outlined in 44 CFR Part 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 Cordova LHMP meets those criteria are outlined below:

Table 3. Federal Requirements

Section 322 Requirement	How is this addressed?
Identifying Hazards	Cordova city staff and community members identified natural hazards at community meetings, which were used in developing the Plan.
Profiling Hazard Events	The hazard-specific sections of the Cordova LHMP provide documentation for all natural hazards that may affect the City. Where information was available, the Plan lists relevant historical hazard events.
Assessing Vulnerability: Identifying Assets and Estimating Potential Losses of Critical Facilities	Vulnerability assessments for floods/erosion, severe weather, wildland fire, earthquakes, avalanches and tsunamis have been completed and are contained within the hazard chapter. Additional vulnerability assessments will be added as they are funded and completed.
Assessing Vulnerability: Analyzing Development Trends	The Community Profile Section and Chapter 3 include a description of development in Cordova.

Economic Analysis

FEMA and DHS&EM require that the city perform a benefit/cost analysis of mitigation projects when applying for grant funds for actual project. This section briefly outlines what a cost/benefit analysis entails and provides information on where to obtain information when the city applies for project specific grants.

Only mitigation options with essentially no cost can be accurately assessed at this time. The data necessary to conduct an accurate cost-benefit analysis of mitigation actions that require significant investments, such as engineering analysis or project design is not currently available, but will be added as resources allow further study.

Chapter 4, Mitigation Strategy, outlines Cordova's overall strategy to reduce its vulnerability to the effects of the hazards studied. Currently the planning effort is limited to the *natural* hazards determined to be of the most concern; flooding/erosion, severe weather earthquake, avalanche and tsunamis. Future additions could include *manmade* hazards such as technology, public health crisis or homeland security.

The City of Cordova will use the following FEMA required factors to prioritize mitigation project items should funding become available.

1. Extent the project reduces risk to life.

2. Extent to which benefits are maximized when compared to the costs of the project.

3. Project protects critical facilities or critical city functionality.
   A. Hazard probability.
   B. Hazard severity.

Please see specific projects, with baseline cost estimates in Chapter 4.

Cordova will prioritize projects and prepare mitigation grant applications as mitigation funding becomes available and as applicable to grant funding guidelines.

Benefit-cost analysis will be conducted as projects are submitted to DHS&EM for consideration.

FEMA 2006 Guidelines for Benefit-Cost Analysis

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

The purpose of the FEMA document is to provide information about how to perform Benefit-Cost Analysis (BCA) and provide proper documentation. BCA is the method by which the future benefits of a mitigation project are determined and compared to its cost. The end 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.

Facilitating BCA

Although the preparation of a BCA is a technical process, FEMA has developed software, written materials, and training that simplifies 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 Help line at bchelpline@dhs.gov or toll free number at (866) 222-3580.

The BC Help line 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 Help line. FEMA and the BC Help line provide technical assistance regarding the preparation of a BCA.

Identifying Cost-Effective Mitigation Projects

Applicants and Sub-Applicants are encouraged to consider the idea of “risk” when identifying and analyzing mitigation projects. Risk is simply the threat to the built environment (buildings and infrastructure) and people (casualties) expressed in terms of dollars. Risk depends both on the frequency and severity of natural hazards and on the vulnerability of the built environment and people. The highest risk situations have a combination of high hazard, high vulnerability, and high value of inventory (buildings, infrastructure, people) exposed to the hazard. This concept of risk is illustrated in the figure below (using structures as an example):

Figure 1. FEMA Cost-Benefit Analysis Hazard & Risk

HAZARD & RISK

Hazard Event (Frequency and Severity)	x	Property Exposed to the Hazard	=	Hazard Risk Dollars ($$$)
Probability of Damaging Hazard Events	x	Value and Vulnerability of Property Exposed to the Hazard	=	Severity of the Hazard Threat to the Built Environment

While it is generally true that high-risk situations have the highest potential benefits, the cost-effectiveness of mitigation projects also depends directly on how much they cost and how effectively the proposed activity mitigates current hazard damages. The project BCR is a *comparison* of benefits to costs. Even in situations where risk appears relatively small, such as a rural culvert washing out every year, an inexpensive mitigation project may be highly cost-effective. Projects that mitigate “big” risk are not necessarily more cost effective.

Chapter 2: Community Profile

Community Overview

Current Population:	2,211 (2006 DCRA Certified Population)
Pronunciation:	core-DOH-vuh
Incorporation Type:	Home Rule City
Borough Located In:	Unorganized
Census Area:	Valdez/Cordova

Location and Transportation

Michael J. Heney, builder of the Copper River and Northwestern Railroad, named Cordova in 1906. A post office was established there in October 1906. The town had its origin as the railroad terminus and ocean shipping port for the copper ore shipped from the Kennicott mine up the Copper River. On April 8, 1911, Cordova celebrated "Copper Day" when the first train load of copper ore, approximately 1,200 tons, arrived from the mines and was poured into the holds of the steamship "Northwestern, 11 bound for the smelter at Tacoma, Washington. The name of the town was derived from the original name "Puerto Cordova", is given to what is now known as Orca Bay, by Senor Don Calvador Fidalgo, who visited the region 1790.

Cordova is located at the southeastern end of Prince William Sound in the Gulf of Alaska. The community was built on Orca Inlet, at the base of Eyak Mountain. It lies 52 air miles southeast of Valdez and 150 miles southeast of Anchorage. The community lies at approximately 60.542780° North Latitude and -145.757500° (West) Longitude. (Sec. 28, T015S, R003W, Copper River Meridian.) Cordova is located in the Cordova Recording District. The area encompasses 61.4 sq. miles of land and 14.3 sq. miles of water.

Eyak is located along the Eyak River, 5.5 miles southeast of Cordova. Access to Eyak from Cordova is via the Copper River Highway. It was annexed to the City of Cordova in 1992, and the area is considered to be the Native Village of Eyak. Eyak is a federally recognized Native village within the City of Cordova. Commercial fishing and subsistence activities are central to the community's culture.

Cordova is accessed by plane or boat. It is linked directly to the North Pacific Ocean shipping lanes through the Gulf of Alaska. It receives year-round barge services and State Ferry service. The Merle K. "Mudhole" Smith Airport at mile 13 is State-owned and operated, with a 7,499' long by 150' wide asphalt runway and 1,875' long by 30' wide gravel crosswind runway. The State-owned and City-operated Cordova Municipal Airport has a 1,800' long by 60' wide gravel runway. Daily scheduled jet flights and air taxis are available. Floatplanes land at the Lake Eyak seaplane base or the boat harbor. Harbor facilities include a breakwater, dock, a small boat harbor with 850 berths, boat launch, boat haul-out, a ferry terminal, and marine repair services. A 48-mile gravel road provides access to the Copper River Delta to the east.

Climate

Winter temperatures average from 17 to 28 degrees Fahrenheit. Summer temperatures average from 49 to 63 degrees Fahrenheit. Annual precipitation is 167 inches, and average snowfall is 80 inches. Please see the section on severe weather for more detailed information on the climate.

Population

The population of the community consists of 15% Alaska Native or part Native. Cordova has a significant Eyak Athabascan population with an active Village Council. Commercial fishing and subsistence are central to the community's culture. During the 2000 U.S. Census, total housing units numbered 1,099, and vacant housing units numbered 141. Vacant housing units used only seasonally numbered 68. U.S. Census data for Year 2000 showed 1,221 residents as employed. The unemployment rate at that time was 6.86 percent, although 33.75 percent of all adults were not in the work force. The median household income was $50,114, per capita income was $25,256, and 7.52 percent of residents were living below the poverty level.

History and Culture

The history and culture section was reproduced, in part, from the *2006 Draft Cordova Comprehensive Plan.*

<u>Ethno History</u>

Before the arrival of western culture two Native groups populated the immediate area:

Eyak Indians lived in the Copper River Delta area and in the immediate vicinity of Cordova; the Chugach Eskimos traditionally occupied coastal regions of Prince William Sound in the area west of present-day Cordova. In addition to the Eyak Indians and the Chugach Eskimo, the Tlingit Indians ranged up the mainland coast from Yakutat Bay at least as far as Controller Bay and Kayak Island. A fourth group, the Ahtna occupied the Copper River valley in the period.

Alaganik, Eyak, and a village located where Old Town in Cordova now stands were the main settlements. Alaganik was abandoned in 1929-30. In recent years, a significant number of Native people from the villages of Tatitlek and Chenega have migrated to Cordova as well.

<u>Founding and Development of Cordova</u>

The town of Cordova began as a part of the rush to develop rich copper deposits. A

Townsite was laid out and Heney helped organize the new town changing the name of the town from Orca to Cordova after learning that the Spanish explorer Salvador Fidalgo has renamed the body of water in front of the town to "Cordova Bay." Town lots were sold in 1908 and the community was incorporated on July 8,1909. Construction of the Copper River and Northwestern Railroad continued and, by 1911, the 131 miles to Chitina plus a branch line of 65 miles to the Kennecott mines had been completed for a total cost of around $23.5 million. By the time the 1910 census was taken, Cordova had a population of 1,152 persons, a gain of 1,102 people in five years if Sheldon Jackson's earlier census was accurate. At the time, only Nome, Fairbanks, Juneau and Ketchikan exceeded this number in Alaska.

After the railway was completed, Cordova settled into its role as the port and gateway to the interior. In the years 1910 to 1938, more than 200 million tons of copper ore from Kennecott were transported to Cordova. While Cordova's primary economic function was to serve as the transportation and service center for the Kennecott copper mines, the development of commercial fisheries began to play an increasingly important role. New canneries were constructed between 1910 and 1940. A commercial clam fishery began in 1915 and produced an average of one million pounds per year. The City of Cordova constructed a wharf in the 1920s and both crab and herring fisheries developed in the late 1920s and early 1930s. By 1938, the number of Cordovans directly employed in the fishing industry totaled five times the number of railroad employees. Fishing and fish processing increased in economic value to the community as the decades passed.

A demand for railroad ties, fish traps, and pilings supported a local forest products industry. Loggers harvested most of their logs from the Chugach National Forest, which had been created in 1907. The town also derived some economic benefit from the limited oil production that occurred in the Katana oil fields.

The Kennecott copper mines proved to be enormously rich. During 1916, the year of greatest production, the output was 120 million pounds of copper ore. By 1925, the Guggenheims had takes about $175 minion worth of copper out of the district. Annual output began to decline in 1927, and by 1934 the known high-grade deposits were almost exhausted. No new high-grade ore was located and the mines closed rather abruptly in 1938. The railroad continued to operate for a short time but was closed and abandoned in 1939.

The Katalla oil fields also closed during the 1930's. The refinery burned in 1933 and there was no economic incentive to rebuild since the field had yielded only about 154, 000 barrels of oil in over thirty years of production.
By the time the 1940 census was taken, the community had a population of 980 and the fishing and fish processing industries had replaced mining-related activities as the dominant force in the economy.

Except for a flurry of construction activity that occurred during World War II, including construction of a major airport and the conversion of old railroad beds into roadways, the fishing and fish processing industries has been the mainstay of Cordova's economy from 1938 through the present. The industry has changed since the early days however. Salmon is still the principal species caught and processed here, but other fish and shellfish products are now important as well. The salmon industry has become increasingly dependent upon hatchery-reared fish since the late 1970's. Cordova experienced steady population growth after 1940, with the exception of the period between 1950 and 1960, a decade in which the population declined slightly.

Unfortunately, little of Cordova's past is readily apparent in the community today. The railroad lines have long since been torn up and most of the town's older structures were destroyed in a series of major fires that struck the central business district in the 1960's. There are several historic downtown buildings still standing but most construction in the downtown area is relatively new. Although little structural damage occurred in town, land in the area raised an average of six feet and this left a number of docks high and dry. Dredging in the vicinity of the boat harbor was needed to make these facilities usable. The dredged materials were used to create a 20-acre industrial park next to the City dock and a new commercial area directly east of the harbor.

The 1989 Exxon Valdez oil spill disrupted commercial fishing and had a greater economic and social impact on Cordova than on any other community in Prince William Sound. In the decade after the spill, a third of the fishing families left Cordova. The town's year-round population has become more transient.

Tourism, timber, mining, and science and education offer potential for future community growth. However, the fishing and fish processing industries and an assortment of government agencies presently constitute the foundation of Cordova's economy and are likely to continue to do so in the immediate future. (2006 Draft Cordova Comprehensive Plan)

Community Information

Table 4. Community Information

Community Information	Contact Information
City of Cordova	City of Cordova Jim Goossens, AICP, City Planner P.O. Box 3426 Cordova, Alaska 99574 Phone: (907) 424-6233 Email: planning@cityofcordova.net City Website: http://www.cityofcordova.net
Borough Located In:	Unorganized
Chamber of Commerce – Cordova Chamber & Visitors	P.O. Box 99 Cordova, AK 99574 Phone 907-424-7260

Community Information	Contact Information
Center	Fax 907-424-7259 E-mail cchamber@ctcak.net Web http://www.cordovachamber.com
Community Non-Profit	Eyak Preservation Council P.O. Box 460 Cordova, AK 99574 Phone 907-424-5890 Fax 907-424-5891 E-mail eyak@redzone.org Web http://www.redzone.org
Electric Utility	Cordova Electric Cooperative P.O. Box 20 Cordova, AK 99574 Phone 907-424-5555 Fax 907-424-5527 E-mail info@cordovaelectric.com Web http://www.cordovaelectric.com/
Media	Cordova Times P.O. Box 200 Cordova, AK 99574 Phone 907-424-7181 Fax 907-424-5799 E-mail advtimes@ctcak.net Web http://www.alaskanewspapers.com
Regional Native Corporation	Chugach Alaska Corporation 560 E. 34th Avenue Anchorage, AK 99503 Phone 907-563-8866 Fax 907-563-8402 E-mail buhart@chugach-ak.com Web http://www.chugach-ak.com
School District	Cordova City School District P.O. Box 140 Cordova, AK 99574-0140 Phone 907-424-3265 Fax 907-424-3271 E-mail donclark@gci.net Web http://cordova.schoolaccess.net/
Village Corporation	Eyak Corporation 901 LeFevre Street, P.O. Box 340 Cordova, AK 99574-0340 Phone 907-424-7161 Fax 907-424-5161

Community Information	Contact Information
	E-mail board@eyakcorp.com Web http://www.eyakcorporation.com
Village Council	Traditional Village of Eyak P.O. Box 1388 Cordova, AK 99574-1388 Phone 907-424-7738 Fax 907-424-7739
Regional Native Health Corporation	Southcentral Foundation 4501 Diplomacy, Suite 200 Anchorage, AK 99508 Phone 907-729-5235 Fax 907-729-4972 E-mail katherineg@scf.cc Web http://www.southcentralfoundation.com/index.cfm
Regional Native Non-Profit	Chugachmiut 1840 South Bragaw Street Anchorage, AK 99508 Phone 907-562-4155 Fax 907-563-2891 E-mail info@chugachmiut.org Web http://www.chugachmiut.org
Regional Development District	Pr. Wm. Sound Econ. Dev. District 2207 Spenard Road #207 Anchorage, 99503 Phone 907-222-2440 Fax 907-222-2411 E-mail pwsedc@alaska.net Web http://www.pwsedd.org/

Facilities

Cordova utilizes water from Murcheson Falls, Heney Creek dam, Meals Reservoir, the Orca Reservoir, and Eyak Lake. The water is treated, but only the Eyak water is filtered. Water storage capacity is 2.1 million gallons. The City operates a piped water and sewer system. Sewage is treated before discharge. Over 90% of homes are fully plumbed. Some homes use individual wells and septic systems. A new Class 2 landfill and sludge disposal is available at Mile 17.

The community participates in recycling and a household hazardous waste program. Cordova Electric Cooperative operates two diesel-powered plants, at Eyak and Orca, and the Humpback Creek Hydro Facility. Cordova Electric Cooperative, Inc provides electricity.

There are two schools located in the community, attended by 457 students. Local hospitals or health clinics include Cordova Community Medical Center and Ilanka Health Center. The hospital is a qualified Acute Care and Long Term Care facility. Cordova is classified as a large town/Regional Center, it is found in EMS Region 2F in the Prince William Sound Region. Emergency Services have limited highway, marine, airport and floatplane access. Emergency service is provided by 911 Telephone Service and volunteers Auxiliary health care is provided by Cordova Volunteer Fire Dept./EMS/Search & Rescue.

Vegetation and Wildlife

The northernmost reaches of the Pacific temperate rainforest surround Cordova. The timber in this area is characterized by mixed stands of Sitka spruce and western hemlock, with minor amounts of mountain hemlock, yellow cedar, and black cottonwood. Pure Sitka spruce stands usually occur only along riverbanks, although this species does dominate stands on the glacial flats in the Copper, Martin, and Bering River valleys.

The Copper River Delta flats are a vast tidal marsh with a vegetation cover of salt and freshwater marsh grass and grass like plants, willow and alder, and a few scattered stands of Sitka spruce and cottonwood. This is a major resting, feeding, and nesting area for migratory birds in the Pacific flyway. The U.S. Forest Service and the Alaska Department of Fish and Game jointly established the 330,000-acre Copper River Delta Game Management Area in 1962. The Copper River Game Management Area is now approximately 700,000 acres and managed jointly by the U.S. Forest Service, Alaska Departments of Fish and Game and Natural Resources, U. S. Fish and wildlife Service, and Bureau of Land Management. It is now designated a State critical Habitat Area.

The Delta is managed primarily for the protection and enhancement of wildlife, fish and their habitat. The productivity of waterfowl habitat in the area was greatly reduced by the 1964 earthquake, which uplifted the beach by about six feet and converted productive brackish ponds into infertile freshwater ponds. To some extent, the uplifting of islands and sandbars and their subsequent conversion to prime wildlife habitat has offset this loss.

Big game animals in the Cordova area include black and brown bear, mountain goat, deer, and moose. Moose are not native to this area and the present herd has descended from 26 animals, which were transported here in 1949. The habitat in the Copper River Delta is excellent for moose and the herd is very healthy. Sitka Blacktail deer are also not native to the area; they were transplanted to Prince William Sound. They live primarily on islands in the Sound but can also be found on the mainland. The habitat in the Sound is favorable for deer and their numbers have increased dramatically. Furbearers are plentiful in the area and resident populations include wolf, wolverine, lynx, beaver, mink, muskrat, marten, land otter and coyote.

While a number of big game hunters are attracted to Cordova, the area is best known for its waterfowl and bird resources. The largest known concentrations of trumpeter swans in North America nest here, as well as 15,000 to 20,000 Dusky Canada Geese and a variety of ducks, geese, cranes, shore birds, hawks, owls and falcons. Bald eagles are also numerous and there are significant numbers of resident eagles that make their homes within or close to the City limits.

Sea lion and seal inhabit coastal areas in the vicinity of Cordova. The Copper, Bering, and Eyak River systems contain large king, red, and Coho salmon populations, which are harvested by both commercial and sport fishermen. The Eyak River red and Coho salmon runs and several small trout lakes on the Delta are especially popular with local sport fishermen. The waters of Prince William Sound provide excellent fishing opportunities for salmon, rockfish, and halibut. Clam digging remains a popular, though diminishing, recreational activity for many local residents.

Community Assets

This section outlines the resources, facilities and infrastructure that, if damaged, could significantly impact public safety, economic conditions, and environmental integrity of Cordova.

Community Maps

List of Maps from this plan:
Map 1. Cordova Regional Map
Map 2. Cordova FIRM Map
Map 3. Cordova Critical Infrastructure, Geo-Reference Photography
Map 4. Cordova Regional Critical Infrastructure

Critical Facilities: Those facilities and infrastructure necessary for emergency response efforts.

- Oil Spill Response Facilities(SERVS)
- Roads and Bridges
- Communications
- Utilities
- Hospital
- Cordova Airport
- City Hall
- Fire Department
- Police Department
- Public Works

Essential Facilities: Those facilities and infrastructure that supplement response efforts.

- Designated Shelters
- City Hall Buildings
- Bulk Fuel Storage Tank Farm
- CTC – Command Center
- Mt. Eccles Elementary
- USFS Building

Critical Infrastructure: Infrastructure that provides services to Cordova.

- Cordova Telephone lines
- Cordova Electric Power Network
- Air Transportation networks (Merle K Smith & city airports)
- Wastewater collection
- Water Supply Facilities including storage and delivery systems
- Power Generators including Humpback Creek, Power Creek hydro facilities

Vulnerable Populations: Locations serving population that have special needs or require special consideration.

- Schools (Mt Eccles Elementary, High School)
- Hospital
- Nursing Home (IN HOSPITAL)
- Elderly residents

Cultural and Historical Assets: Those facilities that augment or help define community character, and, if lost, would represent a significant loss for the community.

- Cordova Museum & Archives
- Ilanka Cultural Center
- City Hall
- Forest Service
- Identified local historic structures/old town
- Masonic Temple
- Alaska Fishermen's Camp
- Cannery Row

Community Resources

This section outlines the resources available to Cordova for mitigation and mitigation related funding and training.

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 Newtok 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/fima/planhowto.shtm).

- **Post-Disaster Hazard Mitigation Planning Guidance for State and Local Governments.** FEMA DAP-12, September 1990. This handbook explains the basic concepts of hazard mitigation and shows state and local governments how they can develop and achieve mitigation goals within the context of FEMA's post-disaster hazard mitigation planning requirements. The handbook focuses on approaches to mitigation, with an emphasis on multi-objective planning.

- **Mitigation Resources for Success 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 Newtok businesses.

- **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 DCRA, Division of Community Advocacy. 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.

- **DCRA, Division of Community Advocacy:** 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

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

Table 5. Legal and Technical Capability

Regulatory Tools (ordinances, codes, plans)	Local Authority (Y/N)	Comments (Year of most recent update; problems administering it, etc)
Building code	No	
Zoning ordinance	Yes	Ongoing Update, as necessary
Subdivision ordinance or regulations	Yes	Ongoing Update, as necessary
Special purpose ordinances (floodplain management, stormwater management, hillside or steep slope ordinances, wildfire ordinances, hazard setback requirements)	Yes Yes	Part of the NFIP. Local floodplain regulations and avalanche regulations.
Growth management ordinances (also called "smart growth" or anti-sprawl programs)	No	
Site plan review requirements	Yes	
Comprehensive plan	Yes	Update underway.
A capital improvements plan	No	
An economic development plan	Yes	Prince William Sound Economic Strategy that includes the Valdez/Cordova region
An emergency response plan	Yes	Plan that being implemented through training exercises.
A post-disaster recovery plan	No	
Real estate disclosure requirements	State	No local requirement.

Table 6. Fiscal Capability

Staff/Personnel Resources	Y/N	Department/Agency and Position
City Manager, Scott Hahn	Yes	City Administration Chief Administrative Officer
City Planner, Jim Goossens, AICP	Yes	City Planning Department Planning Director
Fire Chief, Mike Hicks	Yes	City Fire Department
City Clerk, Lila Koplin	Yes	City Clerk Department Head
Public Works Director, Gary Squires	Yes	City Public Works Department Head
Public Safety Director, Vacant	Yes	Requiting
Librarian, Cathy Sherman	Yes	City Library/Museum Department Head
Fire Department, Oscar Delpino	Yes	City Fire Department Fire Marshal, Department Head
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	No	Public Works Gary Squires, Steve Sanderson, Todd Cook, others
Planners or Engineer(s) with an understanding of natural and/or human-caused hazards	Yes	Fire Department, Oscar Delpino, Paul Trumblee, Mike Hicks, others Public Works Gary Squires, Todd Cook, Steve Sanderson, Planning Department Jim Goossens, AICP, Director
Floodplain manager	Yes	Planning Director Jim Goossens, AICP
Surveyors	No	No certified surveyors, staff with surveying training and experience
Staff with education or expertise to assess the community's vulnerability to hazards	Yes	Fire Department, Oscar Delpino, Paul Trumblee Public Works staff City Police Chief, Ron Bishop Planning Department Jim Goossens, AICP
Personnel skilled in GIS and/or HAZUS	Yes	Planning Department Jim Goossens, AICP
Scientists familiar with the hazards of the community	Y/N	Various City personnel, local agencies and organizations
Emergency manager	Yes	City Manager, Scott Hahn
Grant writers	Yes	Toni Godes
Environmental Advisory Council	Yes	Various local non-profits and governmental agencies exist for this role

Table 7. Administrative and Technical Capability

Financial Resources	Accessible or Eligible to Use (Yes or No)
Community Development Block Grants (CDBG)	Not at this time
Capital improvements project funding	Yes, Pubic Works mostly but others as approved by Council
Authority to levy taxes for specific purposes	Yes
Fees for sewer	Yes
Impact fees for homebuyers or developers for new developments/homes	No
Incur debt through general obligation bonds	With Voter Approval
Incur debt through special tax and revenue bonds	With Voter Approval
Incur debt through private activity bonds	No
Withhold spending in hazard-prone areas	Yes

Chapter 3: Hazards

Alaska State Hazard Plan, 2007 Matrix

The following table is from the *Alaska State Hazard Mitigation Plan, 2007*; each hazard denotes a hazard probability that might not match exactly with the specific previous occurrences sections under each hazard. The table below uses the Cordova and Valdez Census Area, which include property in either city or in areas outside of corporate boundaries. The previous occurrences sections under each hazard are for incidents that occurred within the Cordova city limits.

Table 8. Hazard Matrix

Cordova/Valdez Census Area					
Flood	**Wildland Fire**	**Earthquake**	**Volcano**	**Avalanche**	**Tsunami & Seiche**
Y-H-T	Y –M – L	Y-H – T	U	Y-M - L	Y-M - L
Severe Weather	**Landslides**	**Erosion**	**Drought**	**Technological**	**Economic**
Y-H – T	Y-M - L	Y-H – L	U	Y	U

Source: Alaska State Hazard Mitigation Plan, 2007

Y = Hazard is present in jurisdiction but probability unknown
Y – L = Hazard is present with a low probability of occurrence within the next ten years. Event has up to 1 in 10 years chance of occurring.
Y – M = 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.
Y – H = Hazard is present with a high probability of occurrence within the calendar year. Event has up to 1 in 1 year chance of occurring.
N = Hazard is not present
U = Unknown if the hazard occurs in the jurisdiction

Extent:
Z = Zero
L = Limited
T = Total

Identification of Assets and Vulnerability

The Hazard Vulnerability Matrices below lists the City of Cordova facilities, utilities and transportation systems, including the school district and hospital. The dollar values listed below are from the City of Cordova records, dated July 8, 2007. The list is provided to identify city assets and provide an indication of each asset's vulnerability to natural hazards.

Table 9. City of Cordova - Asset Matrix - Structures and Infrastructure

Building Name	Occ / Description		Constr	Year Built	Sq Ft	Building Value $
City Hall	City Offices	602 Railroad	Steel on Steel Frame	1976	11,920	2,584,466
Fire Dep't Van	2 connected Sealand Vans - for storage purposes	602 Railro				0
PWS Science Center	Office	Breakwater Ave	Frame	1964	2,900	0
Cordova Chamber of Commerce		404 First Street	Frame		600	78,578
Hospital		602 Chase Avenue	Reinforced Concrete	1986	43,440	16,201,676
5 Mile Fire Station		5 Mile Copper River Hwy	Steel	2001	2,400	180,200
Municipal Ocean Dock	Ocean Dock		Concrete /Steel		32,060	5,884,060
North Containment Dock	Commercial Shipping		Concrete /Steel	1990	9,686	2,032,020
Harbor Bathroom		Breakwater Ave	Frame	1983	300	54,149
Old Grid Dock & Approach	PWS Science Center	Breakwater Ave	Wood Timber	1964	7,093	1,008,060
Harbormaster Building	Office	Nicholoff Lane	Frame	1983	2,011	413,074
Coast Guard Dock	USCG	Breakwater Ave	Wood Timber	1960	13,152	5,399,840
Loading Dock with Hoist	Marine Advisory	Breakwater Ave	Wood Timber		4,940	914,250
Small Boat Harbor Approach		Breakwater Ave	Wood Piling		2,184	307,400
3 Stage Dock		Nicholoff Lane	Wood Timber		3,843	530,000
New Grid Approach		Nicholoff Lane	Steel / Timber		672	295,740
Approach No. 1	Small Boat Harbor		Steel / Timber		1,312	210,940
Approach No. 2	Small Boat Harbor		Steel / Timber		1,312	210,940
Approach No. 3	Small Boat Harbor		Steel / Timber		1,105	183,380
Approach No. 4	Small Boat Harbor		Steel / Timber		2,184	331,780
Inner Harbor Launch Ramp	Small Boat Harbor		Steel / Timber	2005		340,000
Float A	Small Boat Harbor		Wood / Concrete	2005	A-7410	1,111,200
Float B	Small Boat Harbor				B-9715	1,401,200

Building Name	Occ / Description		Constr	Year Built	Sq Ft	Building Value $
Float C	Small Boat Harbor				C-10452	1,316,200
Float D	Small Boat Harbor				D-6735	1,016,200
Float E	Small Boat Harbor				E-5453	856,200
Float F	Small Boat Harbor				F-2565	445,200
Float G	Small Boat Harbor				G-11556	2,036,790
Float H	Small Boat Harbor				H-15684	3,362,320
Float I	Small Boat Harbor				I-15684	3,102,090
Float J	Small Boat Harbor				J-8064	1,729,920
Float K	Small Boat Harbor				K-13242	2,826,490
Float L	Small Boat Harbor		Wood / Concrete		L-7720	1,658,370
Float M	Small Boat Harbor		Wood / Concrete		M-5535	1,186,670
Harbor - Forest Service Building	US Forest Service Building		Frame		816	52,959
Library Centennial Building	Public Library	622 First Avenue	Steel on Steel Frame	1966	6,480	1,239,682
Odiak Camper Park	Public Restrooms	Whitshed Road	Frame	1976	792	106,000
Tourist Booth/big Gazebo	at Hollis Henrichs Park	Chase & Copper River Hwy	Frame	1985	100	13,568
Skaters Cabin		Power Creek Road	Log		684	65,984
Bidarki Rec. Center		103 Council	Frame	1933/ 1988/ 1989	11,450	2,438,000
Swimming Pool Building		610 Railroad Ave	HCB & Frame	1974	7,968	2,332,000
Ballfield Restroom/Concession		Block 7A USS 2981	Frame			111,300
Fleming Spit Restroom Bldg		Fleming Spit	Adobe Brick	1999	182	63,600
Odiak Pond	gazebo, boardwalk	CRH				84,800
Hollis Henrichs Park	restroom	CRH & Chase				63,600
Parks Maintenance Facility	(old CG bldg. by city dock)	Breakwater & Seafood				116,600
Nettie Hansen Park	playground equipment	4th st. & Browning	prop. In open			42,400

Building Name	Occ / Description		Constr	Year Built	Sq Ft	Building Value $
Children's Memorial Park	playground equipment	Second St. & Browning	prop. In open			79,500
Tot Park	playground equipment	Sawmill Ave.	prop. In open			15,900
Skate Park	fencing, ramps, prks&rec equip.	Sawmill Ave.	prop. In open			31,800
Nirvana Park	lrge covered shelter,P&R equip.	Lake Ave. & LeFevre				26,500
Public Works	Public Works Shop	.7 Whitshed Road	Wood/Steel Frame		7,260	702,762
Baler Building	Solid Waste Baler	Mile 1 Whitshed Road	Steel on Steel Frame	1985	6,132	1,009,035
17 Mile Landfill Bldg	Storage & Shop	Sec 13, T16S, R1w	Steel	2000	2,400	323,300
Portable	District Office Modular		Frame		600	25,000
Portable	High School Modular Classroom		Frame		600	25,393
Cordova Jr./Sr. High School	100 Fishermans Way		HCB & Frame	1980	52,008	11,531,085
Mt. Eccles Elem. School	201 Adams		Steel on Steel Frame	1955	31,048	7,835,301
Elementary Playground	201 Adams		Frame		2,736	121,459
Eyak Mt. Chairlift	Ski Resort	Eyak Mtn. Ski Area	Steel	1978		309,520
Eyak Mt. Chairlift Building	Ski Resort	Eyak Mtn. Ski Area	Frame	1960	240	0
Eyak Mt. Maintenance Shop	Ski Resort	Eyak Mtn. Ski Area	Frame	1980	240	50,244
Eyak Mt. Snack Shack	Ski Resort	Eyak Mtn. Ski Area	Frame	1960	600	84,270
Eyak Mt. Clubhouse/Rental Shop	Ski Resort	Eyak Mtn. Ski Area	Frame	1992	832	96,036
Eyak Mt. Water Tank	Ski Resort	Eyak Mtn. Ski Area	Steel	1980		132,500
Eyak Mt. Chairlift Building/Top	Ski Resort	Eyak Mtn. Ski Area	Frame	1975		0
Public Works - Water/Sewer 1	Sewage Treatment	Orca Inlet Drive	Joisted Masonry/ Frame	1975	1,560	310,005
Public Works - Water/Sewer 2	STP generator outbuilding	Orca Inlet Drive	fiberglass			32,860
Public Works - Water/Sewer 3	WWTP Garage	Orca Inlet Drive	Frame	1982	2,904	298,174
Public Works - Water/Sewer 4	Whisky Ridge Lift Station	Whitshed Road	Frame	1978	256	18,419

Building Name	Occ / Description		Constr	Year Built	Sq Ft	Building Value $
Public Works - Water/Sewer 5	Whisky Ridge gen. outbldg.	Whitshed Road	fiberglass			32,860
Public Works - Water/Sewer 6	Meals WTP	Whitshed Road	Frame	1975	240	25,652
Public Works - Water/Sewer 7	Meals Dam	Whitshed Road	Sheet Steel / Earth	1973		0
Public Works - Water/Sewer 8	Eyak WTP	Mile 1 Copper River Hwy	Frame	1984	4,428	515,460
Public Works - Water/Sewer 9	Wet Well/Dry Well Murchison Lift Station	Mile 1 Copper River Hwy				12,720
Public Works - Water/Sewer 10	Mews Pump Station	6th Street	Frame	1980	225	11,130
Public Works - Water/Sewer 11	Mews Water Tank	6th Street	Steel	1980		79,500
Public Works - Water/Sewer 12	1.5 mg Water Tank	5th Street	Steel	1980		1,590,000
Public Works - Water/Sewer 13	1.5 mg Pumphouse	5th Street	Frame			25,440
Public Works - Water/Sewer 14	Ferry Dock Lift Station	Ferry Dock Drive	Frame	1985	256	26,182
Public Works - Water/Sewer 15	Eyak Lift Station	LeFevre/Chase	Fiberglass/ Steel			12,720
Public Works - Water/Sewer 16	Odiak Lift Station	South 2nd	Frame			636,000
Public Works - Water/Sewer 17	Orca WTP	Chugach Cannery	Frame	1982		25,440
Public Works - Water/Sewer 18	Morpac Lift Station	Copper River Highway	Steel	1985	256	21,200
Public Works - Water/Sewer 19	Morpac Water Tank	Copper River Highway	Steel	1980		795,000
Public Works - Water/Sewer 20	CT (Murcheson) Water Tank	1 Mile Copper River	Steel			1,685,400
Public Works - Water/Sewer 21	CT (Meals) Water Tank	.75 Mile Whitshed Road	Steel			1,287,900
Public Works - Water/Sewer 22	Solid Handling Bldg	Orca Inlet Drive	Steel	2007	2,772	665,000
Building #4			Frame		400	14,840
Public Works – Refuse	EVOS Building	Mile 1 Whitshed Road	Concrete	1998		161,936
Extra Expense						5,000,000
Increased Cost of Construction						1,000,000
Total Insured Value						**102,623,337**

The following table depicts each of the critical facilities in Table 10 in relation to whether they are vulnerable to the listed natural hazards. However, the designations under flood/erosion are taken from the FEMA Flood Insurance Rate Map that is dated 1979. Since that time areas have been filled to above the Base Flood Evaluation in some cases. Until the FIRM has an official revision or a Letter of Map Revision is approved by FEMA, the designations stand but may not be accurate but do not necessarily reflect the current situation in the field. There are no structures located in the currently delineated avalanche areas.

Table 10. Assets and Vulnerability Matrix - Structures and Infrastructure

Facility	Flood/ Erosion	Severe Weather	Wildland Fire	Earthquake	Tsunami	Avalanche/ Landslide
City Hall		X		X	X	
Fire Dep't Van		X		X	X	
PWS Science Center	X	X		X	X	
Cordova Chamber of Commerce		X		X	X	
Hospital	X	X		X	X	
5 Mile Fire Station	X	X	X	X	X	
Municipal Ocean Dock	X	X		X	X	
North Containment Dock	X	X		X	X	
Harbor Bathroom	X	X		X	X	
Old Grid Dock & Approach	X	X		X	X	
Harbormaster Building	X	X		X	X	
Coast Guard Dock	X	X		X	X	
Loading Dock with Hoist	X	X		X	X	
Small Boat Harbor Approa	X	X		X	X	
3 Stage Dock	X	X		X	X	
New Grid Approach	X	X		X	X	
Approach No. 1	X	X		X	X	
Approach No. 2	X	X		X	X	
Approach No. 3	X	X		X	X	
Approach No. 4	X	X		X	X	
Inner Harbor Launch Ramp	X	X		X	X	

Facility	Flood/ Erosion	Severe Weather	Wildland Fire	Earthquake	Tsunami	Avalanche/ Landslide
Float A	X	X		X	X	
Float B	X	X		X	X	
Float C	X	X		X	X	
Float D	X	X		X	X	
Float E	X	X		X	X	
Float F	X	X		X	X	
Float G	X	X		X	X	
Float H	X	X		X	X	
Float I	X	X		X	X	
Float J	X	X		X	X	
Float K	X	X		X	X	
Float L	X	X		X	X	
Float M	X	X		X	X	
Harbor - Forest Service Building	X	X		X	X	
Library Centennial Building		X		X	X	
Odiak Camper Park	X	X		X	X	
Tourist Booth/big Gazebo		X		X	X	
Skaters Cabin	X	X		X	X	
Bidarki Rec. Center		X		X	X	
Swimming Pool Building		X		X	X	
Ballfield Restroom/Concession	X	X		X	X	
Fleming Spit Restroom Bldg	X	X		X	X	
Odiak Pond		X		X	X	
Hollis Henrichs Park		X		X	X	
Parks Maintenance Facility		X		X	X	
Nettie Hansen Park		X		X		
Children's Memorial Park		X		X	X	
Tot Park		X		X		
Skate Park		X		X	X	

Facility	Flood/ Erosion	Severe Weather	Wildland Fire	Earthquake	Tsunami	Avalanche/ Landslide
Nirvana Park	X	X		X	X	
Baler Building		X	X	X		
17 Mile Landfill Bldg		X	X	X		
Cordova Jr./Sr. High School		X		X	X	
Mt. Eccles Elem. School		X		X		
Elementary Playground		X		X		
Eyak Mt. Chairlift		X	X	X		
Eyak Mt. Chairlift Building		X	X	X		
Eyak Mt. Maintenance Shop		X	X	X		
Eyak Mt. Snack Shack		X	X	X		
Eyak Mt. Clubhouse/Rental Shop		X	X	X		
Eyak Mt. Water Tank		X	X	X		
Eyak Mt. Chairlift Building/Top		X	X	X		
Public Works - Water/Sewer –1	X	X	X	X	X	
Public Works - Water/Sewer –2	X	X	X	X	X	
Public Works - Water/Sewer -3	X	X	X	X	X	
Public Works - Water/Sewer –4		X		X	X	
Public Works - Water/Sewer -5		X	X	X	X	
Public Works - Water/Sewer –6	X	X	X	X		
Public Works - Water/Sewer –7	X	X	X	X		
Public Works - Water/Sewer –8	X	X		X	X	
Public Works - Water/Sewer –9	X	X	X	X	X	
Public Works - Water/Sewer –10		X	X	X		
Public Works - Water/Sewer –11		X	X	X		
Public Works - Water/Sewer –12		X	X	X		
Public Works - Water/Sewer –13		X	X	X		
Public Works - Water/Sewer –14	X	X		X	X	
Public Works - Water/Sewer –15	X	X		X	X	
Public Works - Water/Sewer –16	X	X		X	X	

Facility	Flood/ Erosion	Severe Weather	Wildland Fire	Earthquake	Tsunami	Avalanche/ Landslide
Public Works - Water/Sewer –17		X	X	X		
Public Works - Water/Sewer –18	X	X	X	X	X	
Public Works - Water/Sewer –19		X	X	X		
Public Works - Water/Sewer –20		X	X	X		
Public Works - Water/Sewer –21		X	X	X		
Public Works - Water/Sewer –22	X	X	X	X	X	
Public Works - Refuse	X	X	X	X	X	

Location of Identified Hazards:

In summary, most identified hazards are area wide. The principal hazards of flood, erosion, severe weather, tsunami, avalanche and earthquake could potentially impact any part of Cordova.

Flooding events, even for 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.

A severe weather event would create an area wide impact and could damage structures and potentially isolate Cordova from the rest of the state.

Wildland Fire could occur anywhere in the Cordova region as the area is heavily forested. However, it is also a rain forest so the probability of wildland fire is listed on the Alaska State Hazard Plan matrix, Table 8, as having a moderate probability. The community listed the critical facilities located in heavily forested areas on Table 10. A serious wildland fire could impact the facilities listed in Table 10 and other areas that are undeveloped, but the overall impact, due to the rain forest environment would be limited.

Earthquake damage would be area-wide with potential damage to critical infrastructure up to and including the complete abandonment of key facilities. Priority would have to be given critical infrastructure to include: public safety facilities, health care facilities, shelters and potential shelters, and finally public utilities.

Avalanche and landslide danger is limited primarily to the identified avalanche and landslide areas depicted on Map 4. There are no critical facilities located in the avalanche and landslide areas.

Tsunami damage would impact the structures directly adjacent to the coastline and as depicted on Map 5 Tsunami Hazard Zones.

Section 1. Floods and Erosion

Hazard Description and Characterization

Types of Flooding in Cordova

Flood hazards in Cordova include storm surges, voluminous rainfall, snow and glacier melt and release of glacier-dammed lakes.

Storm Surge Flooding

Storm surges are relatively long-term, local increases in water level resulting from offshore storms. Maximum hazard results when such a surge coincides with a maximum tide.

Ralnfall/Snowmelt/Glacler Melt Flooding

Floods occur in rivers as a result of a large input of water to the drainage basin in the form of rainfall, snowmelt, glacier melt, or a combination of these inputs. In the Cordova area, as well as most coastal areas of Southcentral and Southeast Alaska, the floods due to snowmelt are typically lower in magnitude than those due to rainstorms in late summer or fall. Glacier melt is typically largest in late summer, increasing the potential magnitude of late summer rainfall floods in glacial streams.

Flood and Erosion Hazards

Deposition

Deposition is the accumulation of soil, silt, and other particles on a river bottom or delta. Deposition leads to the destruction of fish habitat and presents a challenge for navigational purposes. Deposition also reduces channel capacity, resulting in increased flooding or bank erosion.

Erosion

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

Stream bank erosion involves the removal of material from the stream bank. When bank erosion is excessive, it becomes a concern because it results in loss of streamside vegetation, loss of fish habitat, and loss of land and property.

Contaminated water

Floodwaters pose a health hazard by picking up contaminants and disease as they travel. Outhouses, sewers, septic tanks, and dog yards are all potential sources of disease transported by floodwaters. Individual wells in Cordova could be contaminated during flood events. The private well systems must be tested and disinfected after a flood. Lack of a water source is a significant concern for flood victims, especially if the flood has been extensive enough to contaminate the public water supply. In such a case, outside bottled water is at times the only source of clean water.

Local Flood and Erosion Hazard Identification

The following section regarding hazard identification was taken from the *Eyak River Flood Control Study.* Prepared by USCOE for the City of Cordova. July 14, 2003.

The principal flood problem in Cordova is caused by high water in Eyak Lake. The Eyak River, which drains Eyak Lake, does not have the capacity for peak flow and hence the lake level rises. Persistent flooding in the Cordova area has also been caused by inflows of the Scott River into the Eyak River. These inflows raise the water surface of both the Eyak River and Eyak Lake.

The Eyak River is a small, clear water river that drains Eyak Lake and has a drainage area of 42 square miles. The Eyak River lies along the extreme western edge of the Scott River delta and the eastern extent of the Heney Range. The Scott River delta is a long, broad delta with considerable topographic relief extending from the Scott Glacier to Prince William Sound. The Scott River is a glacial outwash river that is characterized by a tremendous sediment load and a multi-channeled, braided stream channel system that extends across the entire extent of its previously glaciated valley. Flow paths are highly variable within the delta as stream channels meander, are abandoned for lower grade channels, or are captured by larger flows.

The additional flow and sediment deposition from the Scott River into the Eyak River has greatly restricted the natural flow from the Eyak drainage. Under these conditions, water surface elevations of the Eyak River upstream of the intrusions of the Scott River are held continuously high. The increased water surface elevations of the Eyak River, in turn, keep the water surface of Eyak Lake continuously high and well above normal.

Conditions have changed somewhat since the initiation of this study. Channel shifts at the foot of Scott Glacier and in the mid floodplain area north of the Copper River Highway appear to have led to decreased flows of silt, glacial water into the Eyak River. During the summer of 2001 the flow from Scott Glacier shifted more to the east, away from the Eyak River. This has reduced the amount of Scott River streamflow and sediment into the Eyak River. If these conditions persist, the Eyak River may erode and transport the sediment shoals that have been deposited in it and return the stream channel to its base level. Average channel velocities during a 2-year (50% probability) flood event are estimated to be 3 feet per second, a sufficient velocity to erode the fine sediment that the shoals are composed of. This will return water surface elevations and flooding hazards to those present before the intrusion of the Scott River. It is not known how long these conditions may persist and whether the Eyak River will return to prior conditions.

Below the terminus of the Scott Glacier, the Scott River drainage forms a wide, low elevation flood plain of approximately 30 square miles. In its upper seven miles this floodplain is bounded on both sides by steep valley walls, and averages about two miles in width. The lower section of the floodplain widens out into a broad delta, which coalesces with the delta of the Glacier River to the east.

In early July of 1983 a major shift in the water flow patterns down the Scott River drainage was noted at the Copper River Highway.

This flow shift is likely related to a change in the channels of the Scott River from underneath the Scott Glacier which occurred at about the same time. (However, the flow pattern change could have occurred through a major channel shift further down the valley, independent of the channel changes at the terminus of the Scott Glacier.)

Previous to the July 1983 channel shift at the Copper River Highway, the majority of the turbid, summer and fall glacial flows from the Scott River passed under the Mile 9 bridges on the Copper River Highway (and on the east side of the drainage.) The Mile 7 Bridge passed primarily non-glacial waters from Laydick Creek. These flows were of much less volume than those under the Mile 9 Bridge.

At flood stage, individual channels in the Scott River drainage are incapable of holding all flows. Floodwaters rise and spread across the width of the valley, and high, turbid flows pass under all _the highway bridges, which span the drainage.

Since the July 1983 flow shift, the majority of streamflow from Scott River pass under the Mile 7 Bridge and are now turbid glacial waters. Significantly less than half the flows of the Scott River now pass under the Mile 9 bridges (and at low summer stage virtually no flow.)

The Scott River drainage area is 154 square miles, most of which is mountainous. Elevations range from sea level to 6,000 feet. The Scott Glacier covers 45 percent of the watershed, which receives approximately 150 inches of precipitation per year.

Outburst Floods from Scott Glacier

Along the east flank of Scott Glacier, about 1.5 miles above its terminus, the glacier blocks off a small, east-west trending valley. A lake of approximately 80 acres in surface area forms behind this glacial dam. Occasionally, outburst floods occur from this lake and the majority of its water volume drains out from under the glacier and flows down the Scott River valley. The recurrence interval of this outburst flood may be as frequent as once or twice a year (Post, Austin & Mayo Glacier dammed Lakes and Outburst Floods in AK. USGS, 1971). Apparently, these outburst floods are not of significant enough volume to have a strong downstream influence. Further up the Scott Glacier is another glacially dammed lake, which has occasional outburst floods. The lake is small enough that outburst floods would likely have a low impact on flooding downstream.

Based on the limited data concerning outburst floods from Scott Glacier, it was assumed that outburst flooding would have a minimal direct impact on the frequency or magnitude of major flood events on the Scott River. The outburst floods could redistribute substrate material sufficiently to cause changes in flow patterns within the upper Scott River floodplain. These changes in flow patterns could propagate to lower portions of the watershed and affect the amount of additional flow entering the Eyak River. In 2001 it appeared that channel shifts at the foot of the Scott Glacier led to decreased flows of Scott River water into the Eyak River. (*Eyak River Flood Control Study, 2003).*

The Scott River is a heavily braided stream that flows from the terminus of Scott Glacier. Downstream from the glacier the Scott River forms a wide, low elevation floodplain of approximately 30 square miles. The upper 7 miles of this floodplain is bounded by steep valley walls, and averages about 2 miles in width. The lower section of the floodplain widens out into a broad delta that extends to the Gulf of Alaska.

Community Participation in the NFIP

The City of Cordova participates in the National Flood Insurance Program. The function of the National Flood Insurance Program (NFIP) is to provide flood insurance to homes and businesses located in floodplains at a reasonable cost. In trade, the City of Cordova 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 upon mapping areas of flood risk, and requiring local implementation to reduce flood damage primarily through requiring the elevation of structures above the base (100-year) flood elevations.

The table below describes the FIRM zones.

Table 11. 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.

Flood hazard high velocity zones in the district encompass only a few areas within the Cordova city limits. These areas are Alpine Woods, two lots in Robe River and some undeveloped land.

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:

1. Record the elevation of the lowest floor of all newly constructed buildings, or substantial improvement, located in the floodplain.
2. Determine the proper flood insurance rate for floodplain structures
3. 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.

Table 12. NFIP Statistics

Emergency Program Date Identified	**Regular Program Entry Date**	**Map Revision Date**	**NFIP Community Number**	**CRS Rating Number**	**Total # of Current Policies (07/31/06)**
5/24/1977	04/02/1979	None	020037	Not in CRS	8
Total Premiums	**Total Loss Dollars Paid**	**Average Value of Loss**	**AK State # of Current Policies**	**AK State Total Premiums**	**AK Total Loss Dollars Paid**
$137,300	0	0	2,559	$1.6 million	$3.4 million
Cordova Average Premium	**AK State Average Premium**	**Repetitive Loss Claims**	**Dates of Rep. Losses**	**Total Rep. Loss**	**Average Rep. Loss**
$288	$629	0	0	0	0

Cordova Floodplain	Jim Goossens, AICP, City Planner P.O. Box 1210

Coordinator	Cordova, Alaska 99574 Phone: (907) 424-6233, Email: planning@cityofcordova.net City Website: http://www.cityofcordova.net
State of AK Floodplain Coordinators	Taunnie Boothby, Floodplain Management Program Coordinator Department of Commerce, Community & Economic Development Division of Community Advocacy 550 W. 7th Avenue, Suite 1640 Anchorage, AK 99501, (907) 269-4567, (907) 269-4563 (fax) Email: taunnie_boothby@commerce.state.ak.us Website: http://www.commerce.state.ak.us/dca/nfip/nfip.htm

Source: DCRA, DCA, Floodplain Management

Economic Considerations. The area of Cordova along the western shore of Eyak Lake is densely populated with single- and multi-family residential and commercial structures. All land suitable for development has been developed and no changes in land use are expected over the 25-year period of analysis. The developed area of Eyak on the east bank of the Eyak River consists primarily of single-family residential structures.

A structure inventory was conducted to identify all structures in the floodplain. The inventory identified 196 residential and commercial structures at risk of flooding from a 0.2 percent chance event, commonly referred to as a 500-year flood. The value of property, excluding utilities, within the 500-year flood plain of the Eyak River is estimated to be approximately $16 million.

Previous Occurrences of Flood and Erosion

Planning Commissions at the August 12, 2007 public meeting related their recollections of a wind storm that occurred on December 22, 1999. The wind gusts of over 150 mph damaged roofs, structures and roads.

The following information is from the DHS&EM Disaster Cost Index, 2006.

Cordova, September 16, 1983 The Governor proclaimed a Disaster Emergency after a flash flood generated by heavy rainfall destroyed portions of a pipeline system which provides the City of Cordova with, approximately 60% of its water supply. Public assistance was provided for the purpose of repairing the city's water system.

Cordova, October 31, 1985 After heavy rains, a landslide destroyed water lines between Heney Creek catchment basin and the city. Disaster public assistance supported repair by the city.

Southcentral Alaska Flood (Major Disaster), October 12, 1986 FEMA declared (DR-0782) on October 27, 1986 Record rainfall in South-central Alaska caused widespread flooding in Seward, Matanuska-Susitna Borough and Cordova. The President declared a Major disaster implementing all public and individual assistance programs, including SBA disaster loans and disaster unemployment insurance benefits.

96-180 South-central Fall Floods declared September 21, 1995 by Governor Knowles then FEMA declared (DR-1072) on October 13, 1996: On September 21, 1995, the Governor declared a disaster as a result of heavy rainfall in South-central Alaska an as a result the Kenai Peninsula Borough, Matanuska-Susitna Borough, and the Municipality of Anchorage were initially affected. On September 29, 1995, the Governor amended the original declaration to include Chugach, and the Copper River Regional Education Attendance areas, including the communities of Whittier and Cordova, and the Richardson, Copper River and Edgerton Highway areas which suffered severe damage to numerous personal residences, flooding, eroding of public roadways, destruction & significant damage to bridges, flood control dikes and levees, water and sewer facilities, power and harbor facilities. On October 13, 1995, the President declared this event as a major disaster (AK-1072-DR) under the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Individual Assistance totaled $699K for 190 applicants. Public Assistance totaled $7.97 million for 21 applicants with 140 DSR's. Hazard Mitigation totaled $1.2 million. The total for this disaster is $10.5 million.

06-220 2006 August Southcentral Flooding (AK-06-220) declared August 29,2006 by Governor Murkowski then FEMA declared (DR-1663) on October 16,2006

Beginning on August 18, 2006 and continuing through August 24, 2006, a strong weather system centered causing severe flooding resulting in severe damage and threats to life and property, in the Southcentral part of the State including the Matanuska-Susitna Borough, the City of Cordova and the Copper River Highway area in the Chugach Rural Education Attendance Area (REAA), the Richardson Highway area in the Copper River REAA and Delta/Greely REAA, the Denali Highway area, and the Alaska Railroad and Parks Highway areas in the Matanuska-Susitna Borough and the Denali Borough. Damage cost estimates are near $21 million in Public Assistance primarily for damage to roads, bridges and rail lines. Individual Assistance estimates are near $2 million.

06-221 2006 October Southern Alaska Storm (AK-06-221) declared October 14, 2006 by Governor Murkowski

Beginning on October 8, 2006 and continuing through October 13, 2006, a strong large area of low pressure that developed in the Northern Pacific and moved into the Southwest area of the state, produced hurricane force winds throughout much of the state and heavy rains in the Southcentral and Northern Gulf coast areas, which resulted in severe flooding and wind damage and threats to life in the Southern part of the state, to include the Kenai Peninsula Borough including the Cities of Seward and Seldovia, the Chugach Rural Education Area including the City of Cordova and the City of Valdez, and the Copper River Rural Education Area including the Richardson Highway to the Glenallen and highways and drainages in the McCarthy areas. Total damages are estimated at $557,415 with a public assistance estimate of $456,855 less the US Army Corps of Engineers (USASCE) Advanced Measures Assistance of $250,000 leaving $206,855.

Flood and Erosion Hazard Vulnerability

Please see matrices at the being of Chapter 3.

The following table displays output from the FDA model and demonstrates the calculation of average annual flood damages, which are estimated to equal $205,000 as noted in the lower right cell of the table.

Table 13. Eyak River 2003 Study FDA Model

Return Interval – In years	Probability of Occurrence	Number of Structures Flooded	Single Event Damages	Expected Annual Damages – Cumulative
2	0,5	6	$206,999	$51,700
5	0.2	6	$223,654	$116,300
10	0.1	6	$367,023	$145,800
25	0.04	22	$571,794	$174,000
50	0.02	31	$729,668	$187,000
100	0.01	31	$989,183	$195,600
250	0.004	31	$1,231,884	$202,300
500	0.002	53	$1,708,884	$205,200

Eyak River Study, 2003

Tables at the beginning of Chapter illustrate the dollar amount of facilities located with flood/erosion areas. Cordova is located on the water and therefore the Port and Harbor facilities and areas near the shore are always vulnerable to flooding/erosion.

Flood and Erosion Mitigation Goals and Projects

Goals

Goal 1. Reduce flood damage.

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

Goal 2. Prevent future flood damage.

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

Goal 3: Increase public awareness

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

Projects

General Mitigation Techniques

- Nonstructural Measures. Nonstructural measures include flood warning, flood proofing, and floodplain evacuation. Flood warning is used primarily to provide residents of flood-prone areas an opportunity to prepare for an impending flood. It is useful to alert such residents of approaching storms that may generate flooding or who live on large watersheds to warn of floodwaters that are moving toward a particular area.

Flood proofing can be used to modify existing floodplain development to make it more compatible with the flood hazard. Generally, this is accomplished by elevating structures above flood levels, providing ring levees, or dikes, or waterproofing a structure. Floodplain evacuation involves the removal of damageable property from the flood prone area. This can be done by moving the house or structure to another location or by demolishing the structure and rebuilding elsewhere. Evacuation thus restores the floodplain to its original condition, allowing it to function as an overflow storage area.

- Structural Measures. These include levees, floodwalls, retention/detention reservoirs, channel modifications, and streamflow diversion. All such measures reduce the frequency of damaging overflows.

Levees generally involve either earthen or concrete walls, which constrict water movement into certain areas. They reduce the extent of the area subject to flooding and the amount of property subject to danger. In this manner, the floodplain is altered to be more compatible with existing or planned development. Occasionally, training levees may be used along either or both sides of the stream to confine floodwater to the stream area or floodway. In reducing the extent of flooding and the floodplain, levees also reduce available storage and can cause an increase in flow rate and flood level. Therefore, the usefulness of levees depends a great deal on the topography and other physical characteristics of the area.

Floodwalls can be used to confine floodwaters to the stream and a selected portion of the floodplain. Floodwalls, like levees, also reduce available storage and can cause an increase in flow rate and flood level. Floodwalls also require some form of anchoring device below the surface.

Flood retention/detention reservoirs can be used to temporarily store floodwaters above flood-prone areas, thus reducing the downstream flow volumes and flood levels. Later, the floodwaters can be released at a controlled rate to minimize the downstream effect. The usefulness of such reservoirs depends on the physical characteristics of the upper watershed and the status of development within that area.

Channel modification can be used to alter the existing stream channel and increase its carrying capacity. This is usually accomplished by excavating to make the stream channel either wider, deeper, or both. This increases the velocity and flow rate of the floodwaters thereby reducing flood levels and the extent of flooding. The magnitude and extent of the effect of channel modification on flooding is directly dependent on the extent of excavation; the larger the channel, the greater the reduction in flood levels. However, since floodplain storage in the channeled area is reduced and flow velocities are increased, downstream flooding may actually be greater due to greater flow rates and hydrologic regime alteration. Thus, the usefulness of this measure may depend on downstream conditions as well.

Stream flow diversion can be used to redirect floodwaters around a particular area. This precludes their entry into the problem area thereby greatly reducing the flood problems of that area. This is often accomplished by constructing a secondary channel bypass around the problem area to connect at some downstream point or to another drainage course.

The effectiveness of this measure is thus depends on the physical setting and characteristics of the area.

Specific Mitigation Projects

After receiving public input, it is the recommendation of this plan that the City of Cordova, along with other local, State and Federal entities look at the following projects for flood/erosion mitigation. Please see Chapter 4 Mitigation Strategy for more detail on the following specific projects.

- Construct a 2.75 mile long dike between the Scott and Eyak Rivers

At the August 12, 2007 meeting, the Planning Commission reached a consensus that this project be added to the plan. The project was proposed in 1996 but the USCOE decided not to pursue it. The Commission related that there is $10 million dollars of real estate and property that borders the Eyak River and that this project should be researched and implemented. The Commission also said that there is a lot of public support for the project and that the project design can be modified.

The following is the project description from the USCOE report.

The project is to construct a 2.75 mile long dike between the Scott and Eyak Rivers by discharging approximately 20,000 cubic yards (cy) of native material, 25,000 cy gravel, and 15,000 cy of riprap in approximately 7.5 acres of wetlands and other waters of the United States. The dike will be approximately 3 feet high, have a 10·foot wide crest at the top to function as a road, and be approximately 22 feet wide at the base. The side slopes will be sloped at approximately 1 vertical to 2 feet horizontal, and be armored on the Scott River side. Work will also include (1) the excavation of approximately 10,000 cy of material from alongside the dike (approximately 6 feet deep, 20 feet wide and 7,5000 feet long); and (2) the dredging of approximately 10,000 cy of sediment from the Eyak River between Lydick and Mountain Sloughs (approximately

2.000 linear feet). The 20,000 cy of dredged material will be used to level the area for construction of the dike.

The purpose of the project is to alleviate sediment build-up in the Eyak River, and to lower water levels in the Eyak River and Eyak Lake.

The Scott River has changed course and is flowing into the Eyak River. Most of the water is entering the Eyak River near Lydick Slough; however, some flow is entering further upstream. As a result of the Scott River discharging sediment into the Eyak River, a sediment plug has developed in the Eyak River near the mouth of Lydick Slough upstream to the mouth of Mountain Slough, a distance of approximately 1,800 feet. Sedimentation may actually extend much further upstream. Water levels have risen in both the Eyak River and Eyak Lake because of this sediment build-up.

The sediment plug(s) in the Eyak River will be cleared using the dike to access the river. Excavated material will be used to level the area for dike construction.

- Six-Mile Subdivision Drainage System

Flooding could be mitigated greatly by a drainage system at Six-Mile Subdivision.

- Alternative Water Source to Six Mile Subdivision

- Letter of Map Revision for Flood Insurance Rate Maps (FIRM)

The FEMA FIRMs are dated 1979. Much of the port area has been filled and therefore the maps are very outdated.

- Design and Construct Flood proofing for Hospital

The basement of the Cordova Hospital has flooded in recent years and would benefit by flood proofing techniques.

- Heney Creek Waterline Repair and/or Replacement

During the 2006 flood the Heney Creek water line was damaged. The water line needs studied to decide if it should be 1) abandoned, 2) an alternative route be designed for the water line 3) replace the water line in the present location with upgraded piping, or 4) replace the water line with a new line at Power Creek.

- Power Creek Waterline Repair and/or Replacement

Project FLD-8. Identify Drainage Patterns and Develop a Comprehensive Drainage System

- Structure Elevation and/or Relocation

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.

- Public Education

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 Cordova could be developed and distributed to all households.

- Install new streamflow and rainfall measuring gauges
- Apply for grants/funds to implement riverbank protection methods.
- Pursue obtaining a CRS rating to lower flood insurance rates.
- Continue to obtain flood insurance for all City structures, and continue compliance with NFIP.
- Require that all new structures be constructed according to NFIP requirements and set back from the river shoreline to lessen future erosion concerns and costs.

Section 2. Severe Weather

Hazard Description and Characterization

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 a week at a time Heavy snow can impact the interior and is common along the southern coast. A quick thaw means certain flooding.

Winter Storms

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

Extreme cold

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

Extreme cold, can bring transportation to a halt across 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.

Local Severe Weather Hazard Identification

The Cordova area has a maritime climate, which is characterized by cool summers, mild winters, and heavy year-around precipitation. This type of climate is typical of the southeastern and southern coastal areas of Alaska where the ocean exerts a modifying influence and causes relatively low seasonal and diurnal temperature variations. Proximity to the ocean and the frequent lows which develop or move out of the Gulf of Alaska result in heavy precipitation. According to the U.S. Army corps of Engineers, the design snow load factor for Cordova should be 100 pounds per square foot; the highest in the state. In practical terms, it means that people have to guard against excessive snow accumulations on roofs, boats, and airplanes.

Cordova's winters are relatively mild. The coldest month (January) has an average daily temperature of about 23 degrees F., and although temperatures as low as -33 degrees F. have been recorded, extremely cold weather is usually of short duration. On the other hand, summer temperatures in the community tend to be on the cool side, averaging between 50 and 55 degrees F., with daily maximums reaching into the low 60's in July and August. The record high temperature in Cordova is 84 degrees F., a mark set back in 1946.

Table 14. Cordova Weather Summary, from 1995 - 2006

	Daily Extremes				Monthly Extremes				Max. Temp.		Min. Temp.	
	High	Date	Low	Date	Highest Mean	Year	Lowest Mean	Year	>= 90 F	<= 32 F	<= 32 F	<= 0 F
	F	dd/yyyy or yyyymmdd	F	dd/yyyy or yyyymmdd	F	-	F	-	# Days	# Days	# Days	# Days
January	58	21/1961	-4	12/1969	38.0	2001	13.6	1969	0.0	10.6	23.7	0.5
February	59	05/1995	-2	20/1956	38.3	1998	22.7	1956	0.0	6.2	20.8	0.1
March	51	31/1957	-13	03/1956	37.5	2005	28.2	1959	0.0	3.0	21.7	0.2
April	64	28/1989	3	27/1959	42.4	1993	36.2	1956	0.0	0.1	11.5	0.0
May	73	24/1969	23	04/1956	49.6	2004	40.7	1956	0.0	0.0	1.4	0.0
June	78	11/1959	34	05/1956	56.8	1959	48.1	1956	0.0	0.0	0.0	0.0
July	80	09/1971	35	18/1964	59.5	2004	53.3	1965	0.0	0.0	0.0	0.0
August	81	08/1957	35	01/1964	61.0	2004	52.4	1955	0.0	0.0	0.0	0.0
September	71	01/1960	28	24/1970	54.7	1995	45.5	1992	0.0	0.0	0.6	0.0
October	64	06/1969	16	09/1959	47.2	2002	35.9	1968	0.0	0.1	7.9	0.0
November	55	04/1957	4	30/1990	43.7	2002	26.0	1955	0.0	4.6	17.6	0.0
December	52	17/1969	-23	14/1964	39.5	1986	19.0	1964	0.0	8.3	21.6	0.3
Annual	81	19570808	-23	19641214	44.1	1997	37.8	1956	0.0	32.9	126.8	1.1
Winter	59	19950205	-23	19641214	37.9	1987	20.7	1969	0.0	25.1	66.1	0.9
Spring	73	19690524	-13	19560303	42.1	1993	35.2	1956	0.0	3.1	34.6	0.2
Summer	81	19570808	34	19560605	59.0	2004	52.3	1956	0.0	0.0	0.0	0.0

	Daily Extremes				Monthly Extremes				Max. Temp.		Min. Temp.	
Fall	71	19600901	4	19901130	47.4	2002	37.3	1955	0.0	4.7	26.1	0.0

Source: Western Regional Climate Center, wrcc@dri.edu

Heavy Snow

Heavy snow, generally more than 12 inches of accumulation in less than 24 hours, can immobilize the community by bringing transportation to a halt. Until the snow can be removed, the airport and the one highway out of town Copper River Highway 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.

High Winds

Another major weather factor in the community is high winds. The wind chill factor can bring temperatures down to -50°F, which can lead to frozen pipes and dangerous conditions for outdoor activities. While most home and business owners are prepared for the heavy winds and low temperatures, construction practices must be followed to protect against the high winds.

Previous Occurrences of Severe Weather

Hazard Mitigation Cold Weather, 1990. The Presidential Declaration of Major Disaster for the Omega Block cold spell of January and February 1989 authorized federal funds for mitigation of cold weather damage in future events. The Governor's declaration of disaster provided the State matching funds required for obtaining and using this federal money.

Severe Weather Hazard Vulnerability

The entire community is obviously vulnerable to severe weather. The citizens of Cordova are vulnerable to bitter cold weather, heavy snowfall and high winds. Alaskans are known for self-efficiency and hardy behavior in the face of often inclement weather. Citizens who do not live on the road system must be able to survive without outside assistance several times throughout most winters.

Please see the tables at the beginning of this chapter, which illustrate the city structures, infrastructure, and transportation systems, which are vulnerable.

Severe Weather Mitigation Goals and Projects

Severe Weather Goals and Projects

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

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

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

Projects

- 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: www.nws.noaa.gov/stormready

- Conduct special awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, etc.

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

- Encourage weather resistant building construction materials and practices.

Section 3. 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 fire whirls 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.

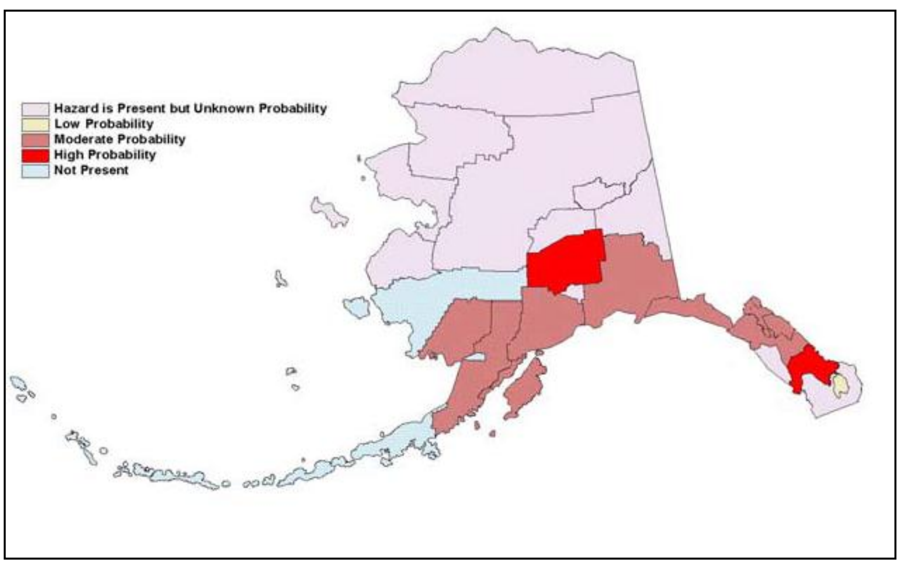
Wildland fire risk is increasing in Alaska due to the spruce bark beetle infestation. The beetles lay eggs under the bark of a tree. When the larvae emerge, they eat the tree's phloem, which is what the tree uses to transport nutrients from its roots to its needles. If enough phloem is lost, the tree will die. The dead trees dry out and become highly flammable.

Local Wildland Fire Hazard Identification

Though Cordova has a moderate probability of occurrence, it is listed as a critical protection area by the Alaska Interagency Fire Management Plan. Please see map and explanation on the following pages.

The following map from the Alaska State Hazard Plan depicts Cordova as being in a moderate probability area of the state.

Figure 2. Alaska Hazard Plan - Fire Risk Map



Cordova is located in a full protection area of the state protection option areas. Full protection is suppression action provided on a wildland fire that threatens uninhabited private property, high-valued natural resource areas, and other high-valued areas such as identified cultural and historical sites. The suppression objective is to control the fire at the smallest acreage reasonably possible. The allocation of suppression resources to fires receiving the full protection option is second in priority only to fires threatening a critical protection area.

Wildland Fire Hazard Vulnerability

Please see Hazard Vulnerability Assessment Matrix and description at the beginning of this chapter.

Previous Occurrences of Wildland Fire

Even though the Alaska State Hazard Plan, 2007 lists Cordova as having a moderate chance of wildland fire there have be no recorded incidents of serious wildland fire in Cordova.

Wildland Fire Mitigation Goals and Projects

Wildland Fire Goals and Projects

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

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

Goal 3: Encourage the evaluation of emergency plans with respect to wildland fire assessment.

Goal 4: Acquire information on the danger of wildland fires and how best to prepare.

Projects

- Continue to support the fire department with adequate firefighting equipment and training.

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

  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).

- Continue to enforce building codes and requirements for new construction.

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

Section 4. Earthquake

Hazard Description and Characterization

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

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

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

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

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

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

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

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

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

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

Local Earthquake Hazard Identification

Prince William Sound is backed by the Chugach Mountains in its central and eastern portions, and by the Kenai Mountains at its western edge. The highest sections of the Kenai-Chugach Range consist of extremely rugged northeast trending ridges from 7,000 to 13,000 feet high. The lower sections consist of massive mountains five to ten miles wide and between 3,000 to 6,000 feet **in** height. All higher parts of the range are buried in ice fields that feed massive valley and piedmont glaciers. The coastline is deeply indented by drowned glacial valleys and there are numerous islands, particularly in the more westerly portions of the Sound. Like the mountain ridges, the major fjords and islands also trend in a northeasterly direction.

The March 1964 earthquake wrought major changes in the physical landscape of the Cordova area. Little structural damage occurred in town and the only fatality occurred at Point Whitshed. However, the tectonic uplift which took place in the Cordova area had a much greater impact upon this community than structural damage had upon some other communities in Southcentral Alaska. Uplifts of 6.5 to 7.5 feet were recorded on the tide gauges at Cordova. Extensive coastal tracts of mud flats, beaches, and reefs throughout the area that were formerly exposed only at lowest minus tides became permanently exposed.

In the immediate Cordova area, the effects of tectonic uplift were described by the U.S. Geological Survey as follows:

"At Cordova, all dock facilities were raised so high that they could be reached by boats only at highest tides. Several nearby canneries had to extend their docks more than 100 feet to permit access. The area in the vicinity of the city dock and the small boat basin was above water at most tides; an extensive and difficult dredging project, together with new breakwaters and dock repairs, was necessary to make the facilities usable. In the course of this work, which was done by the Corps of Engineers, the boat basin was much enlarged, and about 20 acres of new land, eventually usable for industrial purposes, was made from the material dredged from the boat basin. It was also necessary for the Corps of Engineers to dredge a new channel through almost the entire length of Orca Inlet for use by fishermen."

Cordova was once referred to as the clam processing capital of the world. The earthquake effectively eliminated that very important local industry.

In practical terms, the earthquake also ended Cordova's capacity to serve as a deep-water port. This had rather significant economic implications for the community. Cordova has considered several options and has been discussing the possibility of re-establishing itself as a deep water port, however, to date, no decisions have been made on this issue. (*Draft 2006 Cordova Comprehensive Plan*)
The following tables were obtained from the University of Alaska, Fairbanks, and Alaska Earthquake Information Center website at: http://www.giseis.alaska.edu/Seis/

Figure 3. AEIS Earthquake Active Faults

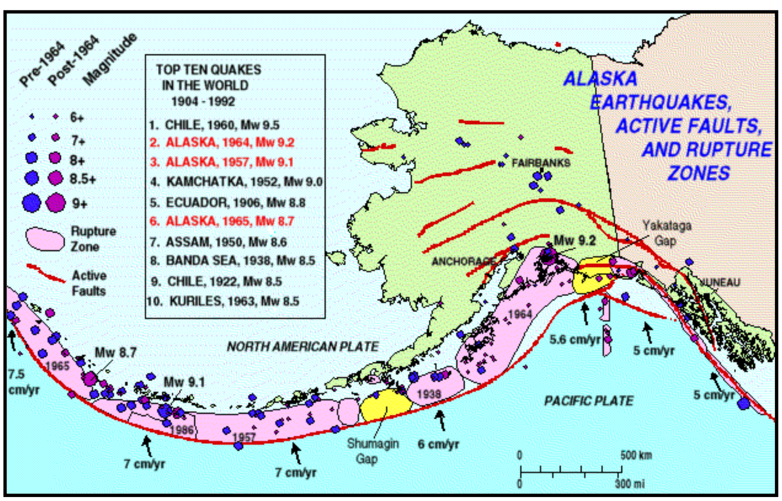
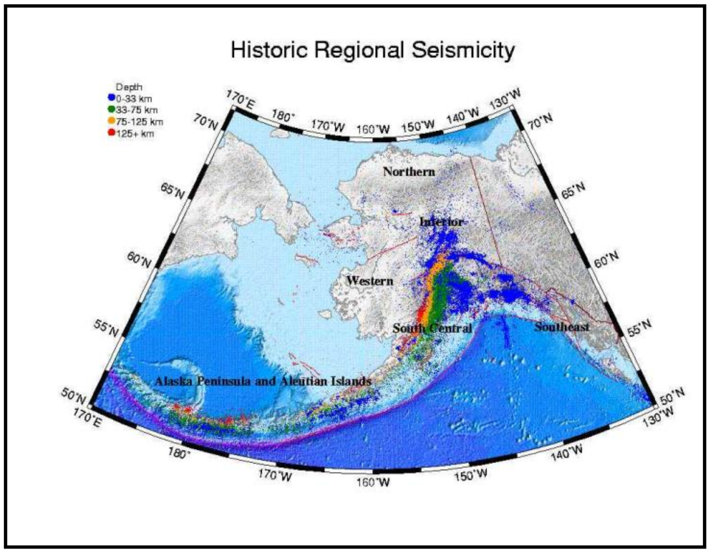


Figure 4. AEIS Historic Regional Seismicity



Previous Occurrence of Earthquakes

Please the above hazard identification regarding the 1964 earthquake.

Earthquake Hazard Vulnerability

Please see Hazard Vulnerability Assessment Matrix and description at the beginning of this chapter.

Earthquake Mitigation Goals and Projects

Goal

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

Projects

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

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

- Contract a structural engineering firm to assess the identified buildings and facilities to determine their structural integrity and strategy to improve their earthquake resistance.

Section 5. Tsunami and Seiche Hazard

Hazard Description and Characterization

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

Tsunami damage is a direct result of three factors:

1. *Inundation* (the extent to which the water covers the land)
2. *Wave action* that will impact structures and moving objects that become projectiles.
3. *Coastal erosion*

A ***seiche*** is a wave that oscillates in partially or totally enclosed bodies of water. They can last from a few minutes to a few hours as a result of an earthquake, underwater landslide, atmospheric disturbance or avalanche. The resulting effect is similar to bathtub water sloshing repeatedly from side to side. The reverberating water continually causes damage until the activity subsides. The factors for effective warning are similar to a local tsunami, in that the onset of the first wave can be a few minutes, giving virtually no time for warning.

Types of Tsunamis

Tsunamis are categorized in one of two ways:

- Distant-source tsunamis
- Locally generated tsunamis

This distinction is made based on the time it takes the tsunami to leave the source disturbance and reach land.

A ***distant-source tsunami*** (Tele-tsunami) is the term for a tsunami observed at places 600 miles or more from their source of origin. Distant tsunamis are more likely to occur in the Pacific Ocean and are capable of traveling across the entire ocean in less than one day. Since distant-source tsunami make such long trips with a relatively constant speed, experts can predict their arrival with a fair degree of accuracy. This allows time for warnings and evacuation.

A ***locally generated tsunami*** is a term for a tsunami that is generated near the coast, thus the first waves may reach the shore within minutes of the event. This gives little or no time for warning or evacuation.

Previous Occurrences of Tsunamis/Seiches

1964 Earthquake Tsunami

The 1964 earthquake triggered several tsunamis, one major tectonic tsunami and about 20 local submarine and subaerial landslide tsunamis. The major tsunami hit between 20 and 45 minutes after the earthquake. The locally generated tsunamis struck between two and five minutes after being created and caused most of the deaths and damage. Tsunamis caused more than 90% of the deaths – 106 Alaskans and 16 Californian and Oregonian residents were killed.

While there was tsunami damage throughout the area, the effects were most significant in Kodiak, Seward, Whittier, Chenga and Valdez. There was a small wave run up from a tsunami at Cordova, but it did not cause any damage.

No other reports of tsunami occurrences in Cordova.

Tsunami/Seiche Hazard Assessment

Hazard Analysis/Characterization

Tsunamis are traveling gravity waves in water, generated by a sudden vertical displacement of the water surface. They are typically generated by an uplift or drop in the ocean floor, seismic activity, volcanic activity, meteor impact, or landslides (above or under sea in origin).

Most tsunamis are small and are only detected by instruments. Tsunami damage is a direct result of three factors: inundation (extent the water goes over the land), wave impact on structures and coastal erosion.

<u>Types of Tsunamis in Alaska</u>

Tele-tsunami is the term for a tsunami observed at places 1,000 kilometers from their source. In many cases, tele-tsunamis can allow for sufficient warning time and evacuation. No part of Alaska is expected to have significant damage due to a tele-tsunami.

Volcanic tsunamis

There has been at least 1 confirmed volcanically triggered tsunami in Alaska. In 1883, a debris flow from the Saint Augustine volcano triggered a tsunami that inundated Port Graham with waves 30 feet high. Other volcanic events may have caused tsunamis but there is not enough evidence to report that conclusively. Many volcanoes have the potential to generate tsunamis.

Types and Extent of Tsunamis in Cordova

> The following is from Map 5 Cordova, Alaska Tsunami Hazard Zones, (in the appendix) produced by the State of Alaska, Division of Emergency Services.

Local Tsunami

These are waves that are generated from nearby waters and could reach the community before a warning is issued. Local tsunamis are normally caused by a strong earthquake whose epicenter is located a short distance away. Such an earthquake can trigger massive landslides or changes in the underwater terrain that will create large waves in the immediate area. Historically such waves have been the highest, reaching heights of 100 feet or more and up to one-mile inland. Cordova is considered to have a local tsunami hazard.

Map 4 illustrates, for the public, blue shaded areas that are below the 100-foot approximate elevation level or less than one-mile inland. Table 10 marks critical facilities that are located within the tsunami hazard zone as shown on the map.

Distant Source Tsunami

This is a tsunami that is generated so far away that the earthquake was either not felt or only slightly felt. The waves from a distant source tsunami are generally smaller than those created by a local tsunami. There will normally be sufficient time for officials to issue a warning and alter (you) to possible danger. Cordova is considered to have a moderate potential danger form a distant source tsunami. This means that a wave of 35 feet with water reaching up to ¼ mile inland is possible.

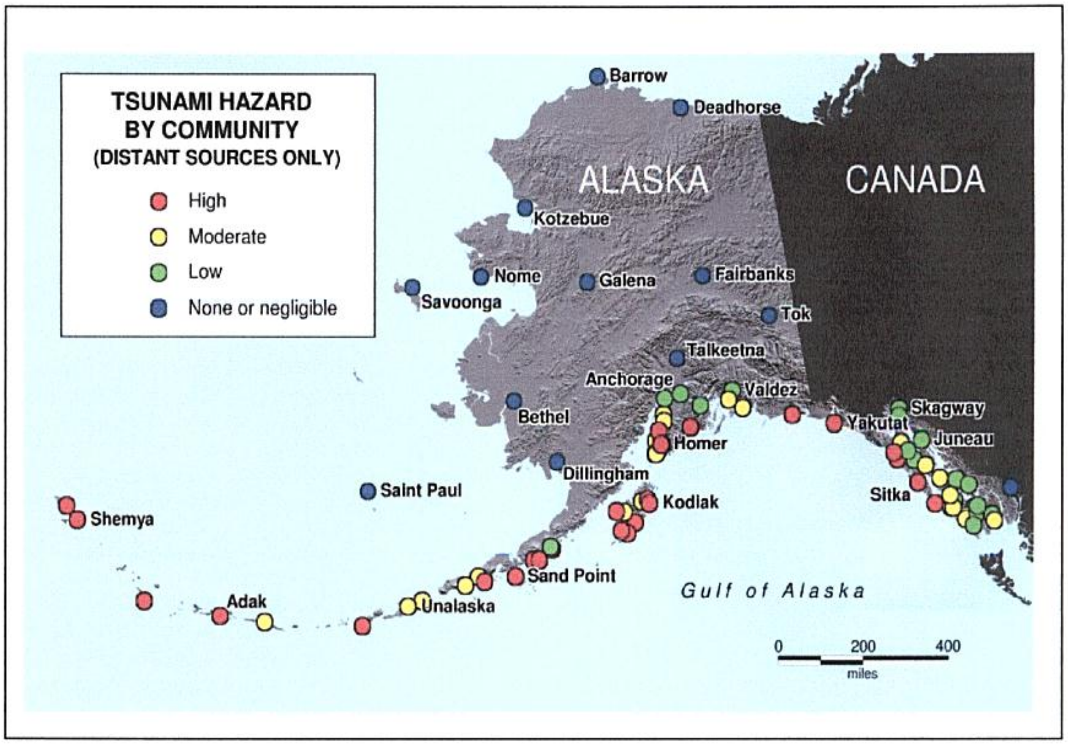
Extent or Severity of Tsunami Hazard in Cordova

The State of Alaska DHS&EM designates Cordova as having an extent or possible severity of *limited* damage from a tsunami. Table 10 at the beginning of this chapter marks critical facilities that are located within the tsunami hazard zone, or within one mile of the shoreline and below 100 feet in elevation.

Port and harbor facilities, public works facilities, structures, vehicles, equipment, and transportation facilities such as docks, float systems, and roads could all be affected.

Environment that could be affected include wetlands with inclusive flora and fauna, and coastal vegetation.

Figure 5. Tsunami Hazard by Community



Source: Alaska State Hazard Mitigation Plan, 2007

Vulnerability Assessment

Please see matrices at the beginning of this chapter, which outlines that there are quite a few structures and infrastructure vulnerable to tsunami damage. Table 8 at the beginning of this chapter from the Alaska State Hazard Plan designates Cordova has having a

In Cordova, the most serious threat is from a locally generated tsunami/seiche originating in the Gulf of Alaska and the nearshore water bodies. These waves have reached heights of 170 feet. Because they are generated immediately offshore, they may strike the coast before a warning could be issued.

Vulnerability: Currently, all coastal areas below 100 ft. elevation and/or within one mile of the waters edge. More current tsunami inundation mapping may lead to a revision of vulnerable areas.

Property That May Be Affected: Port and harbor facilities, public works facilities, structures, vehicles, equipment, and transportation facilities such as docks, float systems, and roads. Critical facilities marked on Table 10.

Environment That May Be Affected: Wetlands with inclusive flora and fauna, coastal vegetation.

Unusual Conditions: Multiple fish processing facilities including but not limited to the following hazardous materials: Ammonia, Freon, Crude Oil, etc.

Tsunami/Seiche Mitigation Goals and Projects:

Goals

Goal 1. Increased Public Education about Tsunamis and Seiches.

Goal 2. Tsunami Ready Community Designation.

Goal 3. Develop accurate inundation maps for the Port of Cordova.

Goal 4. Update Cordova Emergency Operations Plan.

Projects

- Participation in the Tsunami Awareness Program.

Residents and visitors will be educated about the threat of tsunamis to the City of Cordova, as well as being informed about tsunami evacuation areas, routes and safe areas. Community members will be encouraged to develop a Family Disaster Plan and an Emergency Survival Kit for their home and vehicles.

- Tsunami Ready Community Designation

Participate in the NWS/WC&ATWC Tsunami Ready Program. The City of Cordova could participate in the "Tsunami Ready Certification". The Tsunami Ready Community program promotes tsunami hazard preparedness as an active collaboration among Federal, State, and local emergency management agencies, the public, and the NWS tsunami warning system. This collaboration supports better and more consistent tsunami awareness and mitigation efforts among communities at risk. The main goal is improvement of public safety during tsunami emergencies.

- Inundation Mapping

Obtain tsunami inundation maps for Cordova. Without these maps, communities must rely on historical or estimated information for land use and evacuation route planning. Inundation maps will provide more accurate and precise information. Our goal is to ensure that emergency management has the most up to date and accurate information needed for planning and zoning.

- Use the Emergency Operations Plan in exercises regarding natural hazards including tsunami danger.

Section 6. Avalanche and Landslides

Hazard Description and Characterization

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.

A snow avalanche is a swift, downhill-moving snow mass. The amount of damage is related to the type of avalanche, the composition and consistency of the material in the avalanche, the force and velocity of the flow, and the avalanche path.

Avalanche Types

There are two main types of snow avalanches; loose snow and slab. Other types that occur in Alaska include: cornice collapse, ice, and slush avalanches.

Loose Snow Avalanches

Loose snow avalanches, sometimes called point releases, generally occur when a small amount of uncohesive snow slips and causes more uncohesive snow to go downhill. They occur frequently as small local cold dry 'sluffs', which remove excess snow (involving just the upper layers of snow) keeping the slopes relatively safe.

They can be large and destructive, though. For example, wet loose snow avalanches occur in the spring are very damaging. Loose snow avalanches can also trigger slab avalanches. Loose snow avalanches typically occur on slopes above 35 degrees, leaving behind an inverted V-shaped scar. They are often caused by snow overloading (common during or just after a snowstorm), vibration, or warming (triggered by rain, rising temperatures or solar radiation).

Slab Avalanches

Slab avalanches are the most dangerous types of avalanches. They happen when a mass of cohesive snow breaks away and travels down the mountainside. As it moves, the slab breaks up into smaller cohesive blocks. Slab avalanches usually require the presence of structural weaknesses within interfacing layers of the snow pack. The weakness exists when a relatively strong, cohesive snow layer overlies weaker snow or is not well bonded to the underlying layer. The weaknesses are caused by changes in the thickness and type of snow covers due to changes in temperature or multiple snowfalls. The interface fails for several reasons. It can fail naturally by earthquakes, blizzards, temperature changes or other seismic and climatic causes, or artificially by human activity.

When a slab is released, it accelerates, gaining speed and mass as it travels downhill. The slab is defined by fractures. The uppermost fracture delineating the top line of the slab is termed the “crown surface”, the area above that is called the crown. The slab sides are called the flanks. The lower fracture indicating the base of the slab is called the “stauchwall”. The surface the slab slides over is called the “bed surface”. Slabs can range in thickness from less than an inch to 35 feet or greater.

Cornice Collapse

A cornice is an overhanging snow mass formed when by wind blowing snow over a ridge crest or the sides of a gulley. The cornice can break off and trigger bigger snow avalanches when it hits the wind-loaded snow pillow.

Ice Fall Avalanche

Ice fall avalanches result from the sudden fall of broken glacier ice down a steep slope. They can be unpredictable as it is hard to know when ice falls are imminent. Despite what some people think, they are unrelated to temperature, time of day or other typical avalanche factors.

Slush Avalanches

Slush avalanches occur mostly in high latitudes such as in the Brooks Range. They have also occurred in the mountain areas of Alaska's Seward Peninsula and occasionally in the Talkeetna Mountains near Anchorage. Part of the reason they are more common in high-latitudes is because of the rapid onset of snowmelt in the spring. Slush avalanches can start on slopes from 5 to 40 degrees but usually not above 25 to 30. The snow pack is totally or partially water saturated. The release is associated with a
bed surface that is nearly impermeable to water. It is also commonly associated with heavy rainfall or sudden intense snowmelt. Additionally, depth hoar is usually present at the base of the snow cover.

Slush avalanches can travel slowly or reach speeds over 40 miles per hour. Their depth is variable as well, ranging from 1 foot to over 50 feet deep.

Avalanche Terrain Factors

There are several factors that influence avalanche conditions, with the main ones being slope angle, slope aspect and terrain roughness. Other factors include slope shape, vegetation cover, elevation, and path history. Avalanches usually occur on slopes above 25 degrees. Below 25º, there usually is not enough stress on the snow pack to get it to slide. Above 60º, the snow tends to ‘sluff’ off and does not have the opportunity to accumulate. Avalanches can occur outside this slope angle range, but are not as common. Slope aspect, also termed orientation, describes the direction a slope faces with respect to the wind and sun. Leeward slopes loaded by wind-transported snow are problematic because the wind-deposited snow increases the stress and enhances slab formation.

Intense direct sunlight, primarily during the spring months, can weaken and lubricate the bonds between the snow grains, weakening the snow pack. Shaded slopes are potentially more unstable because the weak layers are held for a longer time in an unstable state.

Terrain influences snow avalanches because trees, rocks, and general roughness act as anchors, holding snow in place. However, once an anchor is buried by snow, it loses its effectiveness. Anchors make avalanches less likely but do not prevent them unless the anchors are so close together that a person could not travel between them.

Avalanche Path

The local terrain features determine an avalanche's path. The path has three parts: the starting zone, the track, and the run-out zone.

The starting zone is where the snow breaks loose and starts sliding. It's generally near the top of a canyon, bowl, ridge, etc., with steep slopes between 25 and 50 degrees. Snowfall is usually significant in this area.

The track is the actual path followed by an avalanche. The track has milder slopes, between 15 and 30 degrees, but this is where the snow avalanche will reach maximum velocity and mass. Tracks can branch, creating successive runs that increase the threat, especially when multiple releases share a run-out zone.

The run-out zone is a flatter area (around 5 to 15 degrees) at the path base where the avalanche slows down, resulting in snow and debris deposition.

The impact pressure determines the amount of damage caused by a snow avalanche. The impact pressure is related to the density, volume (mass) and velocity of the avalanche. (*2004 State Hazard Plan*)

Landslides

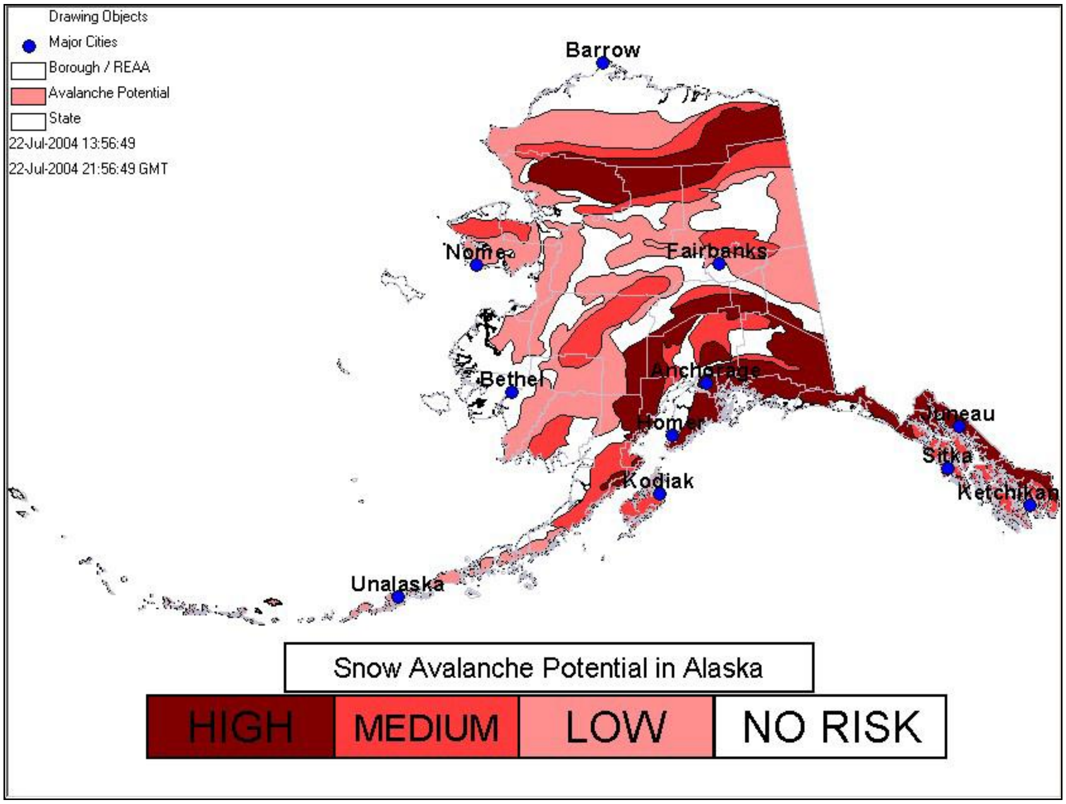
A landslide is a natural event that causes damage when human activities interface with slides areas. Landslides occur naturally when inherent weaknesses in the rock or soil combine with one or more triggering events such as heavy rain, snowmelt, changes in groundwater level, and seismic or volcanic activity. Erosion that removes material from the base of a slope can also cause naturally triggered landslides. Human activities such as road construction, excavation, and mining can also cause landslides.

Landslides are a significant hazard in Cordova because of the climate, topography, and the presence of other hazards such as earthquakes that might increase the likelihood of a landslide. The possibility of additional hazards caused by landslides compounds the hazard; landslides can trigger tsunamis and flash floods.

The Alaska State All Hazards Mitigation Plan identifies the extent to damage from a landslide event as limited. As denoted on Table 10, there are no critical facilities located in known landslide areas.

The following figure depicts that Cordova faces a high avalanche threat.

Figure 6. Snow Avalanche Potential in Alaska



Source: 2004 Alaska State Hazard Plan

Previous Occurrences of Avalanches and Landslides

Alaska has a long history of snow avalanches. It has been estimated that there have been over 4,500 avalanche disaster events in the past 200 years. The Palm Sunday avalanche, April 3, 1898 is considered to be the deadliest event of the Klondike gold rush. The Chilkoot Trail, near Skagway, experienced multiple slides that day, including three with fatalities. The first fatal slide killed three people. The second one killed the entire Chilkoot Railroad and Transportation Company crew who were trying to evacuate an avalanche prone area further up the trail. The third slide occurred in about the same location as the second killing approximately 70 people who were following the trail left by the construction crew. The exact death toll is unknown because of the transient nature of those involved and inefficiencies in the identification process.

Late 1999 and early 2000 saw avalanches in Cordova, Valdez, Anchorage, Whittier, Cooper Landing, Moose Pass, Summit, Matanuska Susitna Valley, and Eklutna from the Central Gulf Coast Storm. The most damaging avalanche occurred in Cordova, near milepost 5.5 of the Copper River Highway and was approximately ½ mile wide. It resulted in one death, at least 10 damaged structures, and about 1 million dollars in damage.

Avalanches had struck in that spot before, including one in 1971. (*2007 State Hazards Plan*)

There have been no reported incidents of landslide occurrences in Cordova.

Avalanche/Landslides Mitigation Goals and Projects

Goals

Goal 1. Reduce Cordova's vulnerability to avalanche and landslide hazards in terms of threat to life and property.

Goal 2. Have comprehensive information regarding avalanche and landslide hazards and unstable soils throughout Cordova's developed area, including areas that will be developed in the future.

Goal 3. Increase public awareness of avalanche and landslide dangers and hazard zones.

Projects

- Prohibit new construction in avalanche zones.

Construction in avalanche zones means bigger losses in the future should an avalanche occur. New construction in hazard zones should be discouraged or prohibited, even if structures are not intended for habitation.

- Utilize appropriate methods of structural avalanche control.

Containment structures, depending on their design, can prevent snow loads from releasing and forming an avalanche, and/or protect structures by diverting or containing avalanche debris. Such structures include snow fences, diversion/containment structures, snow nets, and reforestation.

- Enact buyout of homes in avalanche paths.

A buyout could be implemented to reduce the number of people living in avalanche zones. Update existing structures within avalanche zone to avalanche impact standards. Structures that already exist can be made safer with structural reinforcements.

- Prohibit removal of vegetation in areas prone to landslides.

Removal of vegetation from slopes can compromise the integrity of the soil and lead to landslides. Requests to remove vegetation should be handled through a permit process that involves an assessment of the area for landslide hazard.

- Conduct additional study of unstable soils and avalanche or landslide prone areas.

Specifically those areas that have not yet been studied and might present additional dangers in the form of underwater landslides, or landslides that may cause tsunamis.

- Public disclosure of risk linked to deed or title of property and require owners to notify renters of hazard prior to occupancy.

Many residents, especially renters, are not aware of the locations of landslide zones or the potential dangers inherent in living within them .

- Install warning signage in mapped landslide zones.

- Continue to educate public about avalanche and landslide hazards. Information can be disseminated to the public through the City web site, press releases, media ads, and other methods.

Chapter 4: Mitigation Strategy

Benefit - Cost Review

This chapter of the plan outlines Cordova'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 12, Benefit and Costs Listing, 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 Cordova considered the following factors in prioritizing the mitigation projects. Due to the dollar value associated with both life-safety and critical facilities, the prioritization strategy represents a special emphasis on benefit-cost review because the factors of life-safety and critical facilities steered the prioritization towards projects with likely good benefit-cost ratios.

1. Extent to which benefits are maximized when compared to the costs of the projects, the Benefit Cost Ratio must be 1.0 or greater.

2. Extent the project reduces risk to life-safety.

3. Project protects critical facilities or critical city functionality.

    A. Hazard probability.

    B. Hazard severity.

Other criteria that was used to developing the benefits – costs listing depicted in Table 12:

1. Vulnerability before and after Mitigation

Number of people affected by the hazard, areawide, 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)

1. 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

2. Costs

Construction cost
Programming cost
Long time frame to implement
Public or political opposition
Adverse environmental effects

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

The Cordova Planning Commission will hold another round of public meetings on the LHMP Update. The plan is subject to final Cordova City Council approval after pre-approval is obtained by DHS&EM.

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

A description of the BCA process follows, briefly, BCA is the method by which the future benefits of a mitigation project are determined and compared to its cost. The result is a Benefit-Cost Ratio, 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 Benefit –Cost Analysis. The complete guidelines document, a benefit-cost analysis document and benefit-cost analysis technical assistance is available online http://www.fema.gov/government/grant/bca.

Facilitating BCA

Although the preparation of a BCA is a technical process, FEMA has developed software, written materials, and training that simplifies 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.

HAZARD EVENT (Frequency & Severity)	**X**	PROPERTY EXPOSED TO THE HAZARD	**=**	HAZARD RISK Dollars ($$)
Probability of Damaging Hazard Events		Value & Vulnerability of Property Exposed to the Hazard		Severity of the Hazard Threat to the Built Environment

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.

Benefit – Costs Review Listing Table

Table 15. Benefit Cost Review Listing

* Priorities:	High = Clearly 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.
** PDMG	Pre-Disaster Mitigation Grant
*** HMGP	Hazard Mitigation Grant Program
****FMA	Flood Mitigation Assistance (Program)

Mitigation Projects	Benefits (pros)	Costs (cons)	High
Flood/Erosion (FLD)			
FLD-1. Construct a 2.75 mile long dike between the Scott and Eyak Rivers	Life/Safety issue Potential PDMG**	Dollar cost unknown >$1 million Engineering study needed. Funding source not identified 5 + years implementation	Low
FLD-2. Six-Mile Subdivision Drainage System	Benefit to Six-Mile Subd. Property Damage Reduction Could be started within 1 year. Relatively inexpensive, $10,000	Engineering Needed	High
FLD-3. Alternative Water Source to Six Mile Subdivision	PDMG** Funding Possible Benefit to entire community	Expensive >$3.5 million 5+ years to implement	Low
FLD-4. Letter of Map Revision for Flood Insurance Rate Maps	No direct cost Benefit to city and private properties within floodplain.	Staff time	High
FLD-5. Design and Construct Flood proofing for Hospital	Damage Reduction PDMG**, HMGP*** Benefit to public institution	0 – 1 years	High
FLD-6. Heney Creek Waterline Repair	Repair to waterline during flooding event. HMGP*** Benefit to entire community	>$75,000 1 – 5 year	Medium

Mitigation Projects	Benefits (pros)	Costs (cons)	High
FLD-7. Heney Creek Waterline Replacement	Life/safety issue Benefit to entire community Reduction in property damage	Engineering needed. >$1.5 million >5 years	Low
FLD-8. Power Creek Hydrofacility Repair and/or Replacement	Life/safety issue Benefit to entire community Reduction in property damage	Engineering needed >$1.5 million >5+ years	Low
FLD-9. Identify Drainage Patterns and Develop a Comprehensive Drainage System	Benefit to entire community Property damage reduction	Engineering study needed >$50,000 1 – 5 years	Medium
FLD-10. Structure Elevation and/or Relocation	Life/Safety project Benefit to government facilities and private properties. Potential PDMG**, HMGP***, FMA****	Dollar cost unknown, >$50k 1 – 5 year implementation	Medium
FLD-11. Updated FIRM Cordova Maps	FEMA, PDMG**, HMGP*** and State DCRA funding available. USCOE facilitated project. Can be started immediately.	Expensive, at least $100,000	High
FLD-12. Public Education	DCRA funding may be available. Could be done yearly. Inexpensive <$1,000City	Not clear if there would be community interest or participation.	Medium
FLD 13. Install upgraded streamflow and rainfall measuring gauges	Life/Safety project Benefit to government facilities and private properties. Potential PDMG**, HMGP***, FMA****	Dollar cost unknown, >$50k 1 – 5 year implementation	Medium
FLD 14. Apply for grants/funds to implement riverbank protection methods.	Life/Safety project Benefit to government facilities and private properties. Potential PDMG**, HMGP***, FMA****	Dollar cost unknown, >$50k 1 – 5 year implementation	Medium
FLD 15. Pursue obtaining a CRS rating to lower flood insurance rates.	High capability by city to do on an annual basis Will reduce NFIP insurance for entire community. <$1,000/year	Staff time.	High

Mitigation Projects	Benefits (pros)	Costs (cons)	High
FLD 16. Continue to obtain flood insurance for all City structures, and continue compliance with NFIP.	High capability by city to do on an annual basis. Public benefit to have public buildings insured through NFIP. Inexpensive, approx.$3,000/year.	Staff time	High
FLD 17. Require that all new structures be constructed according to NFIP requirements and set back from the river shoreline to lessen future erosion concerns and costs.	High capability by city to do on an annual basis. Public benefit to have public buildings insured through NFIP. Inexpensive, approx.$3,000/year.	Staff time	High
FLD 18. Map the Six-Mile Subdivision as FIRM Maps	FEMA, PDMG**, HMGP*** and State DCRA funding available. USCOE facilitated project. Can be started immediately.	Expensive, at least $100,000	High
Severe Weather (SW)			
SW-1. Research and consider instituting the National Weather Service program of *"Storm Ready"*.	Life/Safety issue Risk reduction Benefit to entire community Inexpensive State assistance available Could be implemented annually	Staff time	High
SW-2. Conduct special awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, etc.	Life/Safety issue Risk reduction Benefit to entire community Inexpensive State assistance available Could be an annual event	Staff time	High
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

Mitigation Projects	Benefits (pros)	Costs (cons)	High
SW-4. Encourage weather resistant building construction materials and practices.	Risk and damage reduction. Benefit to entire community.	Would require ordinance change. Potential for increased staff time. Research into feasibility necessary. Political and public support not determined. 1 – 5 year implementation	Medium
Wildland Fire (WF)			
WF-1. Continue to support the local fire department with adequate firefighting equipment and training.	Life/Safety issue Risk reduction Benefit to entire community State assistance available Annual project.	Dollar cost not determined. Staff time to research grants	High
Project WF-2. 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-3: Continue to enforce development of building codes and requirements for new construction.	Life/Safety issue Risk reduction Benefit to entire community Inexpensive State assistance available Could be implemented annually	Staff time	High
WF-4: Enhance public awareness of potential risk to life and personal property. Encourage mitigation measures in the immediate vicinity of their property.	Life/Safety issue Risk reduction Benefit to entire community Inexpensive State assistance available Could be implemented annually	Staff time	High
Earthquake (E)			
E-1. If funding is available, perform an engineering assessment of the earthquake vulnerability of each identified critical infrastructure owned by the City of Cordova.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available Could be an annual event	Staff time	High

Mitigation Projects	Benefits (pros)	Costs (cons)	High
E-2. Identify buildings and facilities that must be able to remain operable during and following an earthquake event.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available Could be an annual event	Staff time	High
E-3. Contract a structural engineering firm to assess the identified bldgs and facilities.	Benefit to entire community Risk reduction	Feasibility and need analysis needed. 1 – 5 years	Medium
Tsunami/Seiche (T/S)			
Project T/S-1: Participation in the Tsunami Awareness Program.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available Could be an annual event	Staff time	High
Project T/S-2. Tsunami Ready Community Designation	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available Could be an annual event	Staff time	High
Project T/S-3. Inundation Mapping	FEMA, PDMG, HMGP and State DCRA funding available. USCOE facilitated project. 1 – 5 year project.	Expensive, at least $100,000	Medium
Project T/S-4. Update Cordova Emergency Operations Plan	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available 1 – 5 years, or as needed.	Staff time	Medium
Avalanche/Landslide (A/L)			
Project A/L-1. Prohibit new construction in avalanche zones.	Life/Safety issue/Risk reduction Benefit to entire community No direct cost to implement State assistance available 1 – 5 years to adopt ordinance.	Political Support not determined. Private property issues. Staff time.	Medium

Mitigation Projects	Benefits (pros)	Costs (cons)	High
A/L-2. Utilize appropriate methods of structural avalanche control.	Life/Safety issue/Risk reduction Benefit to entire community Federal or State assistance available	Engineering and structural design needed. Dollar cost not determined. Long timeframe to implement,5+ years.	Low
A/L-3. Enact buyout of homes in avalanche paths.	Life/Safety issue/Risk reduction Benefit to entire community PDMG or HMPG projects.	Political Support not determined. Private property issues. Staff time. Expensive, >$100k. Long timeframe 5+ years.	Low
A/L-4. Prohibit removal of vegetation in areas prone to landslides.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available Could be an ongoing project	Staff time	High
Project A/L-5. Public disclosure of risk linked to deed or title of property and require owners to notify renters of hazard prior to occupancy.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available Could be an ongoing project.	Political Support not determined. Private property issues. Staff time.	High
Project A/L-6. Install warning signage in mapped landslide zones.	Life/Safety issue/Risk reduction Benefit to entire community Federal and State assistance available	Mapped landslide zones do not exist at this time. 5+ years to implement	Low
Project A/L-7. Continue to educate public about avalanche and landslide hazards.	Life/Safety issue/Risk reduction Benefit to entire community Inexpensive State assistance available Could be an annual event	Staff time	High

Mitigation Project Plan Table

Table 16. Mitigation Project Plan

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe
Flood/Erosion (FLD)				
FLD-1. Construct a 2.75 mile long dike between the Scott and Eyak Rivers	FEMA USCOE City	>$1 million	PDMG* USCOE	>1 year
FLD-2. Six-Mile Subdivision Drainage System	FEMA	$10,000+	PDMG	<1 year
FLD-3. Alternative Water Source to Six Mile Subdivision	FEMA	$3.5 million	PDMG	>1 year
FLD-4. Letter of Map Revision for Flood Insurance Rate Maps	City DCRA FEMA	Staff Time	City/State Budgets	Ongoing
FLD-5. Design and Construct Flood proofing for Hospital	To be determined			
FLD-6. Heney Creek Waterline Repair	FEMA	>$75,000	PDMG	>1 year
FLD-7. Heney Creek Waterline Replacement	FEMA	>$1.5 million	PDMG	>5 years
FLD-8. Humpback Creek Hydrofacility repair/or replacement	FEMA	$9 million	FEMA DHS&EM	>1 year
FLD-9. Identify Drainage Patterns and Develop a Comprehensive Drainage System	FEMA	N/A	PDMG	>1 year
FLD-10. Structure Elevation and/or Relocation	FEMA DHS&EM	N/A	PDMG	>1 year
FLD-11. Updated FIRM Cordova Maps	FEMA	>$100,000	PDMG	<1 year
FLD-12. Public Education	City DHS&EM	Staff Time	City	Ongoing

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe
FLD 13. Install upgraded streamflow and rainfall measuring gauges	FEMA DHS&EM	$10,000	PDMG	<1 year
FLD 14. Apply for grants/funds to implement riverbank protection methods.	City	Staff Time	PDMG	<1 year
FLD 15. Pursue obtaining a CRS rating to lower flood insurance rates.	City	Staff Time	City	<1 year
FLD 16. Continue to obtain flood insurance for all City structures, and continue compliance with NFIP.	City	$1,500	City	Ongoing
FLD 17. Require that all new structures be constructed according to NFIP requirements and set back from the river shoreline to lessen future erosion concerns and costs.	City	Staff Time	City Budget	Ongoing
FLD 18. Map the Six-Mile Subdivision as FIRM Maps	FEMA USCOE	>$75,000	PDMG	>1 year
Severe Weather (SW)				
SW-1. Research and consider instituting the National Weather Service program of *"Storm Ready"*.	City	Staff Time	City	<1 year
SW-2. Conduct special awareness activities, such as Winter Weather Awareness Week, Flood Awareness Week, etc.	City DCRA DHS&EM	Staff Time	City DCRA DHS&EM	<1 year
SW-3. Expand public awareness about NOAA Weather Radio for continuous weather broadcasts and warning tone alert capability	City	Staff Time	NOAA	Ongoing
SW-4. Encourage weather resistant building construction materials and practices.	City	Staff Time	City	<1 year

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe
Wildland Fire (WF)				
WF-1. Continue to support the local fire department with adequate firefighting equipment and training.	City	Staff Time	City Budget	Ongoing
Project WF-2. Promote Fire Wise building design, siting, and materials for construction.	City	Staff Time	City Budget	Ongoing
WF-3: Continue to enforce development of building codes and requirements for new construction.	City	Staff Time	City Budget	Ongoing
WF-4: Enhance public awareness of potential risk to life and personal property. Encourage mitigation measures in the immediate vicinity of their property.	City	Staff Time	City Budget	Ongoing
Earthquake (E)				
E-1. If funding is available, perform an engineering assessment of the earthquake vulnerability of each identified critical infrastructure owned by the City of Cordova.	City DHS&EM	To be determined	State Grants	>1 year
E-2. Identify buildings and facilities that must be able to remain operable during and following an earthquake event.	City DHS&EM DCRA	Staff Time	State Grants	>1 year
E-3. Contract a structural engineering firm to assess the identified bldgs and facilities.	City DHS&EM	>$10,000	PDMG	>5 years
Tsunami/Seiche (T/S)				
Project T/S-1: Participation in the Tsunami Awareness Program.	City DHS&EM	Staff Time	PDMG	>5 years
Project T/S-2. Tsunami Ready Community Designation	City DHS&EM	Staff Time	PDMG	>5 years

Mitigation Projects	Responsible Agency	Cost	Funding Sources	Estimated Timeframe
Project T/S-3. Inundation Mapping	City DHS&EM	>$15,000	PDMG	>5 years
Project T/S-4. Update Cordova Emergency Operations Plan	City DHS&EM	Staff Time	PDMG	Ongoing
Avalanche/Landslide (A/L)				
Project A/L-1. Prohibit new construction in avalanche zones.	City	Staff Time	City Budget	Ongoing
A/L-2. Utilize appropriate methods of structural avalanche control.	FEMA	>$25,000	PDMG	>5 years
A/L-3. Enact buyout of homes in avalanche paths.	FEMA	>$25,000	PDMG	>5 years
A/L-4. Prohibit removal of vegetation in areas prone to landslides.	City	Staff Time	City Budget	Ongoing
Project A/L-5. Public disclosure of risk linked to deed or title of property and require owners to notify renters of hazard prior to occupancy.	City	Staff Time	City Budget	Ongoing
Project A/L-6. Install warning signage in mapped landslide zones.	DHS&EM FEMA City	<$10,000	PDMG	Ongoing
Project A/L-7. Continue to educate public about avalanche and landslide hazards.	City	Staff Time	City Budget	Ongoing

*PDMG = Pre-Disaster Mitigation Grant

Glossary of Terms

A-Zones

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

Acquisition

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

Asset

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

Base Flood

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

Base Flood Elevation (BFE)

The elevation for which there is a one-percent chance in any given year that flood water 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

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

Governing Body

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

Hazard

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

Hazard Event

A specific occurrence of a particular type of hazard.

Hazard Identification

The process of identifying hazards that threaten an area.

Hazard Mitigation

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

Hazard Mitigation Grant Program

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

Hazard Profile

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

Hazard and Vulnerability Analysis

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

Mitigate

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

Mitigation Plan

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

National Flood Insurance

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

One Hundred (100)-Year

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

Planning

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

Repetitive Loss Property

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

Risk

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

Riverine

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

Riverine Flooding

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

Runoff

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

Seiche

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

Seismicity

Describes the likelihood of an area being subject to earthquakes.

State Disaster Declaration

A disaster emergency shall be declared by executive order or proclamation of the Governor upon finding that a disaster has occurred or that the occurrence or the threat of a disaster is imminent. The state of disaster emergency shall continue until the governor finds that the threat or danger has passed or that the disaster has been dealt with to the extent that emergency conditions no longer exist and terminates the state of disaster emergency by executive order or proclamation.

Along with other provisions, this declaration allows the governor to utilize all available resources of the State as reasonably necessary, direct and compel the evacuation of all or part of the population from any stricken or threatened area if necessary, prescribe routes, modes of transportation and destinations in connection with evacuation and control ingress and egress to and from disaster areas. It is required before a Presidential Disaster Declaration can be requested.

Topography

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

Tribal Government

A Federally recognized governing body of an Indian or Alaska native Tribe, band, nation, pueblo, village or community that the Secretary of the Interior acknowledges to exist as an Indian tribe under the Federally Recognized Tribe List Act of 1994, 25 U.S.C. 479a. This does not include Alaska Native corporations, the ownership of which is vested in private individuals.

Tsunami

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

Vulnerability

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

Vulnerability Assessment

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

Watercourse

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

Watershed

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

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5. *Cordova City Code.* Chapter 18.35, Avalanche District. Draft Version, 2000.

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8. *FEMA Benefit-Cost Analysis Website:* http://www.fema.gov/government/grant/bca.

9. 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)

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Web Sites

American Planning Association:	http://www.planning.org
Association of State Floodplain Managers:	http://www.floods.org
Developing the Implementation Strategy:	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

Appendix

List of Maps

Map 1. Cordova Regional Map
Map 2. Cordova Flood Rate Insurance Map
Map 3. Cordova Critical Infrastructure
Map 4. Cordova Regional Critical Infrastructure
Map 5. Tsunami Hazard Zones

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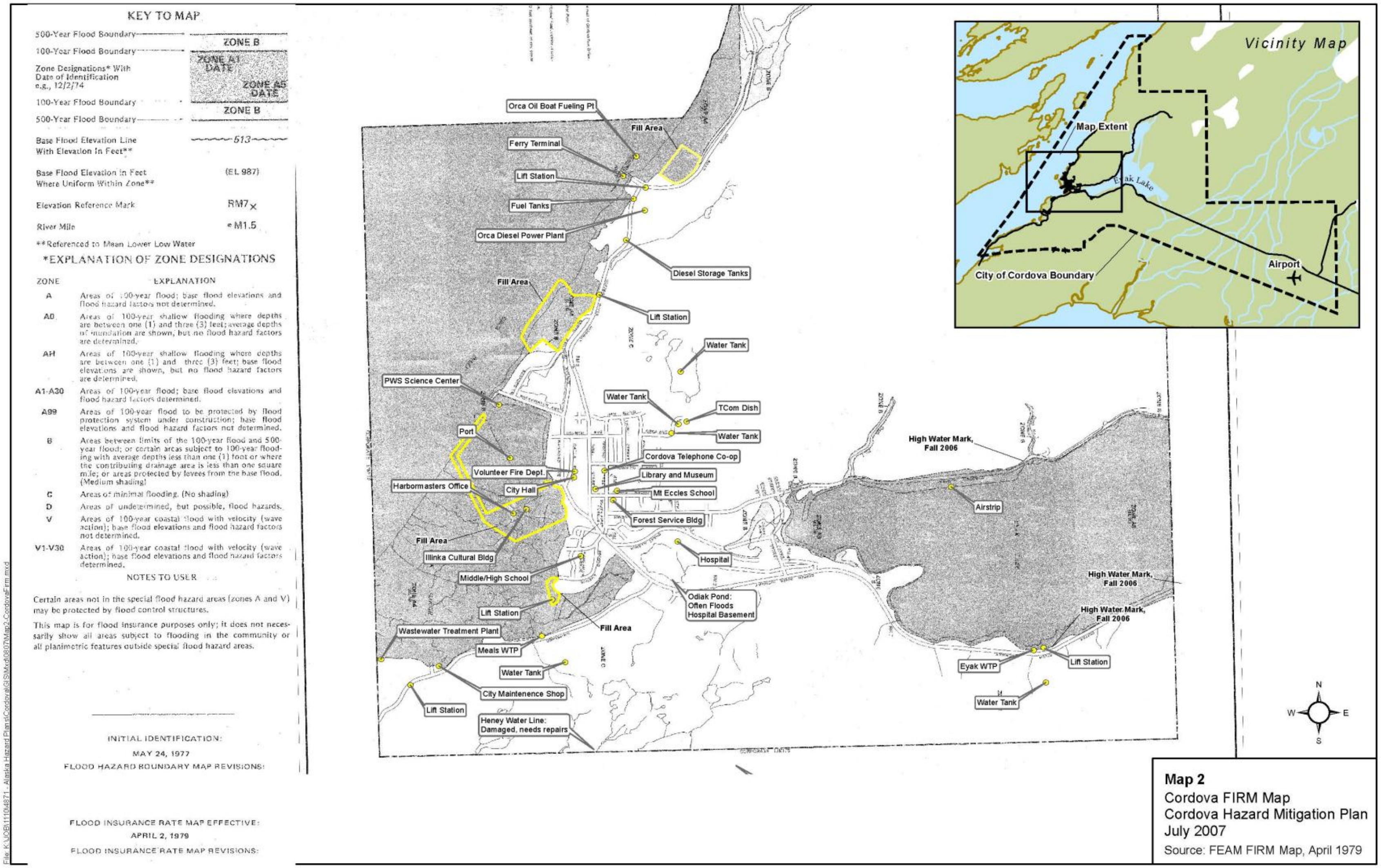
Photos 1. Orca Creek, 11/01/06
Photos 2. Airport and Eyak Lake, 10/31/06
Photos 3. Cordova Flood Pictures, 10/10/06
Photos 4. Cordova Flood Pictures, 10/10/06
Photos 5. Cordova Flood Pictures, 10/10/06
Photos 6. Power Creek, October 2006
Photos 7. Damage to Hydro Plant, 10/31/06

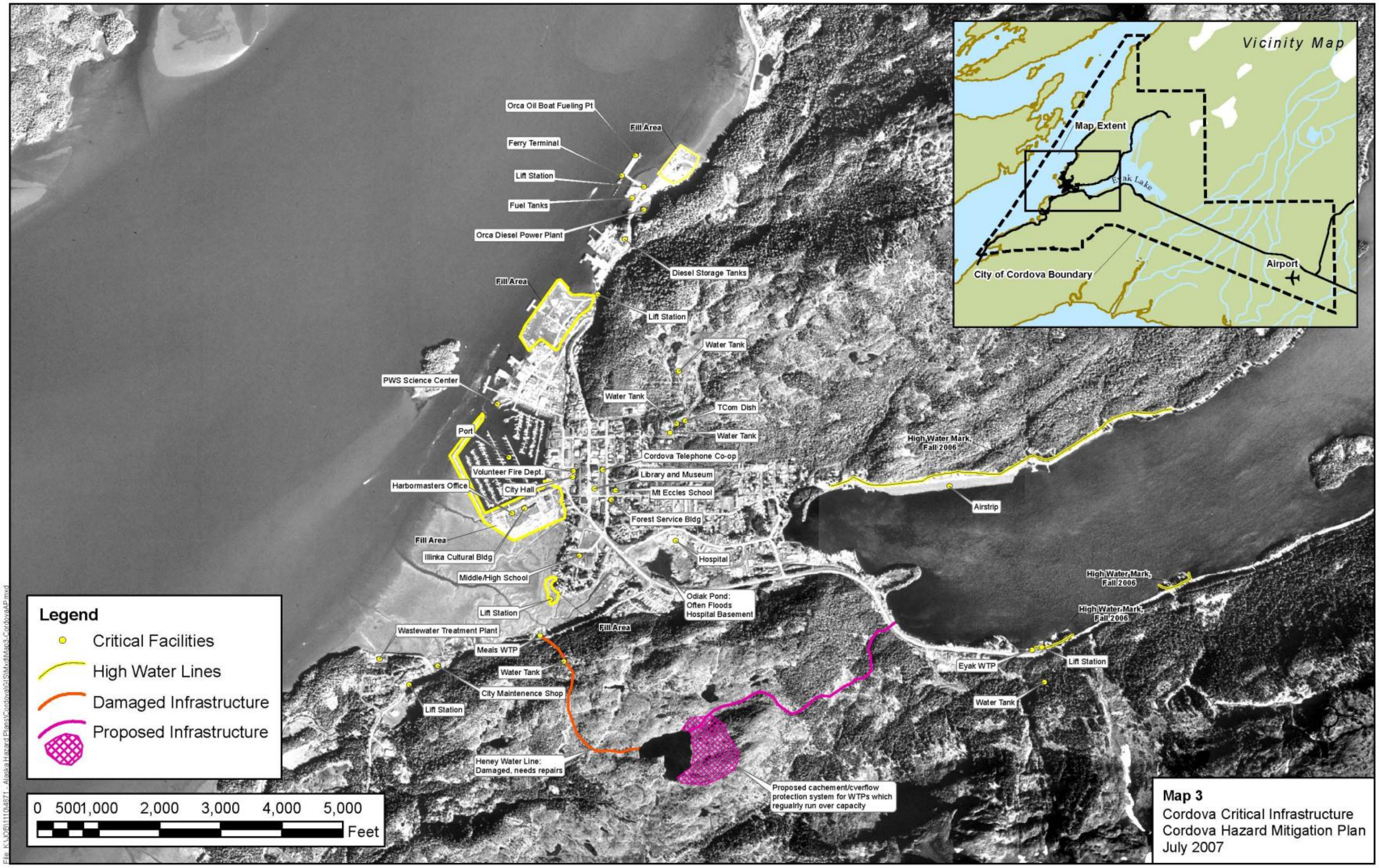
Map 1. Cordova Regional Map

File: K:\JOB\1110\4871 - Alaska Hazard Plans\Cordova\GIS\Mxd\Map1-Regional.mxd

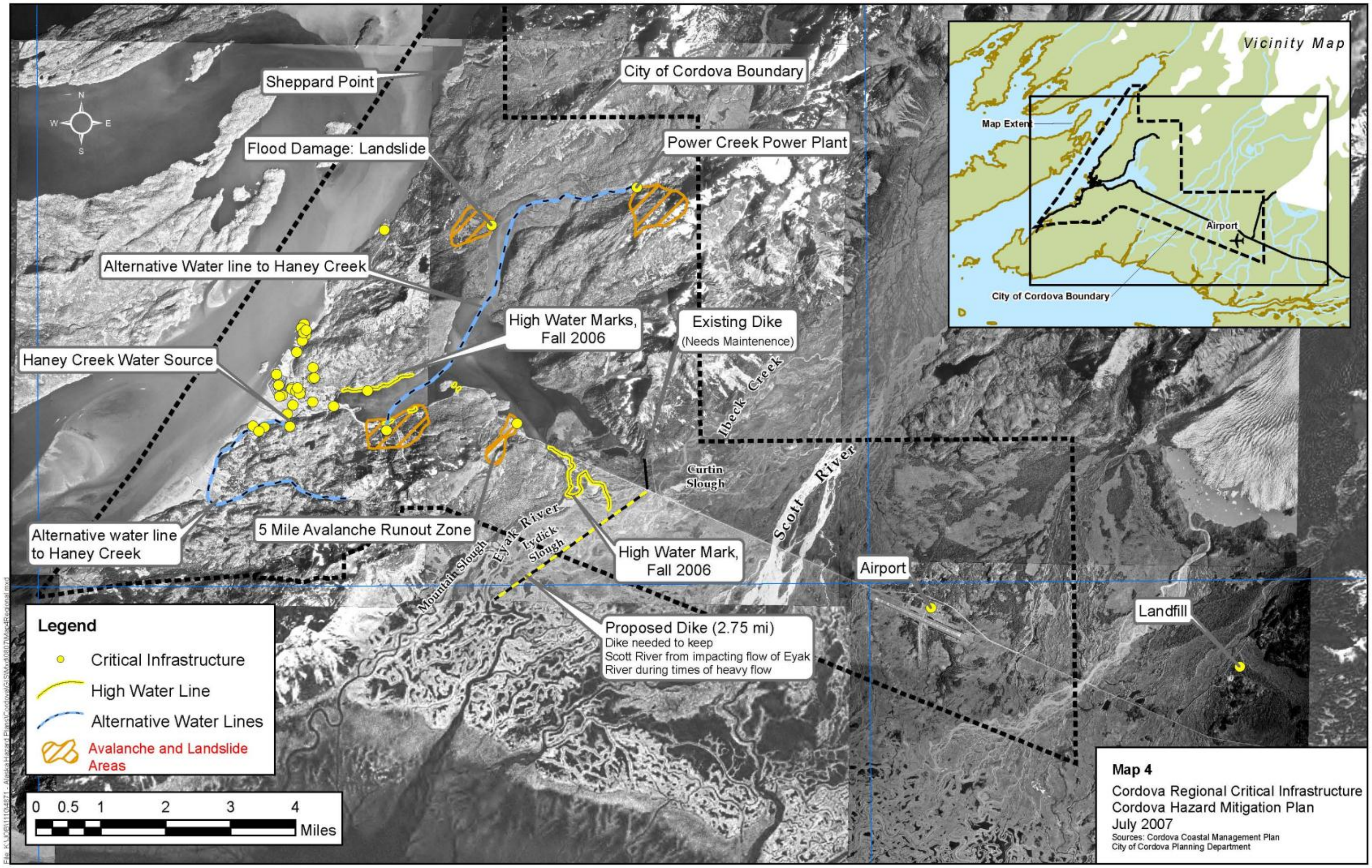
Map 2. Cordova Flood Rate Insurance Map



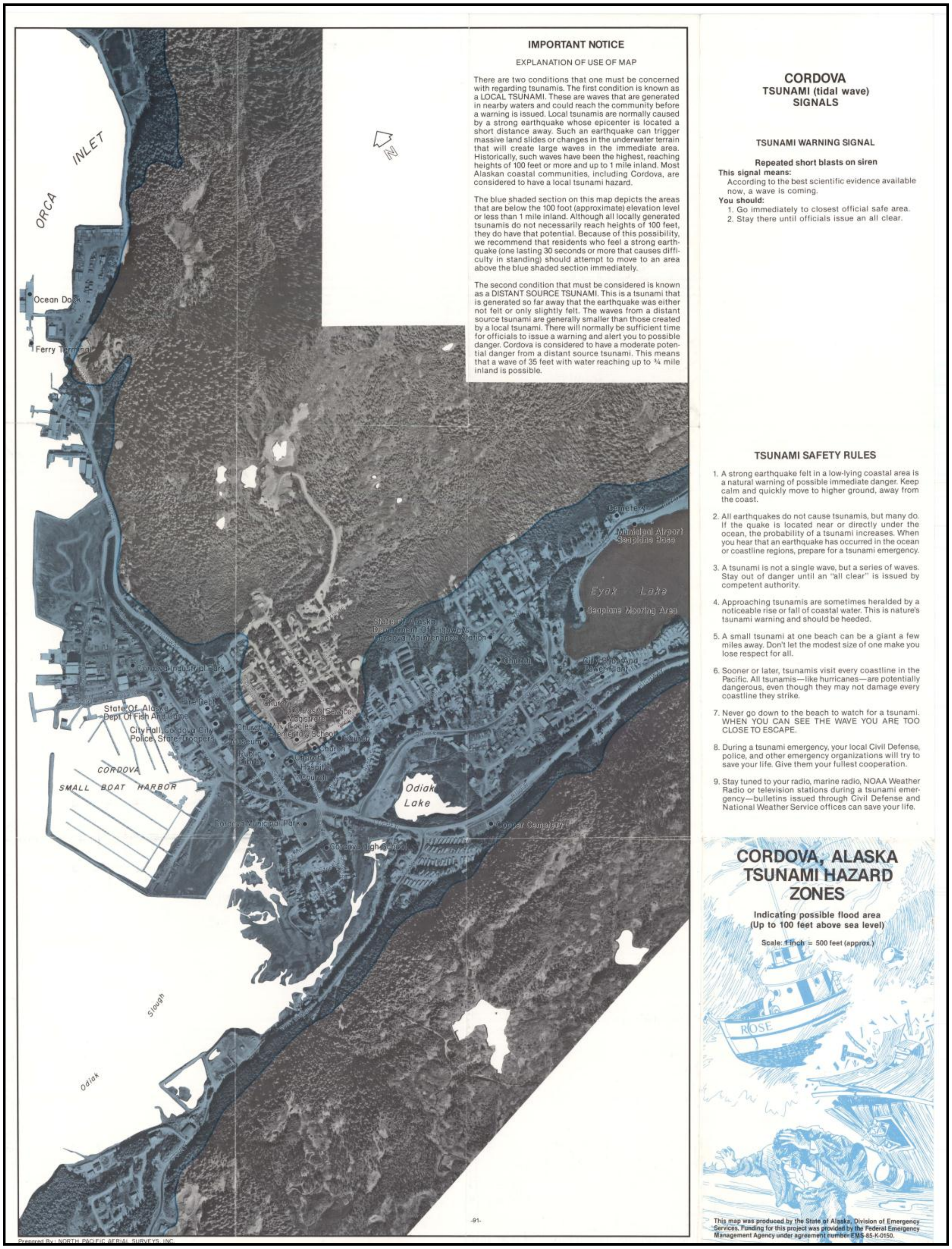
Map 3. Cordova Critical Infrastructure



Map 4. Cordova Regional Critical Infrastructure



Map 5. Tsunami Hazard Zones

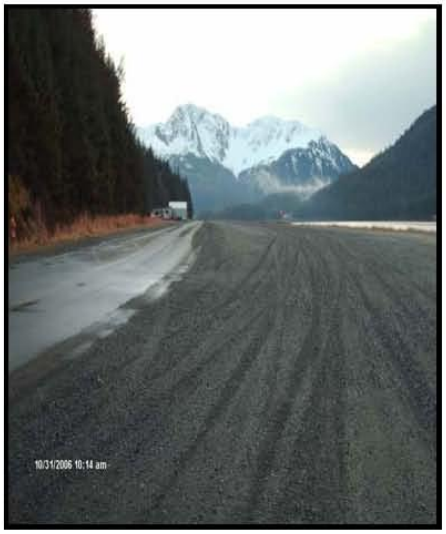


Photos 1. Orca Creek, 11/01/06

Cordova – Orca Creek
November 1, 2006
Water Supply Intake Clogged, Holding Pond filled with Bedload

Photos 2. Airport and Eyak Lake, 10/31/06

Cordova – Dept. of Transportation
October 31, 2006 Flood Pictures



Cordova Municipal Airport

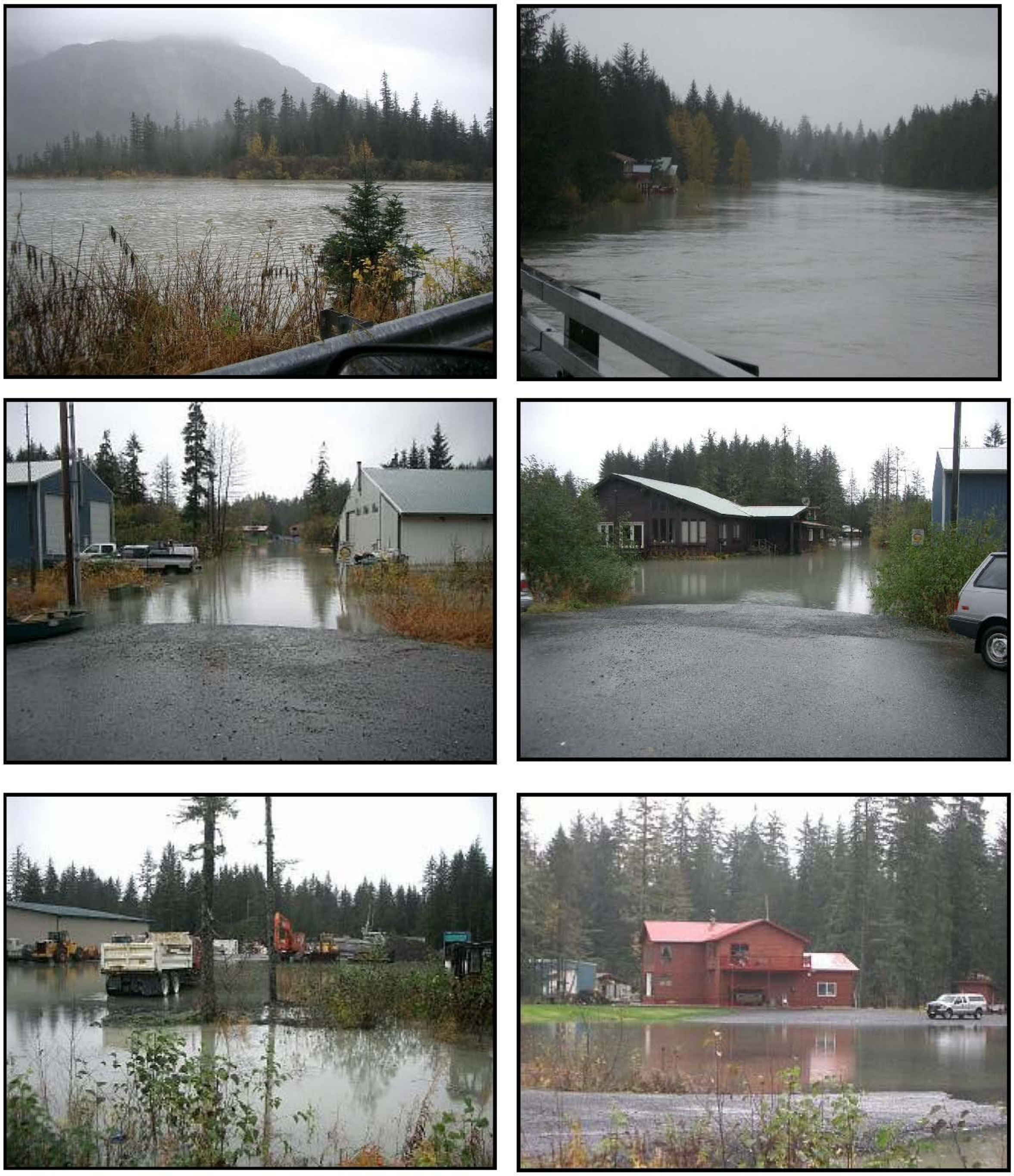
Repaired

Eyak Lake Erosion

Eyak Lake Erosion - Repaired

Photos 3. Cordova Flood Pictures, 10/10/06

Cordova – October 10, 2006 Flood



Photos 4. Cordova Flood Pictures, 10/10/06

Cordova – October 10, 2006 Flood

Photos 5. Regional Flood Pictures, 10/10/06

Cordova – October 10, 2006 Flood

Photos 6. Power Creek, October 2006

Power Creek, October 2006
USGS Survey Mark and Gage Site

Photos 7. Damage to Hydro Plant, 10/31/06

Cordova – October 31, 2006
Damage to Humpback Creek Hydro plant