# All Hazard Mitigation Plan

## Anchorage, Alaska

**Prepared for:**

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**October 2004**

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# EXECUTIVE SUMMARY

The Municipality of Anchorage (MOA) is vulnerable to a wide range of natural, technological, and human/societal hazards including earthquakes, avalanches, and hazardous material accidents. These hazards can affect the safety of residents, damage or destroy public and private property, disrupt the local economy, and negatively impact the quality of life.

Typically, we cannot eliminate these hazards altogether but we can lessen their impact by undertaking hazard mitigation activities. Hazard mitigation activities are those that reduce or eliminate the long-term risk to property and human life from hazards. Examples of hazard mitigation activities include elevating a structure out of a floodplain, bolting a structure to its foundation and developing a hazard mitigation plan.

The Disaster Mitigation Act of 2000 (DMA 2000) requires local governments to have a FEMA approved local mitigation plan as a condition of receiving future FEMA mitigation funds. This hazard mitigation plan was developed to fulfill federal and state hazard mitigation planning requirements.

Development and implementation of this plan has been directed by the Anchorage Hazard Mitigation Planning Team consisting of representatives from a variety of municipal departments including the Office of Emergency Management, Project Management & Engineering, Maintenance & Operations, Anchorage School District, Anchorage Water & Wastewater Utility, Anchorage Police Department and Anchorage Fire Department.

Upon approval by FEMA, this plan will be formally adopted by the Municipality of Anchorage Assembly.

## FEMA REQUIREMENTS

According to the FEMA regulations, a mitigation plan must identify the hazards that occur in Anchorage, contain a strategy to mitigate those hazards and a method of monitoring and updating the plan.

## HAZARDS IN ANCHORAGE

The hazards that may occur in Anchorage include:

| Natural | Technological | Human/Societal |
|---|---|---|
| • Avalanche<br>• Earthquake<br>• Flood<br>• Landslide<br>• Severe Wind Storm<br>• Tsunami<br>• Volcanic Ashfall<br>• Wildfire<br>• Winter Storm<br>• Erosion | • Air Pollution<br>• Dam Failure<br>• Energy Emergency: Fuel/Resource Shortage<br>• Fire: Explosion/Structural<br>• Hazardous Materials Accident<br>• Hazardous Materials Release<br>• Power Failure (Outage)<br>• Radiation Release<br>• Transportation Accident:<br>- Aircraft<br>- Marine<br>- Motor Vehicle | • Attack<br>• Civil Disturbance<br>• Terrorism, WMD: Biological, Chemical, Nuclear |

To make the best use of existing resources, the plan focused natural hazards as they occur most frequently in the MOA. Technological and Human/Societal hazards will be addressed in future updates of the plan.

For each natural hazard, there is a description of the hazard's characteristics, the location where the hazard can occur, previous occurrences of the hazard, and what is vulnerable to the hazard. Where possible, the location of the hazard area has been mapped.

## MITIGATION STRATEGY

The mitigation strategy includes goals, objectives and action items that, when implemented, will make the MOA safer. The goals and objectives are:

Goal 1: Education/Coordination: Develop coordinated and proactive public policies, emergency plans and procedures, and educational programs that minimize the risk to the community from natural hazards and disasters.

*Objective 1.1 Increase coordination among Municipal departments*

Goal 6: Information: Ensure information is easy to access and up-to-date

*Objective 6.1* *Convert all hazard maps to a GIS format*

*Objective 6.2* *Identify hazards not already mapped*

*Objective 6.3* *Map all currently unmapped regulated flood-prone areas*

*Objective 6.4* *Record information about MOA declared disaster events including location, extent, and damage caused on a standardized template*

*Objective 6.5* *Update drainage studies*

Goal 7. Economy/Business: Maintain Anchorage's (and the State's) economic vitality

*Objective 7.1* *Partner with private sector, including small businesses, to promote structural and non-structural hazard mitigation as part of standard business practice*

*Objective 7.2* *Educate businesses about contingency planning citywide, targeting small businesses and those located in high risk areas*

*Objective 7.3* *Partner with private sector to promote employee education about disaster preparedness while on the job and at home*

*Objective 7.4* *Minimize economic loss*

The action items included in the plan are:

Action 1: Have semi-annual meetings of the hazard mitigation committee

Action 2: The City shall develop a program to educate the community on the various methods of making structures and their contents more disaster resistant, which would include: workshops, literature and public safety announcements

Action 3: Continue the A.W.A.R.E. Program

Action 4: Develop a recovery plan

Action 5: The City shall continue to apply floodplain management regulations for development in the flood plain and floodway

Action 6: The City shall continue to utilize the Federal Emergency Management Agency's Flood Insurance Rate Map to define the special flood hazard area, the floodway and the floodplain

Action 7: Develop a list of possible sites to purchase for floodplain mitigation
Action 8: Implement the four essential strategies to implement policy #41 of Anchorage 2020. The four strategies are: design standards, land clearing standards, land use regulation amendment (Central Business zones), and landscape ordinance
Action 9: Evaluate existing development guidelines to identify which ones, if any, should be revised to incorporate hazard mitigation activities.
Action 10: Create of a dam inundation overlay zone in the MOA GIS System of known dam inundation areas.
Action 11: Conduct vulnerability analysis of shelters and traditional housing serving vulnerable populations.
Action 12: Identify alternate connections between Eagle River and the Anchorage Bowl
Action 13: Review existing zoning to determine if additional wildfire mitigation measures could be incorporated
Action 14: Create a prioritized list of FIRMs that need to be updated
Action 15: Digitize the ground failure maps from the Snow Avalanche & Mass-Wasting Hazard Analysis Glacier/Winner Creek Area, Alaska report.
Action 16: Continue to require new MOA buildings to go through the FM Global
Action 17: Develop siting requirements for facilities built with Municipal funds
Action 18: The City shall pursue funding to seismically retrofit City-owned facilities.
Action 19: Install gas shut off valves in all MOA owned public facilities
Action 20: Install gas shut off valves in all ASD public schools
Action 21: Ensure school windows are shatter-resistant by installing a coating on the window or replacing the window.
Action 22: Repair/replace the Lower Fire Lake Dam
Action 23: Retrofit the Lake of the Hills Dam
Action 24: Port of Anchorage - Seismic Retrofit Terminal I Piles
Action 25: Port of Anchorage - Seismic Retrofit Terminal I Wells
Action 26: Port of Anchorage - Seismic Retrofit Terminal II – Crane Tie Downs
Action 27: Identify municipal fire stations, police stations and emergency facilities that need to be seismically retrofit or rebuild to current seismic standards
Action 28: Identify all municipal facilities that need a pollution prevention plan

Action 29: Establish a template that documents the information FEMA wants on each hazard event
Action 29: Establish a template that documents the information FEMA wants on each hazard event
Action 30: Increase the use of HAZUS
Action 31: Investigate the culvert near Arctic Boulevard and the Valley of the Moon Park as it is a source of localized flooding.
Action 32: Maintain the wildfire risk model
Action 33: Continue and maintain vegetation management
Action 34: Develop additional water resources
Action 35: Develop a list of drainage studies needing updating
Action 36: Continue to comply with Right to Know Act
Action 37 Identify necessary warning system improvements

**Plan Maintenance**

This plan will be maintained through a series of annual evaluations, evaluations after major hazard events, and a formal re-adoption every five years. On an annual basis, the plan will be evaluated to:

- Monitor progress made on plan recommendations during the previous 12 months
- Identify mitigation accomplishments in projects, programs and policies
- Update the status of mitigation projects included on the city's Capital Improvement Program list, and elsewhere
- Ensure new mitigation needs are identified
- Identify new mitigation projects
- Review project prioritization to ensure it reflects current conditions
- Modify or remove existing initiatives, and the justification for doing so
- Incorporate changes in membership to the Committee

# CHAPTER 1

# INTRODUCTION

## 1.1 BACKGROUND

The Municipality of Anchorage (MOA) is vulnerable to a wide range of natural, technological, and human/societal hazards including earthquakes, avalanches, and hazardous material accidents. These hazards can affect the safety of residents, damage or destroy public and private property, disrupt the local economy, and negatively impact the quality of life.

Typically, we cannot eliminate these hazards altogether but we can lessen their impact by participating in hazard mitigation. Hazard mitigation is any action taken to reduce or eliminate the long-term risk to property and human life from hazards.

**Benefits of hazard mitigation include…**

- Reduced loss of life, property, essential services, critical facilities, and economic hardship
- Reduced short-term and long-term recovery and reconstruction costs
- Increased cooperation and communication within the community through the planning process
- Expedited pre-disaster and post-disaster grant funding
- Increased disaster resilience
- Improved environmental quality
- Improved economic vitality
- Improved quality of life

There are a wide variety of hazard mitigation activities available. They can be structural in nature such as reinforcing a building's foundation or constructing a levee, or they can be non-structural such as rezoning a flood-prone area or securing a water heater to a wall. Mitigation activities can focus on preventing the damage from occurring in the first place (by limiting development in hazard prone areas), or by protecting against damage (strengthening existing or future development so that it is not damaged by a hazard event). More information about hazard mitigation activities can be found in Chapter 6.

One of the most effective tools to reduce vulnerability to hazards is a local hazard mitigation plan. A hazard mitigation plan identifies what hazards exist in the community and establishes goals and specific mitigation activities to be undertaken.

To encourage communities to develop hazard mitigation plans, the United States Congress passed the Disaster Mitigation Act of 2000 (DMA 2000). This Act requires local governments to have a Federal Emergency

Management Agency (FEMA) approved mitigation plan by November 2004 to remain eligible for Hazard Mitigation Grant Program (HMGP) funding, and Pre-Disaster Mitigation (PDM) grants.

This plan for the MOA has been prepared in coordination with the Alaska Division of Homeland Security and Emergency Management (ADHS&EM) to ensure it meets all applicable DMA 2000 requirements. A Local Mitigation Plan Crosswalk, found in Appendix D, provides a summary of federal and state minimum standards and documents where each requirement is met within the plan.

## 1.2 PURPOSE

The purpose of this plan is to:

- Fulfill the DMA 2000 local hazard mitigation plan requirements.
- Serve as a qualifying document for hazard mitigation programs coordinated through the ADHS&EM.
- Identify hazards, mitigation goals and objects, and potential mitigation projects within the MOA.

## 1.3 HOW THIS PLAN WILL BE USED

A hazard mitigation plan is not intended to be developed and forgotten because it is the implementation of the plan that is essential. To be effective, the goals of the plan need to be incorporated into the everyday activities of the Municipality. As a result, this plan should be used to modify existing Municipal plans and policies so that they support the Municipality's hazard mitigation goals.

## 1.4 SUMMARY OF HAZARDS IN ANCHORAGE

According to the MOA's 2002 Draft Comprehensive Emergency Management Plan (CEMP), Anchorage is vulnerable to three main types of hazards – natural, technological, and human/societal hazards. Table 1.1 shows the types of potential hazards in Anchorage.

**Table 1.1 Potential Hazards in Anchorage**

| ***Natural*** | ***Technological*** | ***Human/Societal*** |
|---|---|---|
| Earthquake | Air Pollution | Attack |
| Wildfire | Dam Failure | Civil Disturbance |
| Severe Wind Storm | Energy Emergency: Fuel/Resource Shortage | Terrorism, Weapons of Mass Destruction (WMD):<br>▪ Biological<br>▪ Chemical<br>▪ Nuclear |

| | | |
|---|---|---|
| Winter Storm | Fire: Explosion/Structural | |
| Flood | Hazardous Materials | |
| Avalanche | Power Failure (Outage) | |
| Landslide | Radiation Release | |
| Volcanic Ashfall | Transportation Accident:<br>▪ Aircraft<br>▪ Marine<br>▪ Motor Vehicle | |
| Tsunami | | |
| Erosion* | | |

Source: 2002 Draft CEMP
Note: *Erosion is not included in the CEMP but has been added based on other information.

Hazards are measured in terms of their frequency and severity. Frequency is the number of times the hazard has occurred. Severity measures how bad the situation can be and is based on several factors including: the number of deaths/injuries; how long critical facilities are shutdown; extent of property damage; effect on economy; and the effect on response systems. Table 1.2 shows the frequency and severity of Anchorage's potential hazards.

**Table 1.2 Hazard Rating Matrix**

| Severity \ Frequency | Has not Occurred yet | Low | Medium | High |
|---|---|---|---|---|
| Catastrophic | ▪ Weapons of Mass Destruction (Biological, Chemical and Nuclear) | ▪ Earthquake<br>▪ Attack | | |
| Critical | ▪ Radiation Release | | ▪ Wildfire | ▪ Power Outage |
| Limited | ▪ Energy Shortage | ▪ Civil Disturbance | ▪ Landslide | ▪ Avalanche<br>▪ Winterstorm<br>▪ Fire<br>▪ Transportation Accident (Aircraft, Marine, Motor Vehicle) |
| Negligible | ▪ Tsunami<br>▪ Dam Failure | | ▪ Volcano Ash | ▪ Floods<br>▪ Windstorms<br>▪ Air Pollution<br>▪ Hazardous Materials |

Source: 2002 Draft CEMP

| Frequency | |
|---|---|
| ***High:*** | At least one occurrence every 1-4 years. |
| ***Medium:*** | At least one occurrence every 5-10 years. |
| ***Low:*** | At least one occurrence every 11-100 years. |
| ***Has Not Occurred:*** | Has not occurred, but for planning purposes should be evaluated as part of jurisdictions Hazard and Vulnerability Assessment. |

| Severity | |
|---|---|
| ***Catastrophic:*** | **More** than 50 deaths/injuries; Complete shutdown of critical facilities for 20 days or more; More than 50% property damage; Severe long-term effects on economy; Severely affects state/local/private sectors' capabilities to begin or sustain recovery activities; Overwhelms local and state response resources. |
| ***Critical: (Major)*** | **10-50** deaths/injuries; Shutdown of critical facilities for 8-30 days; 25-50% property damage; Short-term effect on economy; Temporarily (24-48 hours) overwhelms response resources. |
| ***Limited***: | **Less** than 10 deaths/injuries; Shutdown of critical facilities for 3-7 days; 10-25% property damage; Temporary effect on economy; No effect on response system. |
| ***Negligible:*** | **Minor** injuries; No deaths; Shutdown of critical facilities for less than 3 days; Less than 10% property damage; No effect on economy; No effect on response system. |

After identifying the hazards, the potential consequences of the hazard need to be considered. One potential consequence is property damage. Potential property damage was estimated using Geographical Information System (GIS) analysis. Table 1.3 shows the number of parcels and the taxable value (land and structures) that are vulnerable to each hazard.

**Table 1.3 Vulnerability Summary**

| Hazard | Number of Parcels | Taxable Value |
|---|---|---|
| Earthquake | 81,846 | $16,449,220,529 |
| Wildfire | N/A | N/A |
| Extreme Weather | | |
| Winter Storm | 81,846 | $16,449,220,529 |
| Heavy Snow | 81,846 | $16,449,220,529 |
| Heavy Rain | 81,846 | $16,449,220,529 |
| Extreme Cold | 81,846 | $16,449,220,529 |
| Ice Storm | 81,846 | $16,449,220,529 |
| Wind | 40,438 | $15,578,810,902 |
| Fog | 81,846 | $16,449,220,529 |
| Flooding | 3,333 | $642,907,383 |
| Avalanche | 677 | $67,006,331 |
| Ground Failure | | |
| Seismically Induced Ground Failure | 66,338 | $14,167,753,699 |
| Tsunami | N/A | N/A |
| Volcano | 81,846 | $16,449,220,529 |
| Erosion | | |
| Riverine Erosion | 88 | $8,314,800 |

Source: MOA and HDR, 2003

## 1.5 SCOPE

As table 1.3 shows, Anchorage's greatest potential losses come from earthquakes and extreme weather events. Both of these hazards also cover a large geographic area. As a result, it was decided by the MOA and ADHS&EM to concentrate on these hazards. It also was decided to emphasize wildfire hazard because the Anchorage Fire Department (AFD) is doing a lot of work in this area and because most of the areas with a significant wildfire threat are primarily residential in nature.

Information about other natural hazards was included in this plan if it was readily available, but it is acknowledged that some information needs to be supplemented by additional research and analysis. Information about technological and human/societal hazards, for example, will be addressed in subsequent plan updates.

## 1.5 ORGANIZATION OF THE PLAN

The plan is organized as follows:

### Chapter 1

Chapter 1 is an introduction to the plan and includes the purpose, scope, and organization of the plan, as well as a description of the planning process.

### Chapter 2

Chapter 2 is a community profile providing an overview of the MOA's:

- Location,
- Natural Setting,
- History,
- Demographics,
- Economy.

### Chapter 3

Chapter 3 is an asset inventory identifying what development could be vulnerable to a hazard event.

### Chapter 4

Chapter 4 provides details about the hazards that can occur in Anchorage. For each hazard, there is a description of the hazard's characteristics, the location where the hazard can occur, previous occurrences of the hazard, and what is vulnerable to the hazard. Where possible, the location of the hazard area has been mapped.

### Chapter 5

Chapter 5 contains the MOA's mitigation strategy including mitigation goals, objectives, and action items. This chapter also contains information about how the mitigation measures will be implemented.

### Chapter 6

This chapter is devoted to the maintenance, evaluation, and updating of the plan.

### Appendices

The appendices contain the plan's supporting documentation including a list of abbreviations and references.

## 1.6 PLANNING PROCESS

The planning process was lead by the MOA's Project Management and Engineering (PM&E) department. A consulting firm, HDR Alaska Inc., was retained to assist with the planning process and development of the plan.

The planning process began with the establishment of the core MOA planning team. The MOA planning team consisted of representatives from:

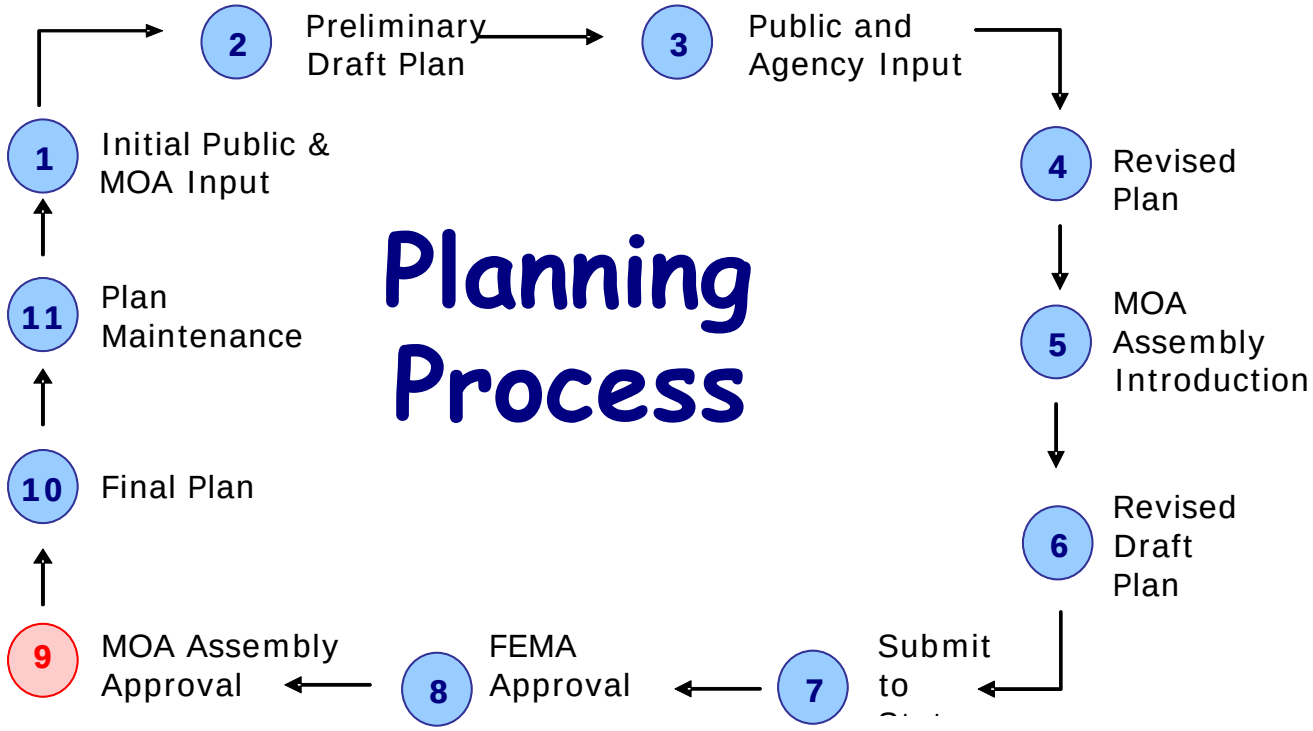
- PM&E
- Maintenance & Operations (M&O)
- Anchorage Fire Department (AFD)
- Anchorage Police Department (APD)
- Anchorage Water & Wastewater Utility (AWWU)
- Office of Emergency Management (OEM)
- Planning
- Anchorage School District (ASD)
- Mayor's Office
- Watershed Management

The next step was to review the existing documentation including AFD's Wildfire Strategic Plan, Anchorage 2020, and the CEMP. This helped to identify the hazards and risk areas in Anchorage. Once these were determined, a public meeting was held to inform the public about the plan and to ask if the public had any additional information about hazards in Anchorage.

The next step was to develop goals, objectives, and action items. First, the existing goals and objectives were identified. Based on input from the planning team, additional goals and objectives were then added and a list of action items was developed.

The next task was to develop a draft hazard mitigation plan. This draft was made available for review by the public and other interested parties. Based on the comments provided on the draft plan, the plan was then revised and introduced to the MOA Assembly. Next, the plan was submitted to ADHS&EM and FEMA for approval. Once FEMA approves the plan, it will go back to the MOA Assembly for adoption. This process is illustrated in Figure 1.1.

**Figure 1.1 The Planning Process**




## 1.7 PUBLIC INVOLVEMENT

To ensure there were adequate opportunities for citizen input, a Public Involvement Plan (PIP) was established (see Appendix B) and implemented. Four open house public meetings were held. The first meeting, held on November 6, 2003, was to announce the kick-off of project and to provide the public with the opportunity to comment on the information collected to date. The meeting material is available in the PIP appendix.

The remaining three meetings were held in September 2004 to present the preliminary draft plan. The material presented was the same for all three meetings and is included in the public involvement appendix.

Other opportunities for public involvement included:

- Presentation to the Federation of Community Council (FCC)
- Website including an On-line survey – linked from PM&E, OEM, and the MOA home pages.

The public meetings were advertised through the Anchorage Daily News, MOA's city website, FCC email list, and the "What's Up" weekly e-mail. The final three public meetings were also advertised in the Turnagain Times and the Alaska Star.

For more information about the planning process and participants, please see the public involvement appendix.

# CHAPTER 2

# COMMUNITY PROFILE

This chapter is a brief community profile for Anchorage. It contains information about Anchorage's location, history, demographics, economy, and natural setting. This information provides an overview of MOA's physical and socioeconomic characteristics.

## 2.1 LOCATION

The MOA is located in Southcentral Alaska at the head of Cook Inlet. It is a 1,955-square mile area between northern Prince William Sound and upper Cook Inlet. The area consists of mostly rugged mountainous terrain, with 84 percent taken up by national forest or state parklands and tidelands. Six percent is occupied by military reservations. Only the remaining 10 percent of the entire MOA is inhabited, which is less than 200 acres.

The Anchorage Bowl is the most urbanized area of the MOA. It occupies approximately 100 square miles, bounded by Chugach State Park, Turnagain and Knik Arms, and by the Elmendorf Air Force Base and Fort Richardson Military Reservation (see Map 2.1). Settlements north of the Fort Richardson Military Reservation include: Eagle River, Chugiak, Birchwood, Peters Creek and Eklutna. Most of this lowland area is between the Chugach Mountains and Knik Arm. South of the Anchorage Bowl are the Turnagain Arm communities of Girdwood, Indian, Rainbow, Bird, and Portage.

## 2.2 NATURAL SETTING

Anchorage has a unique natural setting as it is an urban area surrounded by wilderness and water. Several thousand acres of municipal greenbelts and parklands link developed areas with surrounding natural open space and wildlife habitat in Chugach State Park (the second largest state park in the country), the Chugach National Forest and the 50-square mile Anchorage Coastal Wildlife Refuge.

### 2.2.1 SOILS

Map 2-3 shows the soils in the Anchorage Bowl and Eagle River/Chugiak areas. The data is originally from the U.S. Department of Agriculture Natural Resource Conservation Service.

### 2.2.2 SURFICIAL GEOLOGY

Map 2-4 shows the surficial geology in the Anchorage Bowl area. The data source originally came from a 1972 U.S. Geological Survey (USGS) Report by Schmoll and Dobrovolny called Surficial Geology of Anchorage and

Vicinity. Information on peat in deposits at least two feet deep or areas with numerous manmade cuts and fills are not included.

#### 2.2.3 WILDLIFE

Wildlife abound as Anchorage has 5 salmon species and 52 mammal species including wolf, bear, lynx, and moose.

## 2.3 HISTORY[1]

### Anchorage Bowl

Anchorage was founded in 1914 when the government established the field headquarters for the construction of the Alaska Railroad at Ship Creek. Soon after, in 1920, Anchorage was incorporated as a city.

Between 1940 and 1990, Anchorage grew in spurts. Military build-ups, post-1964 earthquake reconstruction, the TransAlaska pipeline construction in the mid-1970s, and the early 1980s petrodollar boom each pumped up the economy and spurred rapid community growth. Often, the aftermath was recession. By the 1990s, Anchorage had a much more diverse and stable economy resulting in modest and steady community growth.

### Chugiak/Eagle River

The area north of the Anchorage Bowl began to develop shortly after 1900 when traders and prospectors began to arrive in the area looking for minerals and routes to the gold fields. Ekultna was the dominate settlement in the area in the 1920s as a result on federal involvement (home for Native Children and the Eklutna hydroelectric project). However, growth occurred closer to Anchorage, with the creation of Fort Richardson Army Reservation and Elmendorf Air Force Base. Many military personnel and civilians associated with military construction jobs moved into the area. The Chugiak/Eagle River area continued to grow as people looked for a more rural lifestyle than that offered in the Anchorage Bowl. Commercial enterprises subsequently followed the population to the area.

### Girdwood

Girdwood was founded just before the turn of the century as a supply and transport center for the area's placer and lode gold mines. The mining claims operated through the 1930s, when they stopped either due to the exhaustion of lode deposits or lawsuits and presidential orders to stop the environmentally destructive hydro-mining. In the 1920s, the construction of the Alaska Railroad benefited Girdwood as the town a source of timber for rail ties.

[1] Information was taken with permission from Anchorage 2020: Anchorage Bowl Comprehensive Plan, the Girdwood Plan, and the Chugiak-Eagle River Comprehensive Plan.

Development in the Girdwood area was revived in 1949 because of the construction of the Seward Highway. Much of the growth and development in Girdwood since the 1950s has been associated with skiing and other recreational opportunities.

## 2.4 DEMOGRAPHICS

For most of its history, Anchorage grew as a community of immigrants and newcomers from outside the State and Alaska Natives from rural areas within the State. For decades, a seasonal boom-bust economy and military personnel rotations made Anchorage a fast-growing town of transients without a strong stake in the community. Those who stayed as permanent residents lived in Anchorage by personal choice, not by chance of birth. They were rooted by their liking for the place and for the distinctive lifestyle it offered. At the time of the 1990 census, barely a quarter of Anchorage residents were born in Alaska.

In the 1990s, economic stability and military cutbacks dramatically slowed immigration and reduced annual population turnover by half. As a result, Anchorage's population has become much less transient and more committed to long-term community betterment.

The majority of the MOA's population lives in the Anchorage Bowl (see Table 2.1). The number preferring the more rural lifestyle offered by the smaller communities is increasing though. The population residing on the military bases is declining though. Map 2 shows the disbursement of population by census tract (2000 data).

**Table 2.1 Historic Population of the Municipality of Anchorage**

| Year | Anchorage Bowl | Eagle River/Chugiak | Turnagain Arm | Military Bases | Total |
|---|---|---|---|---|---|
| 1980 | 143,351 | 12,858 | 876 | 17,346 | 174,431 |
| 1990 | 184,557 | 25,324 | 1,360 | 15,097 | 226,338 |
| 1998 | 213,919 | 31,654 | 2,108 | 11,117 | 258,798 |

Source: Anchorage 2020.

Today, Anchorage's population is diverse. Racial and ethnic minorities are the fastest growing segment of the population and now account for about 27 percent of the total. Alaska Natives make up 8 percent of the total population and are the largest minority group. There are also substantial African American, Asian/Pacific Islander, and Hispanic communities, each making up about 7 percent of the total population. Table 2.2 is a profile of the general demographic characteristics for MOA. Table 2.3 is the profile of

the general demographic characteristics for the Ekultna Alaska Native Village Statistical Area (ANVSA).

**Table 2.2 Profile of General Demographic Characteristics for the Municipality of Anchorage (2000 data)**

| | Number | Percent |
|---|---|---|
| | | |
| Total population | 260,283 | 100 |
| | | |
| SEX AND AGE | | |
| Male | 131,668 | 50.6 |
| Female | 128,615 | 49.4 |
| | | |
| Under 5 years | 20,033 | 7.7 |
| 5 to 9 years | 21,867 | 8.4 |
| 10 to 14 years | 21,501 | 8.3 |
| 15 to 19 years | 19,662 | 7.6 |
| 20 to 24 years | 17,694 | 6.8 |
| 25 to 34 years | 40,113 | 15.4 |
| 35 to 44 years | 48,210 | 18.5 |
| 45 to 54 years | 38,803 | 14.9 |
| 55 to 59 years | 11,240 | 4.3 |
| 60 to 64 years | 6,918 | 2.7 |
| 65 to 74 years | 8,895 | 3.4 |
| 75 to 84 years | 4,284 | 1.6 |
| 85 years and over | 1,063 | 0.4 |
| | | |
| Median age (years) | 32.4 | (X) |
| | | |
| 18 years and over | 184,412 | 70.9 |
| Male | 92,953 | 35.7 |
| Female | 91,459 | 35.1 |
| 21 years and over | 173,564 | 66.7 |
| 62 years and over | 18,082 | 6.9 |
| 65 years and over | 14,242 | 5.5 |
| Male | 6,268 | 2.4 |
| Female | 7,974 | 3.1 |
| | | |
| RACE | | |
| One race | 244,708 | 94 |
| White | 188,009 | 72.2 |
| Black or African American | 15,199 | 5.8 |
| American Indian and Alaska Native | 18,941 | 7.3 |
| Asian | 14,433 | 5.5 |
| Asian Indian | 453 | 0.2 |

| | | |
|---|---|---|
| Chinese | 870 | 0.3 |
| Filipino | 5,805 | 2.2 |
| Japanese | 899 | 0.3 |
| Korean | 3,432 | 1.3 |
| Vietnamese | 380 | 0.1 |
| Other Asian [1] | 2,594 | 1 |
| Native Hawaiian and Other Pacific Islander | 2,423 | 0.9 |
| Native Hawaiian | 410 | 0.2 |
| Guamanian or Chamorro | 104 | 0 |
| Samoan | 1,428 | 0.5 |
| Other Pacific Islander [2] | 481 | 0.2 |
| Some other race | 5,703 | 2.2 |
| Two or more races | 15,575 | 6 |
| | | |
| Race alone or in combination with one or more other races [3] | | |
| White | 200,926 | 77.2 |
| Black or African American | 18,632 | 7.2 |
| American Indian and Alaska Native | 26,995 | 10.4 |
| Asian | 18,448 | 7.1 |
| Native Hawaiian and Other Pacific Islander | 3,637 | 1.4 |
| Some other race | 8,506 | 3.3 |
| | | |
| HISPANIC OR LATINO AND RACE | | |
| Total population | 260,283 | 100 |
| Hispanic or Latino (of any race) | 14,799 | 5.7 |
| Mexican | 7,246 | 2.8 |
| Puerto Rican | 1,652 | 0.6 |
| Cuban | 343 | 0.1 |
| Other Hispanic or Latino | 5,558 | 2.1 |
| Not Hispanic or Latino | 245,484 | 94.3 |
| White alone | 181,982 | 69.9 |
| | | |
| RELATIONSHIP | | |
| Total population | 260,283 | 100 |
| In households | 253,269 | 97.3 |
| Householder | 94,822 | 36.4 |
| Spouse | 48,421 | 18.6 |
| Child | 82,107 | 31.5 |
| Own child under 18 years | 69,516 | 26.7 |
| Other relatives | 9,971 | 3.8 |
| Under 18 years | 3,872 | 1.5 |
| Nonrelatives | 17,948 | 6.9 |
| Unmarried partner | 6,961 | 2.7 |
| In group quarters | 7,014 | 2.7 |
| Institutionalized population | 1,915 | 0.7 |
| Noninstitutionalized population | 5,099 | 2 |

| | | |
|---|---|---|
| HOUSEHOLDS BY TYPE | | |
| Total households | 94,822 | 100 |
| Family households (families) | 64,131 | 67.6 |
| With own children under 18 years | 36,868 | 38.9 |
| Married-couple family | 48,421 | 51.1 |
| With own children under 18 years | 25,932 | 27.3 |
| Female householder, no husband present | 10,884 | 11.5 |
| With own children under 18 years | 7,839 | 8.3 |
| Nonfamily households | 30,691 | 32.4 |
| Householder living alone | 22,142 | 23.4 |
| Householder 65 years and over | 3,586 | 3.8 |
| | | |
| Households with individuals under 18 years | 39,423 | 41.6 |
| Households with individuals 65 years and over | 10,439 | 11 |
| | | |
| Average household size | 2.67 | (X) |
| Average family size | 3.19 | (X) |

(X) Not applicable

1 Other Asian alone, or two or more Asian categories.

2 Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.

3 In combination with one or more other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.

Source: U.S. Census Bureau, Census 2000 Summary File 1, Matrices P1, P3, P4, P8, P9, P12, P13, P,17, P18, P19, P20, P23, P27, P28, P33, PCT5, PCT8, PCT11, PCT15, H1, H3, H4, H5, H11, and H12.

Source: US Census 2000 data (accessed Sept. 29, 2003)

**Table 2.3 Profile of General Demographic Characteristics for Eklutna Alaska Native Village Statistical Area (ANVSA )(2000 data)**

| | Number | Percent |
|---|---|---|
| | | |
| Total population | 394 | 100.0 |
| | | |
| SEX AND AGE | | |
| Male | 203 | 51.5 |
| Female | 191 | 48.5 |
| | | |
| Under 5 years | 17 | 4.3 |
| 5 to 9 years | 35 | 8.9 |
| 10 to 14 years | 41 | 10.4 |
| 15 to 19 years | 34 | 8.6 |
| 20 to 24 years | 16 | 4.1 |
| 25 to 34 years | 28 | 7.1 |
| 35 to 44 years | 85 | 21.6 |
| 45 to 54 years | 95 | 24.1 |
| 55 to 59 years | 20 | 5.1 |
| 60 to 64 years | 12 | 3.0 |

| | Number | Percent |
|---|---|---|
| 65 to 74 years | 10 | 2.5 |
| 75 to 84 years | 1 | 0.3 |
| 85 years and over | 0 | 0.0 |
| | | |
| Median age (years) | 38.3 | (X) |
| | | |
| 18 years and over | 274 | 69.5 |
| Male | 144 | 36.5 |
| Female | 130 | 33.0 |
| 21 years and over | 262 | 66.5 |
| 62 years and over | 19 | 4.8 |
| 65 years and over | 11 | 2.8 |
| Male | 4 | 1.0 |
| Female | 7 | 1.8 |
| | | |
| RACE | | |
| One race | 364 | 92.4 |
| White | 309 | 78.4 |
| Black or African American | 9 | 2.3 |
| American Indian and Alaska Native | 33 | 8.4 |
| Asian | 8 | 2.0 |
| Asian Indian | 0 | 0.0 |
| Chinese | 0 | 0.0 |
| Filipino | 6 | 1.5 |
| Japanese | 2 | 0.5 |
| Korean | 0 | 0.0 |
| Vietnamese | 0 | 0.0 |
| Other Asian [1] | 0 | 0.0 |
| Native Hawaiian and Other Pacific Islander | 0 | 0.0 |
| Native Hawaiian | 0 | 0.0 |
| Guamanian or Chamorro | 0 | 0.0 |
| Samoan | 0 | 0.0 |
| Other Pacific Islander [2] | 0 | 0.0 |
| Some other race | 5 | 1.3 |
| Two or more races | 30 | 7.6 |
| | | |
| *Race alone or in combination with one or more other races* [3] | | |
| White | 336 | 85.3 |
| Black or African American | 14 | 3.6 |
| American Indian and Alaska Native | 52 | 13.2 |
| Asian | 14 | 3.6 |
| Native Hawaiian and Other Pacific Islander | 3 | 0.8 |
| Some other race | 7 | 1.8 |
| | | |
| HISPANIC OR LATINO AND RACE | | |
| Total population | 394 | 100.0 |
| Hispanic or Latino (of any race) | 17 | 4.3 |
| Mexican | 10 | 2.5 |
| Puerto Rican | 1 | 0.3 |

| | Number | Percent |
|---|---|---|
| Cuban | 1 | 0.3 |
| Other Hispanic or Latino | 5 | 1.3 |
| Not Hispanic or Latino | 377 | 95.7 |
| White alone | 296 | 75.1 |
| | | |
| RELATIONSHIP | | |
| Total population | 394 | 100.0 |
| In households | 394 | 100.0 |
| Householder | 134 | 34.0 |
| Spouse | 94 | 23.9 |
| Child | 143 | 36.3 |
| Own child under 18 years | 116 | 29.4 |
| Other relatives | 8 | 2.0 |
| Under 18 years | 3 | 0.8 |
| Nonrelatives | 15 | 3.8 |
| Unmarried partner | 10 | 2.5 |
| In group quarters | 0 | 0.0 |
| Institutionalized population | 0 | 0.0 |
| Noninstitutionalized population | 0 | 0.0 |
| | | |
| HOUSEHOLDS BY TYPE | | |
| Total households | 134 | 100.0 |
| Family households (families) | 108 | 80.6 |
| With own children under 18 years | 59 | 44.0 |
| Married-couple family | 94 | 70.1 |
| With own children under 18 years | 50 | 37.3 |
| Female householder, no husband present | 9 | 6.7 |
| With own children under 18 years | 6 | 4.5 |
| Nonfamily households | 26 | 19.4 |
| Householder living alone | 19 | 14.2 |
| Householder 65 years and over | 2 | 1.5 |
| | | |
| Households with individuals under 18 years | 61 | 45.5 |
| Households with individuals 65 years and over | 9 | 6.7 |
| | | |
| Average household size | 2.94 | (X) |
| Average family size | 3.27 | (X) |

(X) Not applicable

1 Other Asian alone, or two or more Asian categories.

2 Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.

3 In combination with one or more other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.

Source: U.S. Census Bureau, Census 2000 Summary File 1, Matrices P1, P3, P4, P8, P9, P12, P13, P,17, P18, P19, P20, P23, P27, P28, P33, PCT5, PCT8, PCT11, PCT15, H1, H3, H4, H5, H11, and H12.

Source: US Census 2000 data (accessed November 26, 2003)

### 2.4.1 FUTURE POPULATION

Population increases are expected throughout the MOA. A recent study by the Institute of Social and Economic Research (ISER) at the University of Alaska Anchorage (UAA), has the MOA's population in 2020 as 332,200. This is slightly lower than the population forecast of Anchorage 2020 which expects 365,700 by the year 2020.

Anchorage 2020 expects that the Anchorage Bowl will get about 75 percent of the population increase. This means that the population in the Anchorage Bowl will be close to 300,000 by 2020. The Bowl will have about 31,600 more households and 39,600 more employees.

Most of the population projections do not divide Anchorage into smaller areas. However, it can be assumed that in 75% of the population increase will occur in the Anchorage Bowl, 25% will occur elsewhere. As a result, approximately 65,700 residents will live outside the Anchorage Bowl. Table 2.4 shows employment, population and housing demand in Chugiak/Eagle River in 1990 and 2010. Table 2.5 shows employment, population and housing demand in Girdwood in 1993 and 2013.

**Table 2.4 Employment, Population and Housing Demand in Chugiak/Eagle River**

| | 1990 Estimates | 2010 Forecast |
|---|---|---|
| Total Employment | 12,796 | 18,796 |
| Total Population | 25,324 | 46,152 |
| Total New Housing Demand | 8,393 | 15,693 |

Source: Chugiak-Eagle River Comprehensive Plan, 1993

**Table 2.5 Employment, Population and Housing Demand in Girdwood**

| | 1993 Estimates | 2013 Forecast |
|---|---|---|
| Total Employment | 610 | 2,483 |
| Total Population | 3,230 | 8,175 |
| Total New Housing Demand | 1,314 | 2,873 |

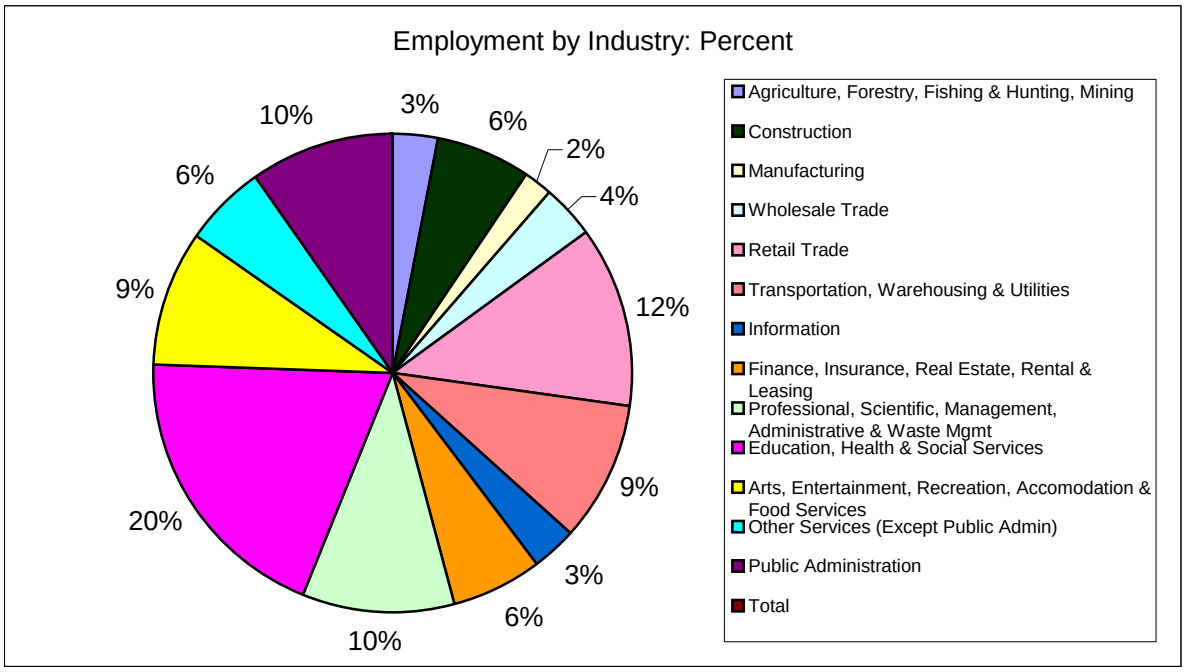
Source: The Girdwood Area Plan, 1995

## 2.5 ECONOMY

At first glance, Anchorage appears off the beaten path - lying as far north as Helsinki, Finland, and almost as far west as Honolulu, Hawaii. This strategic location, together with air, road, port, and rail transportation facilities, is the city's prime economic asset. Anchorage has capitalized on its location and versatile transportation assets to build a solid economic base. The community is firmly established as the statewide trade, finance, service, transportation, and administrative center.

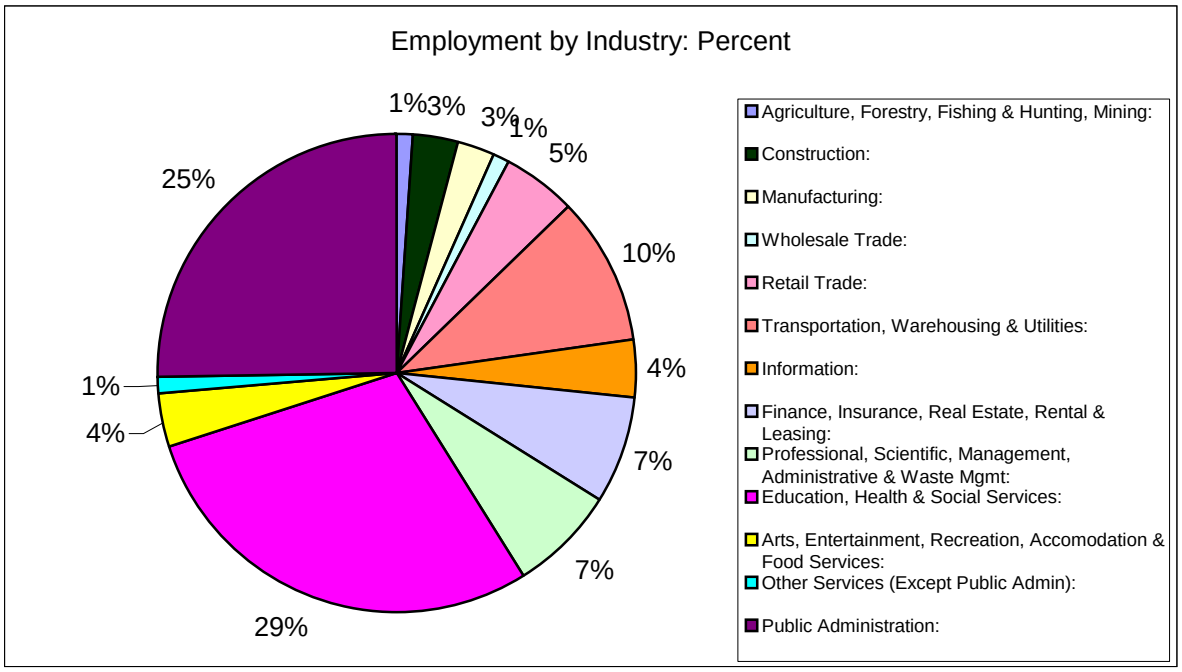
Figures 2.1 and 2.2 show employment by industry in the MOA and the Eklutna ANVSA respectively.

**Figure 2.1 Employment by Industry: Municipality of Anchorage**




Source: 2000 Census

**Figure 2.2 Employment by Industry: Eklutna ANVSA**




Source: 2000 Census

## Anchorage Bowl

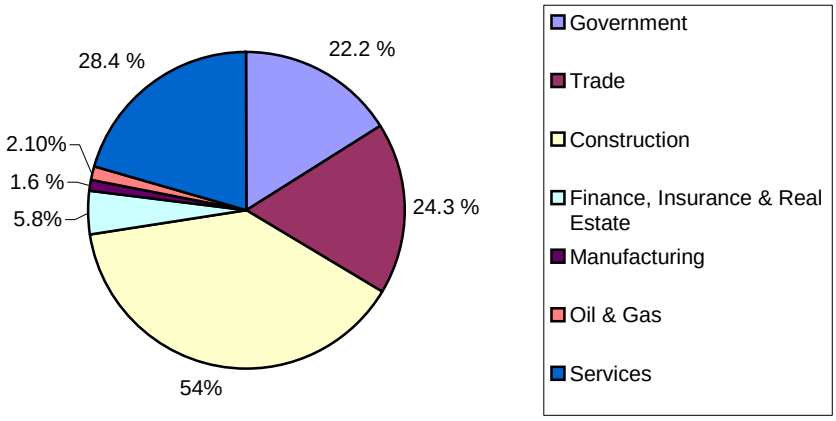
In the Anchorage Bowl, the largest economic sector is construction followed by trade, services, and government.

Anchorage is the distribution gateway for central, western, and northern Alaska. It is also the nation's busiest air cargo airport as Federal Express has made Anchorage a major hub and other firms have expanded their air cargo operations.

Tourism is a growing part of the economy. Anchorage has received an increasing number of visitors due to the increase in conventions being held in Anchorage and those associated with the cruise ship facilities in Seward.

Anchorage has also seen an expansion of the health care sector with the expansion of hospitals and more local provision of services. Residents from outside of Anchorage can receive treatment in Anchorage, and Anchorage residents can stay at home for medical care instead of having to go to the "Lower 48."

**Figure 2.3 Employment by Sector in the Anchorage Bowl**




Source: Anchorage 2020

## Chugiak/Eagle River

In the Chugiak/Eagle River area, local retail growth in response to the increasing population has made retail trade the area's largest employment sector. Services are second with the third largest employment sector being the government. Many of the government jobs are associated with education, although some are with the U.S. Postal Service or the Alaska

Department of Corrections. As in Girdwood, many residents commute to the Anchorage Bowl for employment.

### Girdwood

Girdwood's biggest economic sector is services, with the largest employer being the Alyeska Resort. The service industry has more than triple the amount of employment than the next closest category – construction. The third largest employment sector is trade, mostly associated with tourism. Girdwood's economy is likely to remain tourism- and recreationally-based as there are plans for an additional 750-1,050 hotel rooms and other new recreational amenities.

There is seasonality to employment in the Girdwood area as many of the jobs are associated with skiing in the winter or with the summer tourists. Consequently, many Girdwood residents commute into the Anchorage Bowl.

# CHAPTER 3

# ASSET INVENTORY

Before a community can develop its mitigation strategy, it needs to know what should be protected. The purpose of this chapter is to identify what needs to be protected including Anchorage's critical facilities. In addition to critical facilities, Anchorage has many other assets that should be protected including its infrastructure, existing development, and future development. This information will be used in Chapter 4 to describe Anchorage's vulnerability to each hazard.

## 3.1 Critical Facilities

Critical facilities are those structures or facilities that within MOA that support the delivery of essential services. These facilities are needed to respond to or recover from an event. Quite often, these are specialized facilities and would be hard to replace.

The critical facilities have been divided and rated into four priorities. Priority 1, "essential facilities" include police stations, "911" dispatch centers if not associated with police or fire stations, hospitals, and the primary emergency operations center. The priority 1 facilities are:

- MOA Emergency Operations Center
- Anchorage Police Headquarters (911)
- Anchorage Fire Station #12 (Fire Department 911)
- Anchorage Fire Headquarters
- Providence Medical Center
- Alaska Regional Medical Center
- Alaska Native Medical Center

Priority 2 includes emergency shelters and the remaining fire stations. It is important to note that after a disaster event, each shelter must be evaluated for structural stability and before being activated. The Priority 2 facilities are as follows:

- All remaining Fire Stations
- Municipal Shelters including Spenard Recreation Center, Fairview Recreation Center, and the Mountain View Boys and Girls Club
- The Hill Building
- City Hall
- Department of Health and Human Services (DHHS)

Priority 3 includes other municipal structures and utilities that support lifeline recovery. Examples include public works, transit, power providers, natural

gas providers, water and sewer, etc. (including their buildings and storage yards). The priority 3 facilities are:

- Other Municipal Facilities (Public Works, Transit, Parks and Recreation, etc.),
- Merrill Field Airport,
- Ted Stevens International Airport (if requested).

Priority 4 includes the remainder of the schools and other facilities as needed. The Priority #4 Facilities are:

- All schools as requested through the Anchorage School District,
- Other facilities as needed - this could include University of Alaska, Anchorage as a potential triage center and shelter area.

## 3.2 Infrastructure

Critical facilities are usually part of a community's infrastructure but not all of them. Infrastructure is the basic facilities and services needed for a community. Anchorage's infrastructure includes roads, water supplies, wastewater treatment plants, power plants, bridges, ports, airports, railroads, telecommunications equipment, schools, etc. The critical facilities matrix in Appendix H lists what hazards each facility is exposed to.

### 3.2.1 SCHOOLS

The following is a list of public schools in Anchorage. In addition to those listed below, there are several private schools in existence. Schools identified with an asterisk (*) after their name may be used as a shelter. School locations are shown in Map 3-1.

**Charter**

Aquarian
Family Partnership
Frontier Charter School
Frontier Charter Secondary
Highland Tech High School
Village Charter

**Elementary**

Abbott Loop Elementary
Airport Heights Elementary
Alpenglow Elementary*
Aurora Elementary
Baxter Elementary
Bayshore Elementary
Bear Valley Elementary*
Birchwood ABC
Bowman Willard Elementary*
Campbell Elementary*
Chester Valley Elementary
Chinook Elementary
Chugach Optional Elem.
Chugiak Elementary
College Gate Elementary
Creekside Park Elementary
Denali Elementary
Eagle River Elementary
Fairview Elementary
Fire Lake Elementary*
Gladys Wood Elementary
Government Hill Elementary
Homestead Elementary
Huffman Elementary
Inlet View Elementary
Kasuun Elementary*
Kincaid Elementary*
Klatt Elementary*
Lake Hood Elementary*
Lake Otis Elementary
Mountain View Elementary*
Mt. Spurr Elementary

Muldoon Elementary
North Star Elementary
Northwood Elementary
Nunaka Valley Elementary
O'Malley Elementary
Ocean View Elementary*
Orion Elementary
Ptarmigan Elementary
Rabbit Creek Elementary
Ravenwood Elementary*
Rogers Park Elementary
Russian Jack Elementary*
Sand Lake Elementary
Scenic Park Elementary
Spring Hill Elementary*
Susitna Elementary
Taku Elementary School*
Trailside Elementary
Tudor Elementary
Turnagain Elementary
Tyson William Elementary
Ursa Major Elementary
Ursa Minor Elementary
Williwaw Elementary*
Willow Crest Elementary
Wonder Park Elementary

**Middle**
Central Middle School
Clark Middle School
Goldenview Middle School*
Gruening Middle School*
Hanshew Middle School
Mears Middle School*
Mirror Lake Middle School*
Romig Middle School
Wendler Middle School

**High**
Bartlett High School
Chugiak High School
Dimond High School
East High School
SAVE
Service High School
South Anchorage High School

**Other**
ACE/ACT
Alaska State School for the Deaf and Hard of Hearing
AVAIL
Benny Benson
Benson Search
Booth Secondary
Continuation Program
Crossroads
Girdwood
Jesse Lee
King Career Center
McKinley Heights
McLaughlin
Mt. Iliamna
North Star Residential Secondary
Northern Lights ABC
Polaris K-12
Providence Heights Elementary
Providence Heights Secondary
Steller Secondary
Whaley

### 3.2.2 Hospitals

The main hospitals in Anchorage are:

- UASF Elmendorf Hospital
- Anchorage Pioneer Home
- VA Clinic
- Columbia Alaska Regional Hospital

- Charter North Behavioral Health System
- Providence Hospital
- Alaska Psychiatric Institute
- Alaska Native Hospital
- Providence Extended Care Facility

The locations of these facilities are shown on Map 3-2.

### 3.2.3 Fire Departments

Fire protection in MOA is provided by several sources. The AFD covers most of the Anchorage Bowl. Outside the bowl, communities rely on volunteer fire departments. The fire stations in MOA are:

- AFD Fire Station #1
- AFD Fire Station #3
- AFD Fire Station #4
- AFD Fire Station #5
- AFD Fire Station #6
- AFD Fire Station #7
- AFD Fire Station #8
- AFD Fire Station #9
- AFD Fire Station #10
- AFD Fire Station #11
- AFD Fire Station #12
- South Fork Volunteer Fire Department
- Chugiak Volunteer Fire Department #1
- Chugiak Volunteer Fire Department #2
- Chugiak Volunteer Fire Department #3
- Chugiak Volunteer Fire Department #4
- Girdwood Volunteer Fire Department

The locations of these stations are shown on Map 3-3.

### 3.2.4 Law Enforcement

Police protection is provided by the APD and the Alaska State Troopers (AST). The Federal Bureau of Investigations (FBI) has an office in Anchorage. The law enforcement facilities in Anchorage include:

- Alaska State Troopers Headquarters
- Anchorage Police Department Headquarters
- Eagle River Police Station
- APD Training/Miscellaneous
- Alaska State Court Building
- Cook Inlet Pretrial Facility
- FBI building
- 6th Ave. Jail
- Prosecutor's Office

The location of these facilities is shown on Map 3-4.

### 3.2.5 Water Sources

The MOA gets its potable water from three sources:

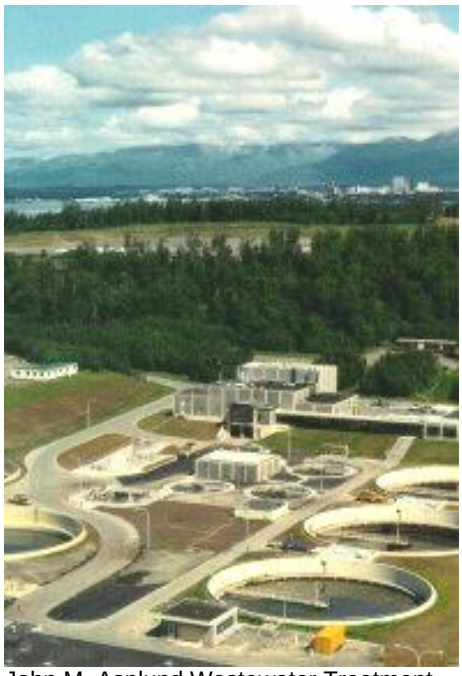
- Eklutna Water Treatment Plant (Eklutna Lake)
- Ship Creek Water Treatment Plant
- Wells

The Eagle River/Chugiak area relies on the Eklutna Water Treatment Plant, the Anchorage Bowl is supplied by the Eklutna Water Treatment Plant and the Ship Creek Water Treatment Plant, while Girdwood relies on wells.

### 3.2.6 Wastewater Treatment Facilities

The MOA has three wastewater treatment facilities namely:

- John M. Asplund Wastewater Treatment Facility
- Eagle River Wastewater Treatment Facility
- Girdwood Wastewater Treatment Facility



John M. Asplund Wastewater Treatment Facility. Image from AWWU.

### 3.2.7 Electricity

Within MOA, electricity is provided by three utilities:

- Municipal Light & Power (MOA Owned)
- Chugach Electric Association
- Matanuska Electric Association

These utilities operate several power plants within MOA including:

- George M. Sullivan Plant 2
- Generation Plant One (also known as Hank Nikkels Plant 1)
- Eklutna Hydroelectric Power Plant

In addition to the power plants, each utility operates substations and electrical (transmission and distribution) lines.

### 3.2.8 Airports

The largest airport in MOA is the Ted Stevens Anchorage International Airport. It serves passenger and cargo travel. Merrill Field is one of the largest general aviation (limited to aircrafts that weigh 12,500 pounds or less) airports in the United States. Anchorage has one seaplane base on Lake Hood. However, many local lakes are used for floatplanes in the summer months. Other airports in the MOA include:

- Birchwood
- Girdwood
- Fire Island
- Campbell Airstrip

### 3.2.9 Rail

The Alaska Railroad (AKRR) is headquartered in Anchorage, near Ship Creek. The main AKRR depot is near the headquarters. The Bill Sheffield Depot is

located at the Ted Stevens Anchorage International Airport. Within MOA, the AKRR has over 100 miles of track.

### 3.2.10 Road

Within the MOA, there is over 1,000 lane miles of road, with numerous bridges, overpasses, etc. Most of the roads in the Anchorage Bowl are in the Anchorage Roads and Drainage Service Area (ARDSA). Other parts of Anchorage are in Limited Road Service Areas. One of the largest is the Chugiak, Birchwood, Eagle River Rural Road Service Area (CBERRRSA) which has over 350 lane miles of roadway. Some roadways, including the Seward Highway and the Glenn Highway are owned and maintained by the State.

### 3.2.11 Other

Natural Gas Utilities

- ENSTAR

Telephone/Communication Utilities

- GCI
- Alaska Communications Systems (ACS)
- Spark Wireless
- Cellular One
- Alaska Digitel
- Alaska Telecom
- Matanuska Telephone Association (MTA) Wireless

### 3.2.12 Historical Sites

According to the National Register Information System, the MOA has the following sites listed on the National Register of Historic Places. The State Historic Preservation Office's (SHPO) Alaska Heritage Resources Survey (AHRS) has many more sites considered historically significant within MOA. As the AHRS has numerous entries and is not available to the general public, information about these sites is not listed here. For more information about these resources, please contact the SHPO.

**Table 3.1 National Register of Historic Places**

| Resource Name | Address | City | Listed |
|---|---|---|---|
| A. E. C. Cottage No. 23 | 618 Christensen Dr. | Anchorage | 1990-06-11 |
| Alaska Engineering Commission Cottage No. 25 | 645 W. Third Ave. | Anchorage | 1996-02-16 |
| Alex, Mike, Cabin | Off AK 1 | Eklutna | 1982-09-08 |
| Anchorage Cemetery | 535 E. 9th Ave. | Anchorage | 1993-04-26 |
| Anchorage City Hall | 524 W. 4th Ave. | Anchorage | 1980-12-02 |
| Anchorage Depot | 411 W. First Ave. | Anchorage | 1999-08-27 |
| Anchorage Hotel Annex | 330 E St. | Anchorage | 1999-04-15 |

| | | | |
|---|---|---|---|
| Anderson, Oscar, House | 4th Ave. extended | Anchorage | 1978-06-13 |
| Beluga Point Site | Address Restricted | Anchorage | 1978-03-30 |
| Campus Center | University Drive | Anchorage | 1979-06-22 |
| Crow Creek Consolidated Gold Mining Company | NE of Girdwood | Girdwood | 1978-09-13 |
| David, Leopold, House | 605 W. Second Ave. | Anchorage | 1986-07-24 |
| Eklutna Power Plant | NE of Anchorage | Anchorage | 1980-06-20 |
| Federal Building-U.S. Courthouse | 601 W. 4th Ave. | Anchorage | 1978-06-23 |
| Fourth Avenue Theatre (AHRS Site No. ANC-284) | 630 W. 4th Ave. | Anchorage | 1982-10-05 |
| Gill, Oscar, House | 1344 W. 10th Ave. | Anchorage | 2001-02-02 |
| Indian Valley Mine | Address Restricted | Indian | 1989-10-25 |
| KENI Radio Building | 1777 Forest Park Dr. | Anchorage | 1988-04-18 |
| Kimball's Store | 500 and 504 W. Fifth Ave. | Anchorage | 1986-07-24 |
| Loussac--Sogn Building | 425 D St. | Anchorage | 1998-05-20 |
| Old St. Nicholas Russian Orthodox Church | Eklutna Village Rd. | Eklutna | 1972-03-24 |
| Pioneer School House | 3rd Ave. and Eagle St. | Anchorage | 1980-12-03 |
| Potter Section House | Off AK 1 | Anchorage | 1985-12-06 |
| Site Summit | Off Arctic Valley Rd., 12.5 mi. E of Anchorage | Anchorage | 1996-07-11 |
| Spring Creek Lodge | 18939 Old Glen Hwy. | Chugiak | 2001-09-09 |
| Wendler Building | 400 D. St. | Anchorage | 1988-06-24 |

Source: National Register of Historic Places

## 3.3 Existing Development in MOA

Anchorage's history has shaped its development patterns making the Anchorage Bowl is the dominant area in terms of developed areas. Table 3.2 shows the number of parcels (by land use) in the Anchorage Bowl, the Turnagain Arm area, and the Eagle River/Chugiak area. Table 3.3 shows the taxable value of the land and buildings in the MOA by land use. The number of parcels was used as a substitute for the number of structures as it is

assumed that the non-vacant parcels have an existing structure on it (what determines the land use).

**Table 3.2 Number of Parcels by Land Use**

| Type of Parcels | In Turnagain Communities | In Eagle River/Chugiak | In Anchorage Bowl |
|---|---|---|---|
| **Residential** | 925 | 8946 | 49915 |
| **Commercial** | 54 | 181 | 3401 |
| **Industrial** | 20 | 110 | 1573 |
| **Institutional** | 8 | 131 | 611 |
| **Parks, Open Space, and Recreation** | 56 | 347 | 1143 |
| **Transportation Related** | 16 | 49 | 423 |
| **Other Land Uses** | 38 | 260 | 256 |
| **Vacant Land** | 736 | 2818 | 7666 |
| **Unidentified** | 30 | 4 | 0 |
| **Total** | 1883 | 12846 | 64988 |

Source: MOA

**Table 3.3 Total Parcels and Taxable Value for MOA**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 59,426 | $3,066,038,500 | $8,334,412,600 | $11,398,571,591 |
| **Commercial** | 3,419 | $605,885,600 | $1,579,095,500 | $2,132,773,711 |
| **Industrial** | 1,610 | $180,641,800 | $290,159,100 | $469,225,809 |
| **Institutional** | 702 | $26,876,800 | $188,839,300 | $90,308,164 |
| **Parks, Open Space & Recreation Areas** | 1,319 | $107,600 | $203,400 | $311,000 |
| **Transportation Related** | 419 | $236,100 | $165,900 | $402,000 |
| **Other** | 300 | $352,000 | $44,400 | $307,600 |
| **Vacant** | 10,326 | $570,157,400 | $450,103,500 | $1,015,367,523 |
| **Unidentified** | 4,325 | $419,913,000 | $924,182,300 | $1,341,953,131 |
| **Total** | **81,846** | **$4,870,208,800** | **$11,767,206,000** | **$16,449,220,529** |

Source: MOA

## 3.4 FUTURE DEVELOPMENT

Like many areas of the United States, Anchorage is expecting increased growth and development in the future. As shown in Tables 3.2 and 3.3, almost one-eighth of Anchorage is vacant land that can be developed. In addition, the other parcels may be redeveloped. These activities may increase Anchorage's vulnerability to hazard events in the future.

Anchorage 2020, the Chugiak Eagle River Plan, the Girdwood Area Plan, also with numerous other plans all describe future development in the MOA. A few items are highlighted below because they could have a large influence in the MOA's future vulnerability. It is important to know and track where and

what will be developed in the future to plan for its protection and mitigation hazards during development.

### 3.4.1 Housing

According to Anchorage 2020, housing increases in the Anchorage Bowl will be fairly consistent across all parts of the bowl. The type of new housing varies, although most of the new housing in Northwest (95%), Northeast (93%), and Central (79%), will be multi-family units. In these 3 areas, almost all of the remaining new housing will be Single-Family Urban. In Southwest, most of the housing will be Single-Family Urban (68%) with an additional 30% being Multi-family. In the Southeast, most new housing will be Single-Family Urban (43%). Multi-family units will make up 30%, and the remaining 27% will be Single-Family Rural.

### 3.4.2 Infrastructure

It is expected that MOA will experience more utility development including:

- New electrical transmission line in South Anchorage
- New water and sewer lines (Locations to be determined during the Water Master Plan and the Wastewater Master Plan updates. For more details about this process, please visit http://www.awwu.biz/project/wmp/ and http://www.awwu.biz/project/wwmp/ respectively.)

### 3.4.3 Transportation

There are several major transportation projects occurring the MOA, including improvements to the New Seward Highway and the Glenn Highway, as well as the development of a Ship Creek Intermodal Facility. For more information about possible new transportation facilities, please see the Anchorage Long Range Transportation Plan (LRTP).

# CHAPTER 4

# HAZARDS IN ANCHORAGE

One of the requirements of a hazard mitigation plan is that is describes the hazards that affect a jurisdiction. This chapter profiles the hazards that occur in Anchorage by identifying each hazard's location, extent, previous occurrences, and the probability of future events.

Hazard mitigation plans are also required to summarize the vulnerability to the hazards. The vulnerability information was calculated by identifying the parcels that intersect each of the hazard zones. Some notes about this method are:

- Not all the hazard GIS layers used to perform this analysis cover the entire MOA. Most only include a portion of the Municipality. (Parcels could be at risk but the risk area has not been mapped and included in the GIS yet.)
- The taxable value is based on 2003 MOA tax assessor data
- Using the taxable Value underestimates the vulnerability because:
    - Some parcels, such as schools, are not taxed and therefore do not have a taxable value.
    - Some parcels are treated as economic units (separate parcels that are treated as 1 for tax purposes) and do not have taxable values listed.
    - Taxable value does not consider the value of the contents.
    - The taxable value is the sum on the land and building taxable values. This is different from the total taxable value listed in the tax assessor's file because tax exemptions have been applied to those totals.
- If a parcel was in multiple risk areas, the entire parcel was considered to be in the highest risk area (i.e., no partial parcels). However, depending on how much of the parcel is in the hazard zone and site specific factors, existing or future structures may not be at risk.
- The number unidentified parcels could be wrong due to data issues (i.e., extra polygons in the GIS file).

It is important to remember that the information listed in this chapter is meant to provide an overview of each hazard. While based on best available information, the information is for planning purpose and should not be used for purposes which it was not intended.

## 4.1 NATURAL HAZARDS

Natural hazards are unexpected or uncontrollable natural events caused by nature, such as earthquakes, floods, and volcanic eruptions. In some cases, although rare, they can be human triggered, such as a human-triggered avalanche.

The majority of the following information describing these hazards is from the State Hazard Mitigation Plan and is used by permission from the ADHS&EM.

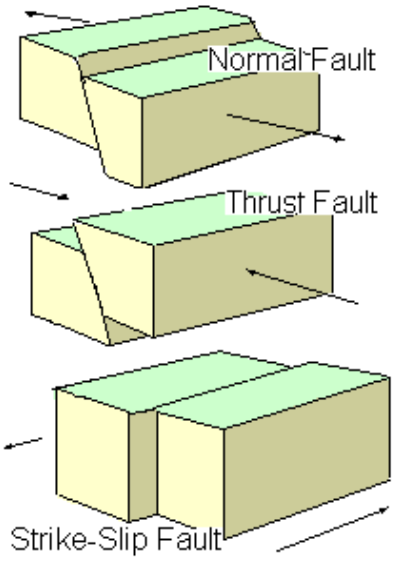
### 4.1.1 EARTHQUAKES

An earthquake is the shaking of the earth's surface. Most large earthquakes are caused by the sudden release of accumulated stresses as the earth's crustal plates move against each other. Other earthquakes occur along faults that lie within these plates. The dangers associated with earthquakes include ground shaking and surface faulting as well as secondary hazards, such as avalanches or landslides.

Ground shaking is responsible for most of the damage. Ground shaking is the result of the three classes of seismic waves generated by an earthquake. Primary waves (P waves) are the first waves, often felt as a sharp jolt. Secondary, or shear, waves (S 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 waves, but they can carry the bulk of the energy in a large earthquake.

The intensity of the shaking is dependent on many factors including the magnitude of the quake, the geology of the area, distance from the epicenter, building design, and local construction practices. The amount of damage to buildings depends on how the specific characteristics of each incoming wave interact with the buildings' height, shape, and construction materials.

Surface faulting is the differential movement of the two sides of a fault. There are three general types of faulting – strike-slip, normal, and thrust (reverse). 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 (or reverse) faults have one side



Three types of faults. Image courtesy of USGS.

moving up and over the fault relative to the other side.

*Secondary hazards*

Secondary effects from an earthquake include seismically-induced ground failure, snow avalanches, tsunamis, landslides, and infrastructure failure. These will be discussed in greater detail in other sections of the plan.

*Magnitude and Intensity*

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 ($M_L$) for small to moderate earthquakes. Large earthquakes, are reported according to the moment-magnitude scale ($M_W$) because the standard Richter scale does not adequately represent the energy released by these large events.

**Richter Scale**

On the Richter scale, magnitude is expressed in whole numbers and decimals. A 5.0 earthquake is a moderate event; a 6.0 characterizes a strong event; a 7.0 is a major earthquake; and a great earthquake exceeds 8.0. The scale is logarithmic and open-ended.

Intensity is usually reported using the Modified Mercalli Intensity Scale (MMI). This scale has 12 categories ranging from not felt to total destruction. Table 4.1 relates the MMI value to the Richter scale. Different MMI 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 areas with unconsolidated fill will have more damage than areas with shallow bedrock.

**Table 4.1 Relationship of the Mercalli Scale to the Richter Scale**

| Scale | | Description |
|---|---|---|
| **Mercalli** | **Richter** | |
| I | 0-4.3 | Not felt. |
| II | | Felt by persons at rest, on upper floors, or favorably placed. |
| III | | Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake. |
| IV | 4.3-4.8 | Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing cars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of IV, wooden walls and frames creak. |
| V | | Felt outdoors; direction estimated. Sleepers awakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate. |
| VI | 4.8-6.2 | Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked. Small bells ring (church, school). Trees, bushes shaken visibly, or heard to rustle. |
| VII | | Difficult to stand. Noticed by drivers. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices, also unbraced parapets and architectural ornaments. Some cracks in masonry C. Waves on ponds, water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged. |
| VIII | 6.2-7.3 | Steering of cars affected. Damage to masonry C; partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes. |
| IX | | General panic. Masonry D destroyed; masonry C heavily damage, sometimes with complete collapse; masonry B seriously damaged. General damage to foundations. Frame structures, if not bolted, shifted off foundations. Frames racked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluviated areas, sand and mud ejected, earthquake fountains, sand craters. |
| X | | Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly. |
| XI | 7.3-8.9 | Rails bent greatly. Underground pipelines completely out of service. |
| XII | | Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air. |

***Masonry A:*** Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.
***Masonry B:*** Good workmanship and mortar; reinforced, but not designed in detail to resist lateral forces.
***Masonry C:*** Ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at corners, but neither reinforced nor designed against horizontal forces.
***Masonry D:*** Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.
Source: State of Alaska Hazard Mitigation Plan

*Location*

The entire Municipality faces a significant threat from earthquakes, as there are at least three suspected active faults within 25 miles of Anchorage that have the potential to generate magnitude 7.5 earthquakes. One of these, the Castle Mountain Fault, produced a magnitude 5.7 earthquake near Sutton in 1984 and may have generated a magnitude 6.9 earthquake that shook Anchorage in 1933. The other two active faults are Bruin Bay Fault and Border Ranges Fault.

Currently, the Alaska Division of Geologic and Geophysical Surveys (ADGGS) and University of Alaska Fairbanks-Geophysical Institute (UAF-GI) are working together on a seismic microzonation project for Anchorage. This project will combine geophysical and geological data to develop a better understanding of how the ground will react in an earthquake.

*Likelihood of Occurrence*

While it is impossible to know when the next earthquake will affect MOA, given the MOA's seismic history, it is safe to assume that earthquakes will continue to occur.

Map 4-1 shows the peak ground acceleration with a 10% probability of exceedance in 50 years; that represents events that are reasonably expected to occur. Peak ground acceleration (PGA) is one method to measure the strength of ground movements. Most of Anchorage has a peak ground acceleration of 30%g, while the southeast portion of the MOA has a value of 40%g. This means that Girdwood and Bird Creek could experience more ground movement. Map 4-2 shows the PGA with a 2% probability of exceedance in 50 years. For these rarer events, the entire MOA is considered to have a PGA of 60%g.

**Peak Ground Acceleration**

Peak ground acceleration (PGA) in percent of g with 10% probability of exceedance in 50 years represents the ground motions that can be reasonably expected in a 50 year period.

The acceleration values are the *peak* or maximum values expected during the earthquake. The "10% probability of exceedance in 50 years" refers to the fact that earthquakes are somewhat random in occurrence. One can not predict exactly whether an earthquake of a given size will or will not occur in the next 50 years.

PGA maps with a 10% probability of exceedance in 50 years means there is a 10% chance (1 chance in 10) that the the ground acceleration values shown on the map will be exceeded in a 50 year time period.

*Historic Events*

*1964 Good Friday Earthquake*

The best known earthquake in Anchorage's history is the March 27, 1964 Good Friday earthquake. This 9.2 $M_W$ earthquake is the largest ever recorded in North America and the second largest in the world. The shaking lasted between 4 and 5 minutes and was felt over a 7 million square mile area.

The Government Hill School after the 1964 Good Friday earthquake.

This earthquake occurred at approximately 5:36 pm. The timing of the event may have saved many lives as several structures with the most damage, such as the Government Hill School, were unoccupied at this time. In 1973, the National Research Council observed that this event could have had 50 times the number of deaths and 60 times as much property damage if it had affected a more densely populated area during work/school hours (Combellick, 1985:6).

The ground shaking caused a significant amount of ground deformation as well as triggering landslides and tsunamis. The Turnagain Heights landslide was the most damaging with over 100 homes being destroyed. Most of the fatalities associated with this event were actually caused by the resulting tsunamis, not the actual earthquake.

*Other events*

Small earthquakes occur frequently in the Anchorage area. The UAF-GI's Alaska Earthquake Information Center (AEIC) keeps records about earthquakes in Alaska. A search of the AEIC database revealed that since 1900, there have been 12 events having a magnitude greater than 4.0 that have had an epicenter within the MOA boundary, including 2 earthquakes registering Richter magnitude 5 that occurred on Feb. 6, 2002. Map 4-3 shows the epicenters of earthquakes near MOA since 1900. Events with an epicenter outside MOA could impact MOA, depending on their location and the amount of energy released.

*Vulnerability*

As an earthquake could affect the entire Municipality, the entire MOA is represented in Table 4.2.

**Table 4.2 Earthquake Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 59,426 | $3,066,038,500 | $8,334,412,600 | $11,398,571,591 |
| **Commercial** | 3,419 | $605,885,600 | $1,579,095,500 | $2,132,773,711 |
| **Industrial** | 1,610 | $180,641,800 | $290,159,100 | $469,225,809 |
| **Institutional** | 702 | $26,876,800 | $188,839,300 | $90,308,164 |
| **Parks, Open Space & Recreation Areas** | 1,319 | $107,600 | $203,400 | $311,000 |
| **Transportation Related** | 419 | $236,100 | $165,900 | $402,000 |
| **Other** | 300 | $352,000 | $44,400 | $307,600 |
| **Vacant** | 10,326 | $570,157,400 | $450,103,500 | $1,015,367,523 |
| **Unidentified** | 4,325 | $419,913,000 | $924,182,300 | $1,341,953,131 |
| **Total** | **81,846** | **$4,870,208,800** | **$11,767,206,000** | **$16,449,220,529** |

### 4.1.2 WILDFIRE

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 important ecological process and natural change agent has been incorporated into the fire management planning process. 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 are divided into the following categories for the purposes of this plan:

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

- Prescribed fires – These fires are 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 fires – These fires are any non-structure fires, other than prescribed fires, that occur in the wildland.

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

- Wildland-Urban Interface Fires – These are 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. The potential for wildland-urban interfaces fires is of primary concern in Anchorage.

***The Fire Triangle***

The interaction of the heat, fuel, and oxygen is required for the creation and maintenance of any fire.

The Fire Triangle. Image from Northern & Intermoununtain Regions of the US Forest Service

**Fire Behavior**

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*[1]

Fuel determines how much energy the fire releases, how quickly the fire spreads, and how much effort is needed to contain the fire.

The primary fuels in wildland fires are living and dead vegetation. Fuels differ in how readily they ignite and how hot or long they burn. This depends on the following characteristics:

Moisture Content

- the amount of water in a fuel

Size and Shape

- Light fuels include grasses, shrubs, and tree leaves or needles (any fuel having a diameter of approximately ½" or less). They burn rapidly and are quickly ignited because they are surrounded by oxygen.. Fires in light fuels spread quickly but burn out quickly and are easy to put out with the correct equipment. They are the primary fuels that carry fires and ignite homes in many wildfire situations.
- Heavy fuels, such as large tree branches, downed logs, and buildings, require more heat energy to ignite, but they burn longer and produce more heat once ignited. They are harder to extinguish.

Fuel Loading

- the quantity of fuel in an area

Horizontal Continuity

[1] adapted from Eli, 2003 and wildlandfire.com

- The distribution of fuel particles or extent of the fuel bed, thus affecting a fire's ability to sustain combustion and spread. It may be described as uniform (have a uniform pattern and distributed continuously across the ground, allowing a wildland fire to travel uninterrupted Include all fuels distributed continuously over the area. Areas containing a network of fuels which connect with each other to provide a continuous path for a fire to spread are also included in this category) or patchy (the fuel may be distributed unevenly in a patchy network, forcing the fire to travel over rocks and other barriers by wind-borne embers)

Vertical Arrangement

- The relative heights of fuels above the ground and their vertical continuity, which influences fire reaching various levels or strata.
  - Ground fuels- lie beneath the surface… roots, rotten buried logs etc. All combustible materials lying beneath the surface
  - Surface fuels- lie on or immediately above the ground including leaves, logs, low shrubs
  - Aerial fuels- located in the upper canopy such as standing trees. All green and dead materials including tree branches,

*Weather*

Weather is the most variable and uncontrollable factor in wildland fire fighting. Weather includes temperature, relative humidity, wind, and precipitation. High temperatures and low humidity encourage fire activity while low temperatures and high humidity help retard fire behavior.

Warm temperature heats and dries the fuel and reduces the fuel's moisture content.

Relatively Humidity is the ratio of the amount of moisture in the air to the amount which the air could hold at the same temp and pressure if it were saturated. High humidity is preferred while fighting a fire because it makes the fuels moist. Low humidity dries it out quicker. As relative humidity increases, fuel moisture increases.

Wind increases the supply of oxygen, influences the direction of the fire, dries fuels, carries sparks ahead of the main fire causing spot fires, moves heated air from convection heat transfer to downwind fuels. Wind also drives convective heat into adjacent fuels, influences spread direction and spotting, carriers moist air away replacing it with drier air, dries fuels, raises fuel moisture if the air contains moisture.

Precipitation increases the moisture content in light fuels making them harder to burn. It does not affect heavy fuels as much because the water isn't absorbed as quickly.

*Topography*

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. Burning material can roll down the slope and ignite fires below you.

Slope orientation also influences fire behavior. Forests on southern or southwestern slopes (those hit by the sun) generally have lower humidity and higher temperatures than those on north or northeast slopes. Consequently, fire hazard is often higher on south and southwest facing hills.

*Location*

In 2001, Anchorage was declared a community-at-risk for wildfire by the US Department of Agriculture (USDA) Forest Service. According to the AFD, the factors contributing to Anchorage's wildfire risk include:

- Mixed hardwood and conifer forests that burn readily in high fire danger conditions. White spruce trees have persistent branches that contribute to ladder fuels. Black spruce trees have a very low moisture content that allows them to burn easily when ambient weather conditions provide for low relative humidity, high temperatures, and dry duff layers in the soil.
- Residential and rural neighborhoods exist throughout forested stands that have been affected by the spruce bark beetle. In the MOA, this area extends over 85,000 acres. The dead trees resulting from beetle attacks contribute to forest fuel accumulations that create high risk for wildfire in your backyard.
- In a wildfire event, mutual aid resources to help the AFD may take an hour or more to arrive on site. Suppression resources from the Division of Forestry must travel to Anchorage from Palmer and other locations outside of the MOA.
- On the south Anchorage Hillside, Eagle River Valley, South Fork, and other sites around the MOA, there are limited water resources to help fight a wildland fire.
- Many neighborhoods in the MOA have limited ingress and egress routes for suppression apparatus to enter in and for residents to evacuate.
- The hilly topography throughout the wildland-urban interface areas contributes to increased rate of fire spread. Where the Miller's Reach Fire of 1996 spread across mostly flat terrain and still burned over 400 structures, a wildfire in South Anchorage would spread even faster because fire spread rates increase with slope.
- The spring fire season is a dry time in Southcentral Alaska. Dry foliage on the trees and dead bluejoint grass burns readily soon after snow melts.

Neighborhood wildfire assessments have been performed in multiple areas. These assessments are considered works in progress and are re-evaluated throughout the fire season. The assessments contain an evaluation of the hazard; potential hazards/complications, such as power lines; potential staging areas for equipment; potential safety zones (to wait out passing flames); and potential evacuation sites. They exist for the following areas:

- Tudor Road to Abbott Road
  - Including Far North Bicentennial Park
- Eagle River
- Hiland Road, South Fork
- DeArmoun Road to Potter Creek Heights
- Chugiak

Individual neighborhood assessments are available through the AFD.

**Spruce Bark Beetle**

Wildland fire risk is growing 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 dies. The dead trees dry out and become highly flammable. Large areas, including the Anchorage Hillside, have significant quantities of spruce bark beetle kill trees.

To better define the wildfire risk in Anchorage, the AFD in conjunction with Geographic Resource Solutions, has undertaken a risk mapping project. The project is using satellite imagery to develop a vegetation/fuels map for Anchorage. This information will then by combined with information about suppression capabilities, ignition potential, accessibility and many other factors to develop a fire-exposure model, which will allow AFD to better identify the wildfire risk areas.

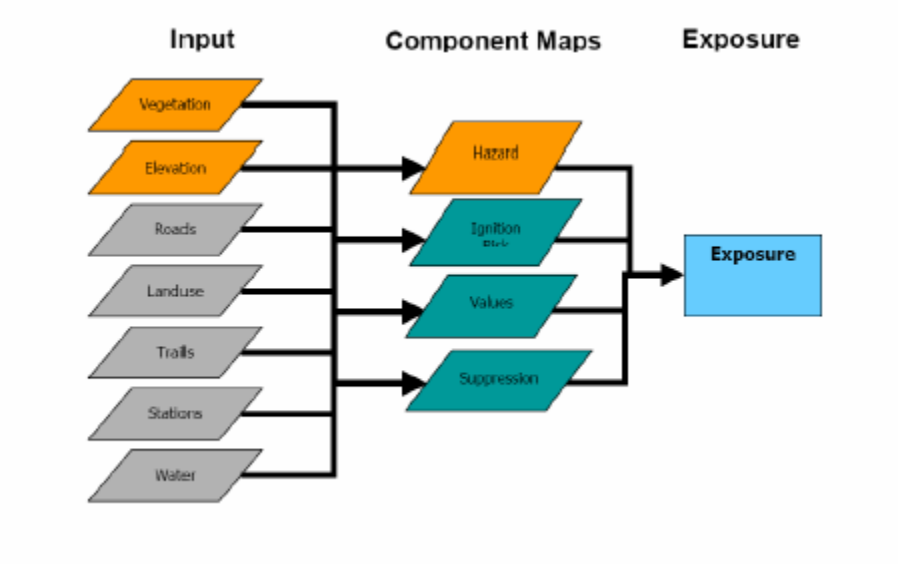
Anchorage Fire Exposure Model (AFEM) allows uses to determine the fire exposure in the Anchorage study area. The exposure is based on the cumulative weight of four components: the potential intensity of fire caused by natural fuels (fuels hazard); the susceptibility and risk of a location to ignition (ignition risk); the effort required to access and suppress a fire (suppression) and the existence of improvements that have cultural value (values at risk).

Users can adjust the model to evaluate different scenarios caused by such influences as development, fuel mitigation, vegetation successions, changes in fire fighting resources, and availability of water sources.

Each of the four components are calculated from the environmental factors and cultural conditions that contribute to each. Vegetation, habitation, building, land-use, terrain, weather, and fire history are among the

environmental and cultural conditions that contribute to fire exposure. Exposure is calculated as the combination of the components that occur at each location across the landscape. Exposure modeling is the process of combining these factors and components to calculate or predict the threat posed by wildfire. The purpose of the AFEM is to incorporate model inputs, calculate the weights for each component and combine these components weights into an exposure rating. Figure 4.1 summarizes the development of the model.

**Figure 4.1 Graphical Illustration of the AFEM**




The results of the modeling are shown in Map 4-4. As the maps shows, much of the developed portion of the Eagle River/Birchwood/Chugiak area has a wildfire exposure of high, very high or extreme. In the Anchorage Bowl, most of the hillside has an exposure of high or very high as does Stuckagain Heights. Most of the Campbell Tract/Far North Bicentennial Park is low or moderate but there are some areas that are considered very high and extreme. There are also pockets of high, very high, and extreme exposure along Turnagain Arm. It is important to remember that if the inputs to the wildfire model change, the results will be different.

*Likelihood of Occurrence*

According to the Alaska Department of Forestry, fire season in Alaska is typically from early May to mid-August. Wildfires can occur in other months though. Wildfires are more likely to occur in drought or low precipitation times and are less likely to occur during high precipitation times and when snow is on the ground.

Wildfires in Anchorage are more likely to be human triggered than caused by other sources. As more development occurs in areas with high wildfire

potential, the chances of a wildfire increase. The AFD is taking measures to reduce the risk of fires by controlling the amount of fuel available. The AFD does this through the use of controlled burns, homeowner education, and the development of firebreaks.

*Historic Events*

No declared wildfire disasters have been identified to date. However, the potential is there. Every year, the AFD puts out dozens of fires that could be disastrous if they are not contained early. Table 4.3 shows the non-structural fires responded to by the AFD in 2001.

**Table 4.3 Wildfire Events in 2001**

| Date | Description | Acres Burned | Location |
|---|---|---|---|
| 1/5/2001 | Authorized controlled burning | 0.1 | 2300 Oak Dr |
| 1/5/2001 | Brush, or brush and grass mixture fire | 0.1 | 1671 Elcadore Dr |
| 1/26/2001 | Forest, woods or wildland fire | 0.1 | 9101 Brayton Dr |
| 2/25/2001 | Natural vegetation fire, other | 0.1 | 5411 Mockingbird Dr |
| 3/18/2001 | Brush, or brush and grass mixture fire | 0.5 | 11725 Inspiration Dr |
| 3/26/2001 | Brush, or brush and grass mixture fire | 0.5 | Adjacent to Kincaid Motor Cross |
| 4/4/2001 | Prescribed fire | 0.2 | south of ER Visitors Ctr |
| 4/9/2001 | Forest, woods or wildland fire | 1 | Spruce St N & 64th Ave |
| 4/12/2001 | Authorized controlled burning | 0.1 | Shandy Ct & Elmore Rd |
| 4/13/2001 | Forest, woods or wildland fire | 0.5 | Maintree Dr & Lonetree Dr |
| 4/16/2001 | Authorized controlled burning | 0.1 | Hillside Dr & OMalley Rd |
| 4/17/2001 | Grass fire | 0.1 | Reeve Blvd. South of Ship Creek |
| 4/17/2001 | Brush, or brush and grass mixture fire | 0.1 | 26126 Wildflower Cir |
| 4/18/2001 | Grass fire | 0.1 | 2852 Telequana Dr |
| 4/20/2001 | Forest, woods or wildland fire | 0.1 | 41st Ave & Minnesota Blvd |
| 4/21/2001 | Natural vegetation fire, other | 0.1 | 3625 Loc Sault Ave |
| 4/22/2001 | Brush, or brush and grass mixture fire | 1 | 11500 Trails End Rd |
| 4/22/2001 | Grass fire | 1 | East end of Pago Pago |
| 4/22/2001 | Brush, or brush and grass mixture fire | 0.2 | 7500 Jewel Lake Rd |
| 4/23/2001 | Natural vegetation fire, other | 0.1 | 10709 Chatanika Loop |
| 4/23/2001 | Natural vegetation fire, other | 0.1 | 20536 Raven Dr |
| 4/24/2001 | Brush, or brush and grass mixture fire | 0.1 | 6820 E 11th Ave |
| 4/19/2001 | Authorized controlled burning | 0.1 | 11061 Snowline Dr |
| 4/25/2001 | Forest, woods or wildland fire | 0.1 | Boniface & DeBarr Rd |
| 4/24/2001 | Brush, or brush and grass mixture fire | 0.1 | Huffman Rd & Elmore Rd |
| 4/25/2001 | Brush, or brush and grass mixture | 0.1 | 11312 Fireball St |

| Date | Description | Acres Burned | Location |
|---|---|---|---|
| | fire | | |
| 4/26/2001 | Forest, woods or wildland fire | 0.1 | Mulcahy Park |
| 4/26/2001 | Brush, or brush and grass mixture fire | 1 | 20th Ave & Bragaw St |
| 4/27/2001 | Brush, or brush and grass mixture fire | 0.1 | 20610 David Ave |
| 4/27/2001 | Brush, or brush and grass mixture fire | 0.1 | 19611 Cicutta Way |
| 4/28/2001 | Natural vegetation fire, other | 0.1 | 17244 Prince of Peace Dr |
| 4/28/2001 | Natural vegetation fire, other | 0.1 | 17610 Kantishna Dr |
| 4/29/2001 | Brush, or brush and grass mixture fire | 0.1 | 1741 W Northern Lights Blvd |
| 4/29/2001 | Grass fire | 0.1 | 3913 Boniface Blvd |
| 4/29/2001 | Brush, or brush and grass mixture fire | 0.2 | Adjacent to E 31st Ave |
| 5/1/2001 | Brush, or brush and grass mixture fire | 0.1 | 20130 David St |
| 4/30/2001 | Grass fire | 0.1 | Woodway Dr & Alderwood Loop |
| 4/29/2001 | Brush, or brush and grass mixture fire | 0.1 | 1326 Nichols St |
| 5/7/2001 | Natural vegetation fire, other | 0.1 | River Park Dr & Wildwater Cir |
| 5/8/2001 | Forest, woods or wildland fire | 0.1 | 16222 Ursa Minor Cir |
| 5/9/2001 | Brush, or brush and grass mixture fire | 0.3 | Dimond Blvd & Victor Rd |
| 5/10/2001 | Grass fire | 0.1 | 3608 Lois Dr |
| 5/13/2001 | Brush, or brush and grass mixture fire | 0.1 | Gambell St & Benson Blvd |
| 5/12/2001 | Brush, or brush and grass mixture fire | 2 | Northway Dr & San Jeronimo Dr |
| 5/13/2001 | Forest, woods or wildland fire | 0.3 | New Glenn Hwy & N Eagle River Access Rd |
| 5/15/2001 | Grass fire | 1 | 9020 Andy Cir |
| 5/17/2001 | Brush, or brush and grass mixture fire | 0.1 | 12322 Woodward Dr |
| 5/17/2001 | Natural vegetation fire, other | 0.1 | 12720 Hace St |
| 5/17/2001 | Brush, or brush and grass mixture fire | 0.1 | Brayton Dr & Thuja Ave |
| 5/18/2001 | Brush, or brush and grass mixture fire | 0.2 | West of Fairbanks Street in the greenbelt. |
| 5/20/2001 | Grass fire | 0.2 | 1440 Muldoon Rd |
| 5/20/2001 | Brush, or brush and grass mixture fire | 1 | Northway Dr & Debarr Rd |
| 5/20/2001 | Brush, or brush and grass mixture fire | 0.1 | 2906 W 35th Ave |
| 5/20/2001 | Grass fire | 0.1 | Minnesota Dr & Westchester Lagoon |
| 5/21/2001 | Brush, or brush and grass mixture fire | 0.1 | 3910 Resurrection Dr |

| Date | Description | Acres Burned | Location |
|---|---|---|---|
| 5/21/2001 | Grass fire | 0.2 | Glenn Hwy & Boniface |
| 5/21/2001 | Brush, or brush and grass mixture fire | 0.1 | Boniface & Debarr Rd |
| 5/22/2001 | Natural vegetation fire, other | 0.1 | 1/4 mile past Earthquake Park on Pt Woronzof |
| 5/23/2001 | Brush, or brush and grass mixture fire | 0.1 | 36th Ave & Muldoon Rd |
| 5/23/2001 | Brush, or brush and grass mixture fire | 0.1 | Arctic & Lancaster Drive |
| 5/24/2001 | Grass fire | 0.1 | Heritage Dr btwn Muldoon Rd / Native Heritage Cent |
| 5/24/2001 | Grass fire | 0.1 | Heritage Dr btwn Muldoon Rd / Native Heritage Cent |
| 5/25/2001 | Brush, or brush and grass mixture fire | 0.1 | Northwood St & Dimond Blvd |
| 5/25/2001 | Grass fire | 0.1 | Northwood St & 45th Ave |
| 5/25/2001 | Brush, or brush and grass mixture fire | 0.1 | 32nd Ave & Wisconsin St |
| 5/26/2001 | Natural vegetation fire, other | 0.1 | Fireweed Lane & Juneau St |
| 5/26/2001 | Natural vegetation fire, other | 0.1 | New Seward & Tudor |
| 5/27/2001 | Brush, or brush and grass mixture fire | 0.1 | Barbara Falls Dr & Waterfall Dr |
| 5/27/2001 | Forest, woods or wildland fire | 1 | Lake Otis & OMalley |
| 5/27/2001 | Brush, or brush and grass mixture fire | 0.1 | W 36th Ave & Bruce Lane |
| 5/28/2001 | Brush, or brush and grass mixture fire | 0.1 | 8021 E 36th Ave |
| 5/28/2001 | Forest, woods or wildland fire | 1 | Ridgemont Dr & Lake Otis |
| 5/28/2001 | Forest, woods or wildland fire | 0.1 | 1700 E Tudor Rd |
| 5/26/2001 | Grass fire | 0.1 | 9499 Brayton Dr |
| 5/28/2001 | Brush, or brush and grass mixture fire | 2 | 6820 Sky Cir |
| 5/30/2001 | Forest, woods or wildland fire | 1.5 | Russian Jack Park so of 6th Ave |
| 5/31/2001 | Brush, or brush and grass mixture fire | 0.2 | OMalley & C |
| 5/31/2001 | Forest, woods or wildland fire | 0.1 | Mile 98 & Seward Hwy |
| 6/1/2001 | Grass fire | 0.2 | 8800 Heritage Dr |
| 6/1/2001 | Brush, or brush and grass mixture fire | 0.1 | Spruce Rd & Fergy Cir |
| 6/2/2001 | Grass fire | 0.1 | 413 E 16th Terr |
| 6/2/2001 | Brush, or brush and grass mixture fire | 0.1 | 7800 Debarr Rd |
| 6/2/2001 | Brush, or brush and grass mixture fire | 0.1 | 7001 Lake O the Hills Cir |
| 6/2/2001 | Forest, woods or wildland fire | 1 | Minnesota & W 100th Ave |
| 6/3/2001 | Forest, woods or wildland fire | 1 | Minnesota & W 100th Ave |
| 6/3/2001 | Brush, or brush and grass mixture fire | 0.1 | E Northern Lights Blvd & Goose Lake Dr |

| Date | Description | Acres Burned | Location |
|---|---|---|---|
| 6/3/2001 | Grass fire | 0.1 | 84th Ave & Lake Otis |
| 6/4/2001 | Natural vegetation fire, other | 0.1 | Victor & Old Klatt |
| 6/4/2001 | Grass fire | 0.1 | Heritage Dr & Muldoon Rd |
| 6/5/2001 | Brush, or brush and grass mixture fire | 0.1 | 1900 Congress Cir |
| 6/6/2001 | Brush, or brush and grass mixture fire | 0.1 | 8800 Heritage Dr |
| 6/8/2001 | Brush, or brush and grass mixture fire | 0.1 | 8800 Heritage Dr |
| 6/8/2001 | Grass fire | 0.1 | 2303 D St |
| 6/9/2001 | Forest, woods or wildland fire | 0.2 | Debarr Rd & Creekside St |
| 6/9/2001 | Forest, woods or wildland fire | 0.1 | Mile 108.5 Seward Hwy |
| 6/10/2001 | Brush, or brush and grass mixture fire | 0.2 | east side of Glenn Hwy NB prior to the Hiland exit |
| 6/13/2001 | Brush, or brush and grass mixture fire | 0.1 | 7301 Old Rabbit Creek Rd |
| 6/13/2001 | Natural vegetation fire, other | 0.1 | Northfleet & Seagate Cir |
| 6/15/2001 | Natural vegetation fire, other | 0.1 | 1910 Congress Cir |
| 6/15/2001 | Natural vegetation fire, other | 0.1 | 1741 W Northern Lights Blvd |
| 6/17/2001 | Brush, or brush and grass mixture fire | 0.1 | 3701 Eureka St |
| 6/16/2001 | Grass fire | 0.1 | Lake Otis & Mona Loop |
| 6/17/2001 | Forest, woods or wildland fire | 0.1 | Tudor & Arctic |
| 6/18/2001 | Forest, woods or wildland fire | 0.1 | Balto Seppala Park |
| 6/18/2001 | Natural vegetation fire, other | 0.1 | 1840 Minerva Way |
| 6/18/2001 | Brush, or brush and grass mixture fire | 0.1 | 801 E 82 Ave |
| 6/18/2001 | Brush, or brush and grass mixture fire | 0.2 | E 20 Ave & Karluk St |
| 6/20/2001 | Brush, or brush and grass mixture fire | 0.1 | On Muldoon Rd at E Northern Lights |
| 6/21/2001 | Grass fire | 0.2 | On E Klatt Rd at Johns Rd |
| 6/22/2001 | Brush, or brush and grass mixture fire | 0.1 | On W Dimond Blvd at C St |
| 6/23/2001 | Grass fire | 0.1 | On Muldoon Rd at Pioneer Dr |
| 6/23/2001 | Grass fire | 0.1 | On E 34TH Ave at OLD SEWARD Hwy |
| 6/23/2001 | Grass fire | 0.1 | 13650 Lake Otis Pky |
| 6/23/2001 | Natural vegetation fire, other | 0.1 | 651 W 92nd Ave |
| 6/25/2001 | Natural vegetation fire, other | 0.1 | On W Klatt Rd at Spyglass Cir |
| 6/25/2001 | Natural vegetation fire, other | 0.1 | On E 120th Ave at Division St |
| 6/25/2001 | Grass fire | 0.1 | On West Lake Ave at Moorland St |
| 6/25/2001 | Grass fire | 0.1 | 8033 Sand Lake Rd |
| 6/25/2001 | Brush, or brush and grass mixture fire | 0.1 | 4245 Debarr Rd |

| Date | Description | Acres Burned | Location |
|---|---|---|---|
| 6/26/2001 | Grass fire | 0.1 | 100' SW of intersection S Hoyt St & San Ernesto Av |
| 6/27/2001 | Brush, or brush and grass mixture fire | 0.1 | 5311 E 26th Ave |
| 6/27/2001 | Forest, woods or wildland fire | 0.1 | 579 E Dowling Rd |
| 6/28/2001 | Grass fire | 0.1 | On New Glenn Hwy at Boniface Pky |
| 6/28/2001 | Grass fire | 0.1 | 3751 Challenger Cir |
| 6/28/2001 | Forest, woods or wildland fire | 0.1 | E 16th Ave & A St south of Mulcahy Park in green |
| 6/28/2001 | Grass fire | 0.1 | 9220 Old Seward Hwy |
| 6/28/2001 | Natural vegetation fire, other | 0.1 | On W 88th Ave at Jewel Lake Rd |
| 6/29/2001 | Forest, woods or wildland fire | 0.1 | 23020 New Seward Hwy |
| 6/30/2001 | Forest, woods or wildland fire | 0.2 | 23020 New Seward Hwy |
| 7/1/2001 | Grass fire | 0.1 | 6865 All Star Cir |
| 7/1/2001 | Natural vegetation fire, other | 0.1 | 1000 E Northern Lights Blvd |
| 7/2/2001 | Forest, woods or wildland fire | 0.1 | 23020 New Seward Hwy |
| 7/2/2001 | Grass fire | 1 | 6301 Jewel Lake Rd |
| 7/2/2001 | Natural vegetation fire, other | 0.1 | On E 15th Ave at Sitka St |
| 7/3/2001 | Grass fire | 0.1 | 1741 W Northern Lights Blvd |
| 7/20/2001 | Forest, woods or wildland fire | 0.1 | Adjacent to C St |
| 7/26/2001 | Brush, or brush and grass mixture fire | 0.1 | On W 40th Ave at Wilson St |
| 7/26/2001 | Brush, or brush and grass mixture fire | 1 | 8300 Jodhpur St |
| 7/26/2001 | Grass fire | 0.1 | On Old Klatt Rd at Victor Rd |
| 7/28/2001 | Grass fire | 0.1 | Adjacent to 2400 E Northern Lights Blvd |
| 8/2/2001 | Authorized controlled burning | 0.1 | 7541 Upper Omalley Rd |
| 8/8/2001 | Authorized controlled burning | 0.5 | 2864 Commercial Dr |
| 8/11/2001 | Forest, woods or wildland fire | 0.1 | 3408 Tarwater Ave |
| 8/12/2001 | Natural vegetation fire, other | 0.1 | 5700 E 4th Ave |
| 8/16/2001 | Forest, woods or wildland fire | 0.1 | 2025 TERREBONNE Loop |
| 8/23/2001 | Grass fire | 0.1 | 24935 Mile 109 New Seward Hwy |
| 8/28/2001 | Natural vegetation fire, other | 0.1 | In front of 5700 E 4th Ave |
| 9/17/2001 | Natural vegetation fire, other | 0.1 | On Minnesota Dr at C St |
| 9/18/2001 | Natural vegetation fire, other | 0.1 | On W OMALLEY Rd at C St |
| 9/22/2001 | Brush, or brush and grass mixture fire | 0.1 | 400 Rodeo Cir |
| 9/24/2001 | Authorized controlled burning | 0.1 | 7015 Abbott Rd |
| 9/30/2001 | Brush, or brush and grass mixture fire | 0.1 | 1705 W 32ND Ave |
| 1/25/2002 | Authorized controlled burning | 0.1 | 2000 W Dimond Blvd |
| 1/26/2002 | Authorized controlled burning | 0.1 | On DOMAIN LN at MAUSEL St |

Source: AFD, 2004

Appendix F lists wildfire events from 1999 and 2000.

*Other Wildfire events*
*O'Malley/Hillside Fire, 1973*
In May 1973, a small brush fire at a private home, fanned by 40 mph winds, burned out of control in the foothills of the Chugach range. The fire threatened 25 homes, and forced several families to evacuate. By the time firefighters contained the blaze, 300 acres of brush and timber were destroyed.

*Vulnerability*
There are many factors that determine the number of parcels that are vulnerable to wildfires. As a result, the number of vulnerable parcels has not been calculated because the information will be out-dated quite quickly. For the latest vulnerability information, please contact the Wildfire Mitigation division of the Anchorage Fire Department.

### 4.1.3 EXTREME WEATHER

Extreme weather is a broad category that includes winter storms, heavy snow, extreme cold, ice storms, high wind, thunder & lightning, hail, coastal storms, and storm surge.

**Winter Storms**
Winter storms originate as mid-latitude depressions or cyclonic weather systems and are usually accompanied by high winds, heavy snow, and cold temperatures. To develop, they require:

- Cold air - Subfreezing temperatures (below 32ºF) in the clouds and/or near the ground to make snow and/or ice.
- Moisture - The air must contain moisture in order to form clouds and precipitation.
- Lift - A mechanism to raise the moist air to form the clouds and cause precipitation. Lift may be provided by any or all of the following:
  - The flow of air up a mountainside.
  - Fronts, where warm air collides with cold air and rises over the dome of cold air.
  - Upper-level low pressure troughs.

*Location*
The entire MOA can experience a winter storm. Different areas will have varying impacts depending on where the storm originates.

*Likelihood of Occurrence*

Anchorage has the potential for a winter storm every winter. The development on a winter storm depends on the weather conditions and their occurrence is random in nature.

*Historic Events*

*2003 Winter Storm – Federal Disaster 1461*

In March 2003, a winter storm brought high winds and freezing temperatures to Anchorage and surrounding communities for several days. This event involved a Bora wind, which is a very cold northerly wind (sometimes called the Matanuska wind). Bora winds are rare in Anchorage, and usually only occur every 10 to 15 years (Vonderheide, 2003). Prior to this event, the last one occurred in 1989.

Within the Municipality, the worst effects occurred in the west Anchorage area. Ted Stevens Anchorage International Airport had record high winds, sustained winds around 92-94 mph and a peak gust of 109 mph (Scott, Baines & Papineau, 2003). Damage for the event in MOA alone exceeded $3.5 Million. MOA conducted a voluntary on-line survey about the damage caused by storm. The survey results are displayed in Map 4.5.

*2000 Central Gulf Coast Storm - Federal Disaster 1316*

In December 1999 and January 2000, a series of severe winter storms triggered avalanches and flooding throughout Southcentral Alaska. Anchorage was one of many jurisdictions included in a Federal Disaster Declaration. In Anchorage, damage from this event included one fatality, property damage, disruption of electrical service, and interruption of rail and road access south of the Potter Weigh Station.

*Vulnerability*

As a winter storm could affect the entire Municipality, the entire MOA is represented in Table 4.4.

**Table 4.4 Winter Storm Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 59,426 | $3,066,038,500 | $8,334,412,600 | $11,398,571,591 |
| **Commercial** | 3,419 | $605,885,600 | $1,579,095,500 | $2,132,773,711 |
| **Industrial** | 1,610 | $180,641,800 | $290,159,100 | $469,225,809 |
| **Institutional** | 702 | $26,876,800 | $188,839,300 | $90,308,164 |
| **Parks, Open Space & Recreation Areas** | 1,319 | $107,600 | $203,400 | $311,000 |
| **Transportation Related** | 419 | $236,100 | $165,900 | $402,000 |
| **Other** | 300 | $352,000 | $44,400 | $307,600 |
| **Vacant** | 10,326 | $570,157,400 | $450,103,500 | $1,015,367,523 |

| | | | | |
|---|---|---|---|---|
| **Unidentified** | 4,325 | $419,913,000 | $924,182,300 | $1,341,953,131 |
| **Total** | **81,846** | **$4,870,208,800** | **$11,767,206,000** | **$16,449,220,529** |

### Heavy Snow

Heavy snow is generally considered to be more than 6 inches of accumulation in less than 24 hours. Heavy snow can have a significant impact on an area. Until the snow can be removed, airports and roadways experience delay, or are closed completely, stopping the flow of traffic, supplies and disrupting emergency and medical services. Heavy snow loads can damage light aircraft and sink small boats. It can also cause roofs to collapse and knock down trees and power lines.

**Snow Terminology**

Snow is defined as a steady fall of snow for several hours or more.

Heavy Snow generally means:
- Snowfall accumulating to 4 inches or more in depth in 12 hours or less
- Snowfall accumulating to 6 inches or more in depth in 24 hours or less

Snow Squalls are periods of moderate to heavy snowfall, intense, but of limited duration, accompanied by strong, gusty surface winds, and possibly lightning.

A Snow Shower is a short duration of moderate snowfall.

Snow Flurries are an intermittent light snowfall of short duration with no measurable accumulation.

Blowing Snow is wind-driven snow that reduces surface visibility. Blowing snow can be falling snow or snow that already has accumulated but is picked up and blown by strong winds.

Drifting Snow is an uneven distribution of snowfall and snow depth caused by strong surface winds. Drifting snow may occur during or after a snowfall.

A Blizzard means that the following conditions are expected to prevail for a period of 3 hours or longer:
- Sustained wind or frequent gusts to 35 miles/hour or greater
- Considerable falling and/or blowing snow reducing visibility to less than 1/4 mile
- Freezing Rain or Drizzle occurs when rain or drizzle freezes on surfaces such as the ground, trees, power lines, motor vehicles, streets, highways, etc.

Heavy snowfalls can cause secondary hazards. In the mountains, heavy snow can lead to avalanches. A quick thaw can cause flooding, especially along small streams and in urban areas. The cost of snow removal, repairing damages, and the loss of business can have severe economic impacts.

*Location*

The entire Municipality can get heavy snows but Girdwood tends to receive more snow than other areas. In general, the location of heavy snowfall depends on the weather system involved. The typical storm is a low pressure system originating in Prince William Sound that moves in from the East. This results in heavier snow on the hillside, and less as you get further from the mountains. When the storm is out of the south, the snowfall is heavier in West Anchorage (Vonderheide, 2003). Occasionally, air comes up Cook Inlet and hits the mountains. This may lead to heavy snow on the upper hillside and less in the bowl area (Vonderheide, 2003). See Map 4.6 for the average annual snowfall pattern in MOA.

Snowfall tends to be highest in December and at higher elevations such as those on the Hillside. Tables 4.5, 4.6, and 4.7 show the average total snowfall at selected weather stations in the Anchorage Bowl, Eagle River/Chugiak, and Girdwood respectively. Tables 4.8 and 4.9 show the snow depth at selected weather stations in the Anchorage Bowl and Eagle River/Chugiak. Data for Girdwood was unavailable.

**Table 4.5 Anchorage Bowl Average Total Snowfall (inches)**

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANCHORAGE INTERNATIONAL AIRPORT | 11.25 | 7.54 | 7.3 | 2.8 | 0.64 | 0.02 | 0 | 0 | 0.02 | 5.35 | 9.86 | 12 | 57.63 |
| ELMENDORF AIR FORCE BASE | 10.46 | 12.94 | 8.98 | 4.81 | 0.16 | 0 | 0 | 0 | 0.2 | 9.57 | 13.38 | 16.54 | 80.88 |
| GLEN ALPS | 23.48 | 24.6 | 24.14 | 11.96 | 3.32 | 0 | 0 | 0 | 1.2 | 17.93 | 24.56 | 35.15 | 171.07 |

Source: Western Regional Climate Center, 2003

**Table 4.6 Eagle River/Chugiak Average Total Snowfall (inches)**

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EKLUTNA LAKE | 6.16 | 2.34 | 5.44 | 0.19 | 0.05 | 0 | 0 | 0 | 0 | 1.41 | 2.09 | 14.75 | 47.43 |
| EKLUTNA PROJECT | 7.76 | 9.36 | 7.8 | 2.35 | 0.05 | 0 | 0 | 0 | 0.01 | 5.36 | 10.37 | 13.05 | 55.09 |

Source: Western Regional Climate Center, 2003

**Table 4.7 Girdwood Average Total Snowfall (inches)**

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALYESKA | 29.1 | 32.27 | 32.27 | 11.72 | 1.09 | 0 | 0 | 0 | 0 | 13.07 | 26.8 | 48.82 | 216.66 |

Source: Western Regional Climate Center, 2003

**Table 4.8 Anchorage Bowl Average Snow Depth (inches)**

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANCHORAGE INTERNATIONAL AIRPORT | 10 | 10 | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 6 | 3 |
| ELMENDORF AIR FORCE BASE | 12 | 13 | 11 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 9 | 4 |
| GLEN ALPS | 40 | 48 | 51 | 43 | 6 | 0 | 0 | 0 | 0 | 3 | 11 | 29 | 19 |

Source: Western Regional Climate Center, 2003

**Table 4.9 Eagle River/Chugiak Average Snow Depth (inches)**

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EKLUTNA LAKE | 9 | 12 | 10 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 3 |
| EKLUTNA PROJECT | 10 | 12 | 13 | 8 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 8 | 5 |

Source: Western Regional Climate Center, 2003

*Likeliness of Occurrence*

While snow falls frequently in Anchorage during the winter, most snowfalls are not usually heavy. However, heavy snowfalls are possible every winter. Their occurrence depends on the weather conditions.

*Historic Events*

*2002 Heavy Snow Fall*

Record heavy snow occurred in MOA on March 17, 2002 when 2 to 3 feet of snow fell in less than 24 hours. Ted Stevens Anchorage International Airport recorded a total of 28.7 inches while an observer near Lake Hood measured over 33 inches. The Municipality was essentially shut down because of the accumulating snow. Fortunately, the storm occurred on a Sunday morning when fewer businesses are open. The following day, both military bases, both universities, and many businesses remained closed, while Anchorage schools remained closed for 2 days. It took 4 days for snowplows to reach all areas of the city.

*Other Snow Events*

On March 20, 2001, 8-12 inches of snow fell in the Anchorage Bowl-Eagle River area.

**Snowfall records**

Normal snowfall – 69.5'

**Top 5 Highest Winter Snowfall**

171.8 inches.....1955-1956
123.1 inches.....1949-1950
121.1 inches.....1994-1995
119.1 inches.....1996-1997
105.0 inches.....1959-1960

**Top 5 Lowest Winter Snowfall**

30.4 inches.....1957-1958
32.6 inches.....1941-1942
32.9 inches.....1980-1981
38.5 inches.....1960-1961
38.7 inches.....1986-1987

**Top 5 Highest Daily Snowfall**

25.7 inches.....March 17, 2002
15.6 inches.....December 29, 1955
15.1 inches.....December 4, 1998
14.3 inches.....March 18, 1976
13.4 inches.....December 28, 1955

**Maximum Snow Depth**

47 inches.....December 31, 1955 and January 1, 1956

Source: National Weather Service Anchorage Forecast Office's Climate Records List, (1917 – 2002)

*Vulnerability*

As a heavy snowfall could affect the entire Municipality, the entire MOA is represented in Table 4.10.

**Table 4.10 Heavy Snow Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 59,426 | $3,066,038,500 | $8,334,412,600 | $11,398,571,591 |
| **Commercial** | 3,419 | $605,885,600 | $1,579,095,500 | $2,132,773,711 |
| **Industrial** | 1,610 | $180,641,800 | $290,159,100 | $469,225,809 |
| **Institutional** | 702 | $26,876,800 | $188,839,300 | $90,308,164 |
| **Parks, Open Space & Recreation Areas** | 1,319 | $107,600 | $203,400 | $311,000 |
| **Transportation Related** | 419 | $236,100 | $165,900 | $402,000 |
| **Other** | 300 | $352,000 | $44,400 | $307,600 |
| **Vacant** | 10,326 | $570,157,400 | $450,103,500 | $1,015,367,523 |
| **Unidentified** | 4,325 | $419,913,000 | $924,182,300 | $1,341,953,131 |
| **Total** | **81,846** | **$4,870,208,800** | **$11,767,206,000** | **$16,449,220,529** |

## Heavy Rain

There is no universal definition of heavy rain. Generally, when rainfall is sufficient to cause localized or widespread flooding, it is considered heavy. One definition for heavy rain, from Environment Canada, is 50 millimeters (mm) (1.97 inches) of rain over a 12-hour period or less, or 80 mm (3.15 inches) of rain in less than 24 hours (50 mm [1.97 inches] of rain over 24 hours or less in areas north of 60°, such as Alaska).

*Location*

The Girdwood area receives the most railfall. See Map 4.7 for the average annual rainfall pattern. Rainfall also varies with time of year with most precipitation occurring in late summer and fall. Tables 4.11-4.13 show the average monthly precipitation at selected weather stations in the Anchorage Bowl, Eagle River/Chugiak, and Girdwood. The data for the three tables is from http://www.wrcc.dri.edu/summary/climsmak.html

### Precipitation Records

**Normal Precipitation:** 16.08"
**Highest Annual Precipitation:** 27.75" (1989)
**Lowest Annual Precipitation**: 8.08" (1969)
**Longest Consecutive Days with Measurable Precipitation:** 17 days (September 12 – 28, 1979)
**Consecutive Days Without Precipitation:** 47 (January 6 – February 21, 1939)

Source: National Weather Service Anchorage Forecast Office's Climate Records List, (1917 – 2002)

**Table 4.11 Anchorage Bowl Average Monthly Precipitation (inches)**

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANCHORAGE INTERNATIONAL AIRPORT | 0.82 | 0.58 | 0.54 | 0.38 | 0.56 | 1.01 | 1.6 | 2.62 | 2.58 | 1.99 | 1.03 | 0.93 | 14.62 |
| ELMENDORF AIR FORCE BASE | 0.86 | 0.94 | 0.74 | 0.57 | 0.61 | 1.07 | 2.1 | 2.58 | 2.42 | 1.78 | 1.19 | 1.3 | 16.15 |
| GLEN ALPS | 2.05 | 1.91 | 1.68 | 1.28 | 1.12 | 1.46 | 2.4 | 3.3 | 4.2 | 3.12 | 2.2 | 2.7 | 27.4 |

Source: Western Regional Climate Center, 2003

**Table 4.12 Eagle River/Chugiak Average Monthly Precipitation (inches)**

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EKLUTNA LAKE | 0.69 | 0.46 | 0.5 | 0.5 | 0.52 | 1.04 | 1.6 | 1.64 | 1.64 | 1.27 | 0.86 | 1.22 | 11.89 |
| EKLUTNA PROJECT | 1.04 | 0.93 | 0.75 | 0.61 | 0.79 | 1.75 | 2.8 | 2.56 | 2.48 | 1.73 | 1.27 | 1.32 | 18.08 |

Source: Western Regional Climate Center, 2003

**Table 4.13 Girdwood Average Monthly Precipitation (inches)**

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALYESKA | 8.75 | 5.13 | 4.82 | 4.97 | 3.78 | 2.45 | 2.6 | 4.57 | 7.73 | 7.86 | 6.35 | 8.69 | 67.71 |

Source: Western Regional Climate Center, 2003

*Likelihood of Occurrence*

The occurrence of heavy rain depends on the weather conditions.

*Historic Events*

No significant historic heavy rainfalls have been identified

*Vulnerability*

As a heavy rain could affect the entire Municipality, the entire MOA is represented in Table 4.14.

**Table 4.14 Heavy Rain Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 59,426 | $3,066,038,500 | $8,334,412,600 | $11,398,571,591 |
| **Commercial** | 3,419 | $605,885,600 | $1,579,095,500 | $2,132,773,711 |
| **Industrial** | 1,610 | $180,641,800 | $290,159,100 | $469,225,809 |
| **Institutional** | 702 | $26,876,800 | $188,839,300 | $90,308,164 |
| **Parks, Open Space & Recreation Areas** | 1,319 | $107,600 | $203,400 | $311,000 |
| **Transportation Related** | 419 | $236,100 | $165,900 | $402,000 |
| **Other** | 300 | $352,000 | $44,400 | $307,600 |
| **Vacant** | 10,326 | $570,157,400 | $450,103,500 | $1,015,367,523 |
| **Unidentified** | 4,325 | $419,913,000 | $924,182,300 | $1,341,953,131 |
| **Total** | **81,846** | **$4,870,208,800** | **$11,767,206,000** | **$16,449,220,529** |

## 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.

**Frostbite** is damage to body tissue caused by that tissue being frozen. Frostbite causes a loss of feeling and a white or pale appearance in the extremities.
**Hypothermia** is low body temperature. Normal body temperature is 98.6ºFahrenheit (F). When body temperature drops to 95ºF, however, immediate medical help is needed. Hypothermia also can occur with prolonged exposure to temperatures above freezing.

Extreme cold can also bring transportation to a halt for days or weeks at a time. Aircraft may be grounded due to extreme cold and ice fog conditions. Long cold spells can cause rivers to freeze which increases the likelihood of ice jams and ice jam related flooding. If extreme cold conditions are combined with low or no snow cover, the ground's frost depth can increase, and disturb buried utility pipes.

The greatest danger from extreme cold is to people. Prolonged exposure to the cold can cause frostbite or hypothermia and become life threatening, especially for infants and the elderly. Carbon monoxide poisonings also increase as people use supplemental heating devices.

*Location*

In MOA, the official temperature is recorded at the Ted Stevens Anchorage International Airport. Due to its close proximity to open water, the airport tends to be warmer than the rest of Anchorage. For example, east Anchorage is generally 10 to 15 degrees cooler than at the airport (Vonderheide, 2003). The Eagle River/Chugiak area tends to get the coolest temperatures in the winter. See Map 4.8 for the extreme minimum temperatures.

The coldest months in Anchorage are generally December, January, and February. The temperature tends to decrease, the further inland you are. Tables 4.15-4.20 show monthly average mean and minimum temperatures for selected weather stations in the Anchorage Bowl, Eagle River/Chugiak, and Girdwood.

Table 4.15 Anchorage Bowl Monthly Average Mean Temperatures

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ANCHORAGE INTERNATIONAL AIRPORT** | 15.8 | 18.7 | 25.9 | 36.3 | 46.9 | 54.7 | 58.4 | 56.4 | 48.2 | 34.1 | 21.8 | 17.5 | 36.2 |
| ELMENDORF AIR FORCE BASE | 14 | 16.9 | 24.6 | 36.1 | 47 | 54.8 | 58.7 | 56.7 | 48.2 | 33.5 | 20.4 | 15.9 | 35.6 |
| FT RICHARDSON WTP | 14.4 | 17.5 | 25.1 | 35 | 45.8 | 53.5 | 57.1 | 55.3 | 46.8 | 32.6 | 20.4 | 16.2 | 35 |
| GLEN ALPS | 17.8 | 18.9 | 22.9 | 30.5 | 40 | 48.1 | 52 | 50.5 | 42.7 | 30.7 | 22.6 | 19.7 | 33 |

Source: Alaska Climate Research Center, 2003

Table 4.16 Anchorage Bowl Monthly Average Minimum Temperatures

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ANCHORAGE INTERNATIONAL AIRPORT | 9.3 | 11.7 | 18.2 | 28.7 | 38.9 | 47 | 51.5 | 49.4 | 41.4 | 28.3 | 15.9 | 11.4 | 29.3 |
| ELMENDORF AIR FORCE BASE | 7.1 | 9.1 | 16.4 | 28.5 | 39.1 | 47.6 | 52.3 | 49.9 | 41.6 | 27.6 | 14.2 | 9.5 | 28.6 |
| FT RICHARDSON WTP | 7.3 | 9.6 | 15.8 | 26 | 36.7 | 44.6 | 48.9 | 46.7 | 38.9 | 25.6 | 13.6 | 9.4 | 26.9 |
| GLEN ALPS | 11 | 11.4 | 15.1 | 23.4 | 33.3 | 40.7 | 45.1 | 43.7 | 36.4 | 24.3 | 15.9 | 13.2 | 26.1 |

Source: Alaska Climate Research Center, 2003

Table 4.17 Eagle River/Chugiak Monthly Average Mean Temperatures

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAGLE RIVER 5 SE | 12.8 | 17.3 | 25.6 | 36.6 | 46.9 | 54.6 | 58.2 | 56 | 47.3 | 32.7 | 18.2 | 14 | 35 |
| EKLUTNA PROJECT | 10.2 | 14.8 | 23.5 | 37.1 | 47.6 | 55.5 | 58.6 | 55.3 | 46.3 | 32.3 | 17.9 | 13.2 | 34.4 |

Source: Alaska Climate Research Center, 2003

Table 4.18 Eagle River/Chugiak Monthly Average Minimum Temperatures

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EAGLE RIVER 5 SE | 4.9 | 8 | 14.4 | 25.1 | 34.7 | 42.9 | 47.7 | 45.5 | 37.4 | 25 | 11 | 6.6 | 25.3 |
| EKLUTNA PROJECT | 2 | 5.3 | 12.2 | 25.7 | 35.2 | 43.5 | 47.5 | 44.2 | 36.8 | 24.5 | 10.1 | 5 | 24.3 |

Source: Alaska Climate Research Center, 2003

Table 4.19 Girdwood Monthly Average Mean Temperatures

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALYESKA | 20.4 | 22.2 | 27.7 | 35.8 | 44.3 | 52.2 | 56.7 | 54.8 | 47.4 | 35.8 | 26.3 | 22.5 | 37.2 |

Source: Alaska Climate Research Center, 2003

Table 4.20 Girdwood Monthly Average Minimum Temperatures

| Station | January | February | March | April | May | June | July | August | September | October | November | December | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALYESKA | 14.2 | 15.2 | 19.4 | 27.4 | 35.5 | 42.9 | 47.8 | 46.2 | 39.5 | 29.2 | 20.2 | 16.4 | 29.5 |

Source: Alaska Climate Research Center, 2003

*Likelihood of Occurrence*

Extreme cold temperatures could happen every winter, depending on weather conditions.

*Historic Events*

Extreme cold temperatures can be especially problematic if they are associated with low snow levels as happened in the winter of 1995-1996. The combination of these two factors resulted in the ground freezing to a greater depth than usual (more than 10 feet compared to the usual 3 or 4 feet). As utility pipes, including water and wastewater, are buried to a depth of 10 feet, some pipes froze and subsequently broke. Repairing the broken pipes was a massive undertaking as the ground had to be thawed before work could commence (Vonderheide, 2003).

*Vulnerability*

As extreme cold could affect the entire Municipality, the entire MOA is represented in Table 4.21.

**Table 4.21 Extreme Cold Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 59,426 | $3,066,038,500 | $8,334,412,600 | $11,398,571,591 |
| **Commercial** | 3,419 | $605,885,600 | $1,579,095,500 | $2,132,773,711 |
| **Industrial** | 1,610 | $180,641,800 | $290,159,100 | $469,225,809 |
| **Institutional** | 702 | $26,876,800 | $188,839,300 | $90,308,164 |
| **Parks, Open Space & Recreation Areas** | 1,319 | $107,600 | $203,400 | $311,000 |
| **Transportation Related** | 419 | $236,100 | $165,900 | $402,000 |
| **Other** | 300 | $352,000 | $44,400 | $307,600 |
| **Vacant** | 10,326 | $570,157,400 | $450,103,500 | $1,015,367,523 |
| **Unidentified** | 4,325 | $419,913,000 | $924,182,300 | $1,341,953,131 |
| **Total** | **81,846** | **$4,870,208,800** | **$11,767,206,000** | **$16,449,220,529** |

## Ice Storms

Ice storm is the term used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Ice storms

result from the accumulation of freezing rain (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. Ice storms can be devastating and are often the cause of automobile accidents, power outages and personal injuries.

Glace ice, also known as black ice, which occurs when rains hits the cold ground and turns into ice, is possible in the MOA. It is responsible for multiple traffic accidents every winter.

*Location*

Ice storms can occur anywhere but the atmospheric conditions that can lead to ice storms occur most frequently around Cook Inlet.

*Likelihood of Occurrence*

The future occurrence of ice storms in Anchorage depends on the weather conditions.

*Historic Events*

No significant historic ice storms have been identified.

*Vulnerability*

As an ice storm could affect the entire Municipality, the entire MOA is represented in Table 4.22.

**Table 4.22 Ice Storm Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 59,426 | $3,066,038,500 | $8,334,412,600 | $11,398,571,591 |
| **Commercial** | 3,419 | $605,885,600 | $1,579,095,500 | $2,132,773,711 |
| **Industrial** | 1,610 | $180,641,800 | $290,159,100 | $469,225,809 |
| **Institutional** | 702 | $26,876,800 | $188,839,300 | $90,308,164 |
| **Parks, Open Space & Recreation Areas** | 1,319 | $107,600 | $203,400 | $311,000 |
| **Transportation Related** | 419 | $236,100 | $165,900 | $402,000 |
| **Other** | 300 | $352,000 | $44,400 | $307,600 |
| **Vacant** | 10,326 | $570,157,400 | $450,103,500 | $1,015,367,523 |
| **Unidentified** | 4,325 | $419,913,000 | $924,182,300 | $1,341,953,131 |
| **Total** | **81,846** | **$4,870,208,800** | **$11,767,206,000** | **$16,449,220,529** |

## High Winds

High winds are generally considered to be winds in excess of 60 miles per hour (mph). They can lead to dangerous wind chill temperatures or combine with loose snow to produce blinding blizzard conditions. High winds have the

potential to cause serious damage to a community's infrastructure, especially above ground utility lines.

In mountainous areas, down slope windstorms created by temperature and pressure differences across the terrain can produce winds in excess of 100 mph. These windstorms can be particularly damaging as they are gusty in character and may seem to come from several directions.

*Location*

The Anchorage Area-Wide Wind Speed Study developed a wind zone map for the Anchorage Building Service Area (RWDI, 1998a). The resulting map represents the 50-year mile wind speed (see Map 4.11). This report noted that Anchorage gets strong winds from the southerly direction in the summer and northerly directions during the winter (RWDI, 1998).

Localized high winds can also occur. The most well known local wind is the Chugach wind which blows off the Chugach Mountains. These Chugach winds are really Chinook winds (a strong warm wind) and mostly affect the eastern side of the Anchorage Bowl. There can be winds just in the Turnagain Arm area, which affects traffic on the New Seward Highway (Vonderheide, 2003). Winds near McHugh Creek can get in the 80-90 mph range (Vonderheide, 2003). There is a Knik Valley wind, which brings warm air from Prince William Sound. The hillside area can experience a Chinook/Chugach wind. Eagle River can get winds from the Southeast. Localized winds in Bear Valley can reach 125 mph.

*Likelihood of Occurrence*

High wind advisories, watches, and warnings are frequently issued by the National Weather Service (NWS) for different parts of Anchorage.

*Historic Events*

*April 1980 Windstorm*

On April 1, 1980, a Chinook wind with maximum gust speeds estimated at 134 miles per hour caused approximately $25 million in damages.

*Other Wind Events* (From RWDI 1998a and b)

- December 3, 1994 - southeasterly downslope wind storm
- Feburary 20, 1994 – northeasterly wind storm
- November 22, 1993 - southeasterly downslope wind storm
- February 3, 1993 – northeasterly wind storm
- December 1, 1992 windstorm - southeasterly downslope wind storm
    - Had maximum gust speeds estimated at 112mph
- December 26, 1991 - southeasterly downslope wind storm
- March 4, 1989 – northeasterly wind storm

- November 9, 1986 – southeasterly downslope wind storm
- February 14, 1979 – northeasterly windstorm

*Vulnerability*

The entire MOA was not included in the Anchorage Area-Wide Wind Speed Study. The area included in the study is shown on Map 4.9. The size of each wind speed zone is shown in table 4.23. The vulnerability tables for each wind speed zone (tables 4.24 – 4.27) only reflect the area included in the study.

**Table 4.23 Area of Wind Speed Zones**

| Wind Speed Zone (mph) | Acres |
|---|---|
| 90 | 21,566 |
| 80 | 31,637 |
| 100 | 12,179 |
| 105 | 22,424 |

**Table 4.24 80 mph wind speed Vulnerability in the Anchorage Building Service Area**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 18,276 | $936,597,800 | $2,496,505,400 | $3,432,540,030 |
| **Commercial** | 2,176 | $345,494,400 | $1,116,758,400 | $1,415,560,023 |
| **Industrial** | 763 | $66,722,500 | $123,800,000 | $189,888,047 |
| **Institutional** | 302 | $53,987,934 | $302 | $0 |
| **Parks, Open Space & Recreation Areas** | 452 | $40,800 | $33,700 | $74,500 |
| **Transportation Related** | 409 | $27,900 | $0 | $27,900 |
| **Other** | 74 | $72,000 | $44,400 | $116,400 |
| **Vacant** | 1,864 | $135,764,500 | $89,349,200 | $224,899,818 |
| **Unidentified** | 969 | $104,561,600 | $298,227,300 | $401,339,047 |
| **Total** | **25,285** | **$1,643,269,434** | **$4,124,718,702** | **$5,664,445,765** |

**Table 4.25 90 mph wind speed Vulnerability in the Anchorage Building Service Area**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 10,394 | $495,963,800 | $1,335,784,300 | $1,831,593,452 |
| **Commercial** | 806 | $167,427,700 | $314,512,100 | $480,179,007 |
| **Industrial** | 633 | $100,189,800 | $146,761,300 | $246,278,001 |
| **Institutional** | 136 | $9,361,900 | $141,872,900 | $29,601,030 |
| **Parks, Open Space & Recreation Areas** | 169 | $12,300 | $0 | $12,300 |

| | | | | |
|---|---|---|---|---|
| **Transportation Related** | 1 | $0 | $0 | $0 |
| **Other** | 12 | $0 | $0 | $0 |
| **Vacant** | 2,142 | $139,633,600 | $114,182,800 | $252,670,861 |
| **Unidentified** | 590 | $152,471,600 | $312,639,300 | $464,453,728 |
| **Total** | **14,883** | **$1,065,060,700** | **$2,365,752,700** | **$3,304,788,379** |

**Table 4.26 100 mph wind speed Vulnerability in the Anchorage Building Service Area**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 12,079 | $628,334,900 | $1,644,410,600 | $2,272,035,678 |
| **Commercial** | 193 | $53,205,100 | $84,940,300 | $137,622,919 |
| **Industrial** | 74 | $7,120,500 | $10,208,900 | $17,285,097 |
| **Institutional** | 87 | $2,986,200 | $3,420,200 | $3,693,072 |
| **Parks, Open Space & Recreation Areas** | 209 | $0 | $0 | $0 |
| **Transportation Related** | 0 | $0 | $0 | $0 |
| **Other** | 30 | $188,100 | $0 | $175,400 |
| **Vacant** | 992 | $74,884,700 | $66,841,200 | $141,725,900 |
| **Unidentified** | 858 | $72,238,600 | $153,740,300 | $225,943,756 |
| **Total** | **14,522** | **$838,958,100** | **$1,963,561,500** | **$2,798,481,822** |

**Table 4.27 105 mph wind speed Vulnerability in the Anchorage Building Service Area**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 8,634 | $499,830,500 | $1,463,837,100 | $1,963,533,200 |
| **Commercial** | 24 | $10,828,000 | $12,115,400 | $22,836,124 |
| **Industrial** | 16 | $2,513,100 | $918,900 | $3,208,764 |
| **Institutional** | 42 | $171,600 | $372,400 | $203,771 |
| **Parks, Open Space & Recreation Areas** | 182 | $0 | $0 | $0 |
| **Transportation Related** | 0 | $0 | $0 | $0 |
| **Other** | 19 | $0 | $0 | $0 |
| **Vacant** | 1,493 | $82,675,500 | $77,908,800 | $160,524,600 |
| **Unidentified** | 623 | $38,535,700 | $61,512,400 | $100,048,100 |
| **Total** | **11,033** | **$634,554,400** | **$1,616,665,000** | **$2,250,354,559** |

## Fog

Fog is basically a cloud on the ground. When the air is saturated with water vapor, a drop in temperature will cause the excess water vapor to condense into water droplets. These droplets, if thick enough, will turn into fog.

When it is foggy, ice can be deposited on the roadways causing black ice conditions (Vonderheide, 2003).

*Location*
Fog is more frequent in West Anchorage. In the fall and early winter, a northerly wind comes from the north and reduces visibility. In East Anchorage, the drainage winds from the mountains mix the air to help keep the area relatively fog free.

Fog can also occur in the lower parts of Eagle River, but it is rare in the higher elevations.

*Likelihood of Occurrence*
Fog is likely to occur when the climatic conditions are right. Fog events are usually short-term with no lasting effects.

*Historic Events*
No significant historic fog events have been identified to date.

*Vulnerability*
As fog could affect the entire Municipality, the entire MOA is represented in Table 4.28.

**Table 4.28 Fog Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 59,426 | $3,066,038,500 | $8,334,412,600 | $11,398,571,591 |
| **Commercial** | 3,419 | $605,885,600 | $1,579,095,500 | $2,132,773,711 |
| **Industrial** | 1,610 | $180,641,800 | $290,159,100 | $469,225,809 |
| **Institutional** | 702 | $26,876,800 | $188,839,300 | $90,308,164 |
| **Parks, Open Space & Recreation Areas** | 1,319 | $107,600 | $203,400 | $311,000 |
| **Transportation Related** | 419 | $236,100 | $165,900 | $402,000 |
| **Other** | 300 | $352,000 | $44,400 | $307,600 |
| **Vacant** | 10,326 | $570,157,400 | $450,103,500 | $1,015,367,523 |
| **Unidentified** | 4,325 | $419,913,000 | $924,182,300 | $1,341,953,131 |
| **Total** | **81,846** | **$4,870,208,800** | **$11,767,206,000** | **$16,449,220,529** |

## Other Weather Events

Other extreme weather events that are possible, but rare, in the MOA include:

- Tornados
- Coastal Storms
- Storm Surges
- Thunder and Lightning

- Hail

## 4.1.4 FLOODING

### *Types of Flooding*

Flooding can be broken into a number of categories including rainfall-runoff floods, snowmelt floods, ground-water floods, ice jam floods, flash floods, fluctuating lake levels, alluvial fan floods and glacial outburst floods. Coastal flooding from storm surge is not a concern in Anchorage because much of the coastal areas are elevated on bluffs. These are not exclusive categories as a flood event could have elements of more than one type. The types of floods in detail are:

*Rainfall-Runoff Floods*

Typically, rainfall-runoff floods occur in mid to late summer. The rainfall intensity, duration, distribution and geomorphic characteristics of the watershed all play a role in determining the magnitude of the flood. This is the most common type of flood.

*Snowmelt Floods*

Snowmelt floods usually occur in the spring or early summer. The depth of the snowpack and spring weather patterns influences the magnitude of flooding. Snowmelt floods can also be caused by glacial melt.

*Ground-water Floods*

Ground-water flooding occurs when water accumulates and saturates the soil. The water-table rises and floods low-lying areas, including homes, septic tanks, and other facilities.

*Ice Jam Floods*

Ice jams can form during fall freeze up, in midwinter when stream channels freeze forming anchor ice and during spring breakup when the existing ice cover gets broken into pieces and the pieces get stuck at bridges or other constrictions. When the ice jam fails, it releases the collected water.

Water collects upstream from a jam, flooding an area by creating a lake-like effect that has a large areal extent. The effect is analogous to a dam. Little damage typically occurs from the current upstream of the jam but significant damage can result from flooding. The downstream effect is very different. Once the jam is breached there is usually a rapid draining of the water dammed behind the jam. Not only does the downstream stage rise substantially once the jam is breached, but there is substantial current, which can cause erosion and significant damage. Additionally, the rising water causes the ice to float and the increased velocities move the ice further downstream. The motion of large solid blocks of ice is often very destructive.

*Flash Floods*
These floods are characterized by a rapid rise in water level. They are often caused by heavy rain on small stream basins, ice jam formation, or by dam failure. Flash floods are usually swift moving and debris filled, which cause them to be very powerful and destructive. Steep coastal areas in general are subject to flash floods.

*Fluctuating Lake Level Floods*
Generally, lakes buffer downstream flooding due to the storage capacity of the lake. But when lake inflow is excessive, flooding of the lake shore area can occur.

*Alluvial Fan Floods*
Alluvial fans are areas of eroded rock and soil deposited by rivers. When various forms of debris fills the existing river channels on the alluvial fan, the water overflows and is forced to cut a new channel. Fast, debris filled water causes erosion and flooding problems over large areas. The Girdwood area is prone to this type of flooding.

*Glacial Outburst Floods*
A glacial outburst flood, also known as a jökulhlaup, is a sudden release of water from a glacier or a glacier-dammed lake. They can fail by overtopping, earthquake activity, melting from volcanic activity, or draining through conduits in the glacier dam.

Subglacial releases occur when enough hydrostatic pressure occurs from accumulated water to “float” the glacial ice. Water then drains rapidly from the bottom of the lake.

Other problems related to flooding are deposition and stream bank erosion. Deposition is the accumulation of soil, silt, and other particles on a river bottom or delta. Deposition leads to the destruction of fish habitat and presents a challenge for navigational purposes. Deposition also reduces channel capacity, resulting in increased flooding or bank erosion. Stream bank erosion involves the removal of material from the stream bank. When bank erosion is excessive, it becomes a concern because it results in loss of streamside vegetation, loss of fish habitat, and loss of land and property.

According to FEMA, flooding in MOA can occur because of a variety of reasons including temperature, precipitation, snow pack levels, etc. (FEMA, 2002). Anchorage has experienced flood issues because of inadequately sized culverts, damaged culverts, blocked culverts, development encroaching and blocking floodplains, and high velocity flows (FEMA, 2002).

Flooding generally occurs along the banks of a water body. The Principal Drainages in MOA include:

- Peters Creek
- Meadow Creek
- Ship Creek
- Chester Creek
- Fish Creek
- Campbell Creek
- Rabbit Creek
- California Creek
- Glacier Creek

*Location*

The flood hazard varies by location and type of flooding. The FEMA Flood Insurance Study from 2002 identified potential areas of flooding. The study excluded Fire Island, Elmendorf Air Force Base, Fort Richardson Military Reservation and Kincaid Park (referred to in the study as the Point Campbell Military Reservation).

According to this report, most of the development land in MOA is "low, swampy, and subject to inundate from flooding" (FEMA, 2002). Map 4.10 shows flood prone areas in the MOA. This map is for illustrative purposes as not all the floodplains identified on MOA's Flood Insurance Rate Maps (FIRM) are on this map. The main flood prone areas are near Glacier and California Creeks in Girdwood, near Eagle River Road in Eagle River, Potter's Marsh, and along Campbell and Chester Creeks in Anchorage. Please see the appropriate FIRM for more detailed flood information.

Areas with low development potential or minimal flood hazard include:

- Eklutna River
- Fire Creek
- Eagle River
- Rainbow Creek
- Indian Creek
- Twenty Mile River
- Portage Creek
- Placer River
- Knik Arm
- Turnagain Arm

Much of Girdwood is subject to flooding because Girdwood valley occupies a fluvial valley drained by Glacier and California Creeks. The mouth of the valley is at sea level and gains elevation inland of the Seward Highway (MOA 1996). The entire mouth of the Girdwood valley and the area adjacent to

Glacier Creek to the airport is essentially within the 100-year floodplain. Other areas susceptible to flooding are California, Alyeska, and Virgin Creeks. The primary cause of flooding is runoff during heavy rainfall or during rapid snowmelt during the spring (MOA 1995).

*Likelihood of Occurrence*

Coastal areas are more likely to flood when there is a storm that causes storm surge, high waves, or intense rainfall. Riverine flooding is more likely to occur in the spring when the snowpack is melting. There is also more chance of flooding in heavy snow seasons. Riverine flooding can also occur in response to heavy rainfall in upstream areas. Glacier outburst floods are not very predictable.

*Historic Events*

In September 1995, there was a federal disaster declaration (AK-1072-DR) due to flooding caused by heavy rainfall. Most of the damages were outside MOA but Girdwood was negative impacted. Officials in Girdwood had to shut down the wastewater treatment plant when it was overwhelmed by large volumes of mud and water. This resulted in raw sewage being washed into local creeks.

*Other flood events*

August 30, 1989

In August 1989, more than 5 inches of rain fell in the Anchorage area, causing heavy flooding along drainage systems in the MOA. The flooding was concentrated on homes and businesses along Campbell, Chester, and Ship creeks. The flooding resulted in a State Disaster Declaration.

February 10, 1978

During February 1978, the south fork of Campbell Creek experienced flooding and glaciation. Glaciation is when a stream freezes to the bottom or a culvert freezes full. The water flowing on top of the ice freezes so more ice develops and spreads into the overbank areas.

The flooding affected an area bounded by East 80$^{th}$, Spruce Avenue, Lake Otis Parkway, and Abbott Loop Road. Many residential structures were threatened with water, ice, and contamination of surface and subsurface water. The flooding resulted in a State Disaster Declaration.

June 1966

Glacial outburst flooding last occurred on Lake George in June of 1966. Between 1914 and 1966, the lake flooded almost every June or July. Prior to 1914 though, flooding occurred irregularly. These flood events were caused by the Knik Glacier blocking the valley of Lake George, trapping glacier and

snow meltwater. The lake enlarges and the water erodes the glacier until it breaks out. The released water can be flowing as fast as 150 million gallons per minute. The flooding threatened structures on the Knik River floodplain (Davis, 1980).

Other flooding events are listed in Table 4.29.

Table 4.29 Historic Flooding

| Flooding Source and Location | Maximum Discharge (cfs) | Date | Estimated Recurrence Interval (Years) |
|---|---|---|---|
| Ship Creek Near Anchorage | 1,860 | June 1949 | 50.0 |
| South Fork Campbell Creek at mouth | 891 | June 1949 | 100.0 |
| Chester Creek | N/A | April 1963 | 5.0 |
| Rabbit Creek | N/A | June 1964 | 100.0 |
| Eagle River | 6,240 | September 1967 | N/A |
| Glacier Creek at Girdwood | 7,710 | September 1967 | 20.0 |
| Ship Creek Below Power Plant at Elmendorf Air Force Base | 1,600 | August 1971 | 20.0 |
| Campbell Creek Near Dimond Boulevard | 421 | August 1971 | 1.7 |
| Chester Creek At Arctic Boulevard At Anchorage | 95 | August 1971 | 1.1 |
| Peters Creek | N/A | August 1971 | 50.0 |
| Meadow Creek | N/A | August 1971 | 5.0 |

From: Flood Insurance Study, 2002

Parcels adjacent to waterbodies are the most vulnerable to flooding. The vulnerability shown in tables 4.30 and 4.31 are based on the Municipality's flood limit GIS file shown in Map 4.12.

**Table 4.30 100 year Floodplain Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 1213 | $88,033,400 | $171,439,400 | $259,472,800 |
| **Commercial** | 103 | $20,427,100 | $29,252,100 | $49,399,249 |
| **Industrial** | 127 | $10,337,900 | $8,721,800 | $19,059,700 |
| **Institutional** | 31 | $6,481,200 | $133,160,500 | $18,013,780 |
| **Parks, Open Space & Recreation Areas** | 300 | $66,800 | $169,700 | $236,500 |

| | | | | |
|---|---|---|---|---|
| **Transportation Related** | 46 | $208,200 | $165,900 | $374,100 |
| **Other** | 3 | $33,654,200 | $12,203,000 | $43,930,000 |
| **Vacant** | 699 | $33,654,200 | $12,203,000 | $43,930,000 |
| **Unidentified** | 104 | $17,970,300 | $30,225,700 | $48,196,000 |
| **Total** | **2626** | **$210,833,300** | **$397,541,100** | **$482,612,129** |

**Table 4.31 500 year floodplain Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 461 | $50,142,300 | $81,725,300 | $131,867,600 |
| **Commercial** | 26 | $2,663,100 | $3,314,900 | $5,964,954 |
| **Industrial** | 19 | $101,200 | $0 | $101,200 |
| **Institutional** | 8 | $97,400 | $120,000 | $217,400 |
| **Parks, Open Space & Recreation Areas** | 62 | $0 | $0 | $0 |
| **Transportation Related** | 1 | $0 | $0 | $0 |
| **Other** | 2 | $0 | $0 | $0 |
| **Vacant** | 84 | $7,462,000 | $2,058,400 | $9,520,400 |
| **Unidentified** | 44 | $7,853,200 | $4,770,500 | $12,623,700 |
| **Total** | **707** | **$68,319,200** | **$91,989,100** | **$160,295,254** |

For more information about potential vulnerabilities, please see the 2002 Flood Insurance Study.

### 4.1.5 AVALANCHE

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 of avalanches include: cornice collapse, ice, and slush.

*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 occurring 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 snowpack. 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 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. 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 snowpack 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. The main factors are 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 25 degrees, there usually is not enough stress on the snowpack to get it to slide. Above 60 degrees, 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 called 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 snowpack. 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 3 parts: the starting zone, the track, and the run-out zone.

The starting zone is where the snow breaks loose and starts sliding. It is 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. It is located at the path base where the avalanche slows down, resulting in snow and debris deposition.

**Avalanche impact pressures related to damage**

| Impact pressures | | Potential Damage |
|---|---|---|
| Kilopascals (kPa) | Pounds per square foot ($Lbs/ft^2$) | |
| 2-4 | 40-80 | Break windows |
| 3-6 | 60-100 | Push in doors, damage walls, roofs |
| 10 | 200 | Severely damage wood frame structures |
| 20-30 | 400-600 | Destroy wood frame structures, break trees |
| 50-100 | 1000-2000 | Destroy mature forests |

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.

*Location*

Avalanches can occur anywhere, but gullies, steep snow-covered slopes, and areas below steep ridges are particularly susceptible. To identify avalanche prone areas in Anchorage, a study called the Anchorage Snow Avalanche Zoning Analysis was conducted in 1982 by Arthur Mears. This report identified moderate (blue) and high (red) hazard areas, as shown in Map 4-11.

The report describes the red zone as subject to avalanches with a 10-year average return period and the blue zone as prone to avalanches with a 100-year average return period. Like with a flood, this does not mean the avalanche will occur every 10 or 100 years respectively. Instead, a 10-year avalanche has a 10% annual probability while a 100-year event has a 1% probability. Because the average return period is used, a 10-year avalanche could have a return period of 3 to 30 years while a 100-year avalanche has a return period of approximately 30 to 300 years. Events greater than the 100-year avalanche will affect parcels outside the blue zone.

The area with the potential for the largest avalanches is the Girdwood/Crow Creek area. Evidence of snow avalanches is prominent along the mountainsides above the Girdwood valley. The western mountainside has high and moderate avalanche dangers from Turnagain Arm to California Creek. Avalanche hazard is moderate to high on the eastern mountainside at head of the valley, near the day lodge and resort area, and southeast of Virgin Creek. Alyeska's daylodge and day parking are located partially in both the moderate and high avalanche hazard areas. Part of the original base area hotel and condos are in a moderate hazard area.

Other areas south of the Anchorage Bowl which may experience avalanches are Bird Creek, Indian, and Rainbow areas. North of the Anchorage Bowl, the areas near the South Fork of Eagle River, Eagle River, Peters Creek (especially near what is locally known as 4-mile), and Mirror Lake/N.W. Spur of Mt. Eklutna have avalanche potential. For more details, please refer to the Anchorage Snow Avalanche Zoning Analysis.

Another avalanche prone area is the Seward Highway between the flats near Bird Point and the entrance to Girdwood's valley (CSAC, 2004). This may be one of the most dangerous stretches of highway for avalanches because of the traffic volumes. In this area, avalanches have caused numerous accidents, killed at least 5 people directly, and caused other deaths from drowning by sweeping people into Turnagain arm (CSAC, 2004).

*Likelihood of Occurrence*
Multiple avalanches occur every year, but they usually occur in more remote areas. The number and location depends on the conditions - the formation of weak layers in the snow, wind loading, terrain, etc. On a large scale, avalanches are hard to predict because the conditions change and can vary from hour to hour in the winter.

*Historic Events*
The most remembered avalanche in recent history are those associated with the 2002 winter storms. The avalanches resulting in road and rail access to Girdwood being blocked, disruption of electrical service, property damage, and the death of a heavy equipment operator who was clearing debris from an earlier avalanche off the Seward Highway.

The section of New Seward Highway from Bird Point to Girdwood is very avalanche-prone. Between 1951, when the Seward Highway opened, and 1998, avalanches have blocked the road at least 485 times and have been a factor in more than 60 accidents (Cyperspace Snow and Avalanche Center, 2004). A six mile stretch of highway was relocated in 1998 (from mountainside to a new sea level route) and was expected to reduce avalanche danger by approximately 70%. See Table 4.32 for more known historic avalanche events.

**Table 4.32 Known Historic Avalanche Events**

| Date | Description |
|---|---|
| November 11, 2003 | A self-triggered slab avalanche occurred in the Chugach State Park on Triangle Peak near the head of the South Fork of the Eagle River Valley. One man was partially buried but his 2 companions were able to dig him out. |

| Date | Description |
|---|---|
| April 1, 2002 | An avalanche occurred on the south side of Mount Magnificent killing two snowshoers. A third man was caught in the avalanche but he was able to free himself. The avalanche triggered other slides in the area. |
| March 28, 2002 | Two backcountry skiers and two dogs triggered an avalanche in the south bowl of Three Bowl Path near Mile 6.6 of Hiland Road in Eagle River. One skier was buried under 4 feet of debris and was rescued by the other skier. The following day, while searching for the dogs, a rescuer triggered another slide that hit a house. The slide damaged the fence but not the house; however there were several feet of debris against the back wall. |
| November 11, 2000 | On the North Gully of Flat Top Mountain, in the Chugach State Park, one person was severely injured when they were caught by a small slab avalanche. |
| Feb 1, 2000 | Avalanche near Bird Flats on the Seward Highway. An Alaska Railroad employee who was helping clear previous slides from the highway was killed when the avalanche struck the bulldozer he was operating. Three avalanches occurred that day. This specific avalanche occurred at the Five Fingers chute, and was estimated to have crossed the highway between 100 and 125 miles per hour. Slides also occurred at Mile 5.7 on the Eklutna Lake Road, Mile 7.5 of the Old Glenn Highway, and the Glenn Highway at Mile 95. |
| | 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. |
| January 25, 2000 | An avalanche occurred in the High Traverse area of Alyeska Resort. All skiers in the area were accounted. |
| March 1999 | An avalanche at Alyeska Resort partially buried two skiers. This was the first time in 25 years that an avalanche hit skiers at the resort. |
| Dec 7,1997 | One woman was killed in a self-triggered soft slab avalanche while hiking on the Crow Pass Trail. Her companion was not caught by the avalanche but was unable to locate her. |
| April 1997 | There was a series of avalanches between April 5th and 11th that involved skiers, climbers and snowmachiners. A snowmachiner was killed in one of those accidents. http://www.sarinfo.bc.ca/Library/Rescues/girwood.AK |
| 1987-88 | Several (34) avalanches reached the Seward Highway. Some of the avalanches resulted in temporary highway closures and downed power poles. One avalanche, near Super Scooper (MP 94), struck a vehicle on the highway. |

| Date | Description |
|---|---|
| January 1980 | Near MP 94, in a chute called Super Scooper, an avalanche hit a vehicle and derailed 4 locomotives and 13 cars of a freight train. Later that winter, avalanches blocked the road again, closing it for 4 days. |
| March 1979 | A series of storms near Bird Hill caused 24 avalanches over several weeks. One slide, with 33 separate tongues, buried 2 miles of highway closing it for 3 days. |
| 1978 | Seward Highway was blocked at least 17 times. One series of slides trapped 20 cars on Bird Hill. Another slide, near MP 99, hit one car and took high voltage lines off 13 poles. |
| 1959-60 | The Seward Highway was blocked by avalanches at least 81 times because of frequent blizzards in the Bird Hill area. |
| 1952 | On the Girdwood Flats near milepost 91.8, an avalanche hit several cars on the highway. One person got out of their vehicle and was hit by a second slide and subsequently died. |
| 1920 | Near MP 91, an avalanche buried an Alaska Railroad train. As the train's occupants started to dig themselves out, the train was struck by a second slide. This slide buried 25 people and 4 killed others. It has been reported that several people were swept into Turnagain Arm and drowned. |
| 1918 | An avalanche near the present Seward Highway MP 92 killed several draft horses and knocked a telegraph pole over. |

Source: the Cyperspace Snow and Avalanche Center (www.csac.org) unless otherwise noted.

Additional avalanche events are listed in Mears, 1993 and Mears, 1982.

*Vulnerability*

The avalanche vulnerability is calculated using the areas in the MOA's avalanche GIS file (shown in Map 4-11). The number of parcels in a high risk avalanche area is shown in table 4.33 while those in a moderate risk area are shown in table 4.34.

**Table 4.33 High Hazard Area Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 88 | $5,560,300 | $10,747,700 | $16,306,331 |
| **Commercial** | 7 | $8,200 | $0 | $8,200 |
| **Industrial** | 1 | $0 | $0 | $0 |
| **Institutional** | 1 | $0 | $0 | $0 |

| | | | | |
|---|---|---|---|---|
| **Parks, Open Space & Recreation Areas** | 58 | $0 | $0 | $0 |
| **Transportation Related** | 0 | $0 | $0 | $0 |
| **Other** | 1 | $0 | $0 | $0 |
| **Vacant** | 162 | $7,533,800 | $1,576,000 | $8,998,700 |
| **Unidentified** | 50 | $584,500 | $357,800 | $942,300 |
| **Total** | **368** | **$13,686,800** | **$12,681,500** | **$26,255,531** |

**Table 4.34 Moderate Hazard Area Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 161 | $8,264,800 | $32,891,600 | $32,891,600 |
| **Commercial** | 2 | $267,800 | $179,900 | $447,700 |
| **Industrial** | 0 | $0 | $0 | $0 |
| **Institutional** | 0 | $0 | $0 | $0 |
| **Parks, Open Space & Recreation Areas** | 7 | $0 | $0 | $0 |
| **Transportation Related** | 0 | $0 | $0 | $0 |
| **Other** | 1 | $0 | $0 | $0 |
| **Vacant** | 123 | $5,452,500 | $1,639,000 | $6,917,300 |
| **Unidentified** | 15 | $279,300 | $214,900 | $494,200 |
| **Total** | **309** | **$14,264,400** | **$34,925,400** | **$40,750,800** |

### 4.1.6 LANDSLIDE/GROUND FAILURE

Ground failure is a general term used to describe hazards that affect the stability of the ground. It can occur in many different ways including landslides, land subsidence, and failures related to seasonally frozen ground and permafrost. Frequently, ground failure occurs as the result of another hazard such as a earthquake or volcanic eruption.

#### Landslides

Landslide is a generic term for a variety of downslope movements of earth material under the influence of gravity. Some landslides occur rapidly, in mere seconds, while others might take weeks or longer to develop.

Landslides usually occur in steep areas but not exclusively. They can occur as ground failure of river bluffs, cut-and-fill failures associated with road and building excavations, collapse of mine-waste piles, and slope failures associated with open-pit mines and quarries. Underwater landslides usually involve areas of low relief and slope gradients in lakes and reservoirs or in offshore marine setting.

Landslides can occur naturally or be triggered by human activities. They 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. They can be caused by long-term climate change that results in increased precipitation, ground saturation and a rise in groundwater level, which reduces the shear strength and increases the weight of the soil. Erosion that removes material from the base of a slope can also cause naturally triggered landslides.

Human activities that trigger landslides are usually associated with construction such as grading that removes material from the base, loads material at the top, or otherwise alters a slope. Changing drainage patterns, groundwater level, slope and surface water, for example, the addition of water to a slope from agricultural or landscape irrigation, roof downspouts, septic-tank effluent, or broken water or sewer lines can also cause landslides.

Three main factors that influence landslides are topography, geology, and precipitation. Topography and geology are associated with each other; the steeper the slope, the greater the influence from gravity. Rock strength is important as certain bedrock formations or rock types appear to be more prone than others to landsliding. Precipitation may erode and undermine slope surfaces. If precipitation is absorbed into the ground, it increases the pore water pressure and lubricates weak zones of rock or soil.

*Types of Landslides*

Landslides are usually classified by five types of movement; falls, topples, lateral spreads, slides, and flows. A combination of two or more types is called a complex movement. Each type can be further broken down based on the type of material involved. Table 4.35 summarizes the types of landslides.

**Table 4.35 Principal Landslides Types:**

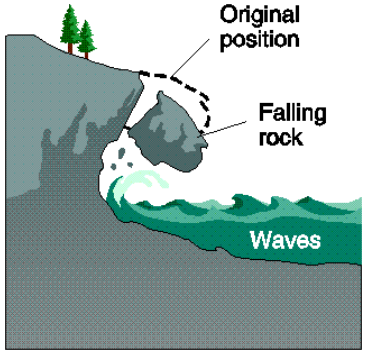
| Type of Movement | | Type of Material | | |
|---|---|---|---|---|
| | | Bedrock | Debris (Course Soil) | Earth (Fine Soil) |
| Falls | | Rock fall | Debris fall | Earth fall |
| Topples | | Rock topple | Debris topple | Earth topple |
| Slides | Rotational | Rock slump | Debris slump | Earth slump |
| | Translational | Rock block slide | Debris block slide | Earth block slide |
| | | Rock slide | Debris slide | Earth slide |
| Lateral Spreads | | Rock spread | Debris spread | Earth lateral spread |

| | | | |
|---|---|---|---|
| Flows | Sackung | Debris flow<br>Debris Avalanche<br>Block Stream<br>Solifluction<br>Soil Creep | Earth flow<br>Wet Sand Flow<br>Rapid Earth Flow<br>Loess Flow<br>Dry Sand Flow |
| Complex | Combination of two or more principal types of movement | | |

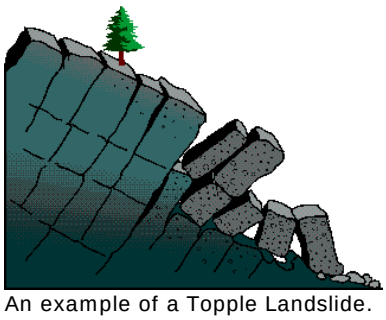
Source: adapted from Varnes, 1978

*Falls*

Falls occur when masses of rock or other material detach from a cliff or other steep slope and move downhill by free fall, rolling or bouncing. The movement is very quick. The typical slope angle involved is from 45 to 90 degrees. Rock falls occur when a rock on a steep slope becomes dislodged and falls down the slope. A rock fall may be a single rock or a mass of rocks. Falling rocks can dislodge other rocks as they collide with the cliff. At the base of most cliffs is an accumulation of fallen material termed talus**.** Rock falls are a constant problem along transportation routes through rocky terrain.



An example of a Fall Landslide. Image courtesy of Landslides in British Columbia.


An example of a Topple Landslide. Image courtesy of Landslides in British Columbia.

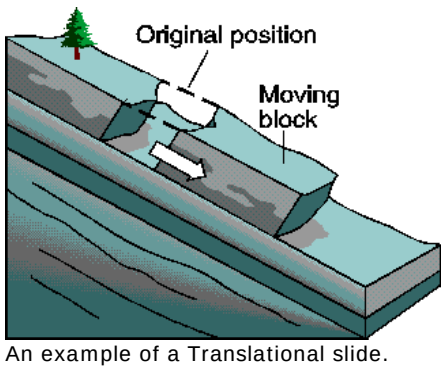
*Debris falls* are similar, except they involve a mixture of soil, regolith (unconsolidated weathered rock and soil material), vegetation, and rocks.

*Topples*

Topples are the forward rotation of rocks or other materials about a pivot point on a hillside. The movement is tilting without collapse but if the mass pivots far enough, a fall may result.

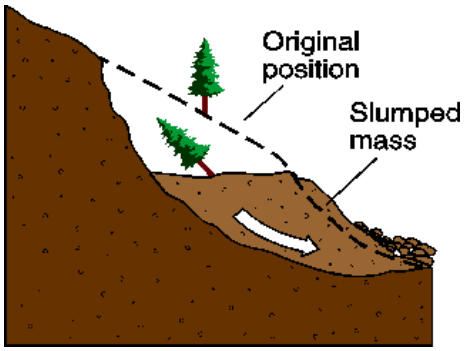
*Slides*

Slides are characterized by shear displacement along one or several surfaces. The two general types of slides are rotational and translational. In a rotational slide, the rupture surface is concave upward, and the mass rotates along the concave shear surface. Rotational slides, also called slumps, can occur in bedrock, debris, or earth. In a



An example of a Translational slide. Image courtesy of Landslides in British Columbia.

translational slide, the rupture surface is a smooth or gently rolling slope. In bedrock and earth, translational slides are sometimes called block slides if an intact mass slides down the slope. If rock fragments or debris slide down a slope on a distinct shear plane, the movements are called rockslides or debris slides. It is obvious that confusion can result by referring to all types of landslides as "slides".



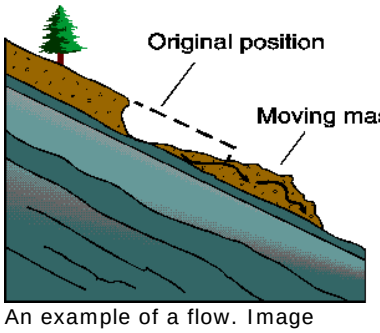
An example of a rotational slide or slump. Image courtesy of Landslides in British Columbia.

*Lateral Spreads*

Lateral spreads involve the horizontal displacement of the surface. They often occur on gentle slops that range between 0.3° and 3°. Lateral spreads can occur in rock but this process is not well documented and movement rates can be quite slow. They are more common in fine-grained soils, such as clay, especially if the soil has been remodeled or disturbed by construction, grading or similar activities. Loose granular soils commonly produce lateral spreads through liquefaction (where saturated soils are transformed from a solid into a liquefied state). Liquefaction can occur spontaneously because of changes in pore-water pressure or in response to vibrations such as those produced by seismic activity. Lateral spreads typically damage pipelines, utilities, bridges, and other structures having shallow foundations.

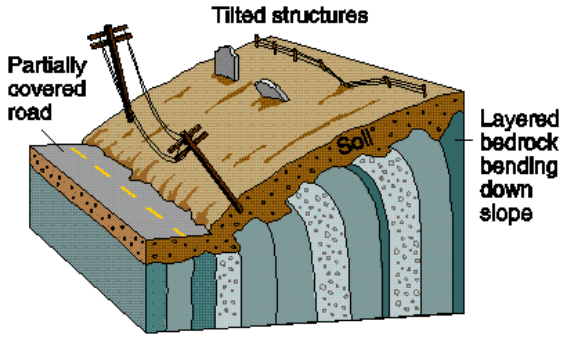
*Flows*

In general, a flow is a moving mass that has differential internal movements that are distributed throughout the mass. They differ from slides by their higher water content and the distribution of velocities that resembles a viscous fluid. Flows in bedrock, also called sackung, gravitational sagging or rock flow, are not common, nor is the process very well understood.



An example of a flow. Image courtesy of Landslides in British Columbia.

Flows in debris include soil creep, solifluction, block streams, debris flows, and debris avalanches. Soil creep is an imperceptibly slow, steady downward movement of slope-forming soil or rock due to gravity. Creep can occur due to alternate wetting and drying which expands and contracts the ground. Creep is more of a problem where the ground freezes and thaws or where clay minerals are present because many of them expand considerably when they contact water. Evidence of soil creep includes bent fences or retaining walls, curved tree trunks, and tilted poles.



An example of a creep. Image courtesy of Landslides in British Columbia.

Solifluction is a slow downward flow of water-saturated soil. It is often observed in areas with perennially or permanently frozen ground because the frozen ground traps snow and ice melt within the surface layer making it more fluid. Meltwater and rain saturate the soil in the springtime because they cannot percolate into the frozen layers below. The surface layers thaw to only a small depth during the short summer. This creates a very unstable situation at the interface between the frozen and unfrozen layers. The whole surface layer tends to move together as a cohesive mass. Solifluction can occur on even moderate slopes, because of the ease with which a lobe slides on the frozen substratum. Solifluction does not occur abruptly, but solifluction lobes can move downhill several inches per day.

Block streams are slow moving tongues of rocky debris on steep slopes, which are often fed by talus cones.

A debris flow is a rapid movement of loose soil, rock, and organic matter combined with water and air to form a downward moving slurry. The slurry can travel several miles from its source, growing in size as it picks up trees, cars, and other materials along the way.

Debris flows tend to occur on slopes in the 20-45 degree range. They are usually associated with unusually heavy precipitation or with rapid snowmelt. They can also occur following the bursting of a natural dam formed by landslide debris, glacial moraine, or glacier ice.

The phrase “debris avalanche” describes a very fast debris flow associated with volcanic hazards, usually strato-volcanoes because of their steep slopes and large amounts of easily remobilized materials.

In fine soils (earth) include earth flows, loess flows, dry sand flows, wet sand flows, rapid earth flows, and mudflows. Earth flows are very slow to rapid flows with a characteristic hourglass shape. A bowl or depression forms at the source where the unstable material collects and flows out. The central area, the flow track, is narrow and usually becomes wider as it reaches the valley floor. Earth flows generally occur in fine-grained materials or clay-bearing rock on moderate slopes and with saturated conditions.

Loess flows and dry sand flows are rapid to very rapid flows of dry material. Loess is buff-colored, wind-blown deposit of fine silt. Loess flows are usually initiated by seismic activity, and are a fluid suspension of silt in air. A loess flow occurred in 1920, in China, following an earthquake where hills of loess gave way and combined with air to move as a dry flow downslope killing 200,000 people. Dry sand flows usually occur along shorelines or in eolian deposits.

Wet sand flows occur along riverbanks or shorelines composed of saturated clean sand. The destabilized sand usually flows into an adjacent body of water.

Rapid earth flows, also called quick clay flows, are very rapid flows that involve the liquefaction of subjacent material and the entire slide mass.

Mudflows are flows of fine-grained material such as silt or clay, with a high water content. They differ from debris flows only in the size of their component materials (over 50% sand-, silt-, and clay-sized particles).

*Complex*
A rock avalanche can be considered a complex type of movement. Rock avalanches, sometimes called sturzstroms, involve the failure and disintegration of a large rockmass on a mountain slope and the rapid movement of this debris downslope and into a valley. Such landslides may reach very high speeds. In the 1959 Pandemonium Creek rock avalanche in British Columbia, Canada, the debris reached speeds up to 360 kilometers/hour.

Secondary Effects
Landslides are often associated with other hazards. For example, a landslide may occur during floods because both involve precipitation, runoff, and ground saturation. Landslides are often associated with seismic and volcanic events. Some of the costliest landslides in American history were associated with the 1964 Good Friday earthquake in Alaska. It has been estimated that ground failure, not shaking, caused about 60% of the damage.

The secondary effects of landslides can also be very destructive. Landslide dams cause damage upstream due to flooding and downstream due to a flood, which may develop as a result of a sudden dam break. Landslides can also trigger tsunamis and seiches.

**Land Subsidence**
Land subsidence is any sinking or downward settling of the earth's surface. Underground mining for minerals, ground water or petroleum, and drainage

of organic materials are typical causes of subsidence. However, these are rare in Alaska. More common causes of land subsidence in Alaska are sediment compaction and seismic or volcanic activity.

Based on previous experience, the Portage and Girdwood areas are susceptible to subsidence.

**Seasonally Frozen Ground**

Frost action is the seasonal freezing and thawing of water in the ground and its effect on the ground and development. Frost heave is when ice formation causes an upward displacement of the ground. When the ground ice thaws, the ground loses bearing strength and its ability to support structures is weakened. This is a widespread problem in Alaska.

**Permafrost**

Ground failure related to permafrost is not a significant problem in Anchorage. Permafrost is frozen ground in which a naturally occurring temperature below 32$^{o}$ Fahrenheit has existed for two or more years. Approximately 85 percent of Alaska lies within the permafrost region. Permafrost is continuous in extent over most of the Arctic but becomes discontinuous and sporadic or isolated as one proceeds further south. Only the southern coastal margins are completely permafrost-free. Permafrost can form an extremely strong and stable foundation material if it is kept in the frozen state, but if it is allowed to thaw, the soil becomes extremely weak and fails. Permafrost can thaw in response to general climate changes and warming or human activity. As Map 4.12 shows, permafrost is not common in Anchorage. In fact, “Anchorage is essentially free of permafrost except at very high locations” (USACE, 2002).

**Seismically-Induced Ground Failure**

In 1979, a Geotechnical Hazards Assessment Study was developed to “inventory all geotechnical data significant with respect to geologic hazards, to analyze the data to provide an indication of the degree of hazard and to designate those areas of potential hazards upon a series of maps” (Harding-Lawson, 1979:3). This study resulted in the seismically-induced ground failure map (Map 4-15) which is used today.

The map shows there is a very high risk of seismically induced ground failure in the Earthquake Park area, parts of south addition and downtown. The risk is high along the coast, Westchester Lagoon, near the Chester Creek greenbelt, around Campbell Lake, and Government Hill. The risk is moderate in the immediate area around Chester Creek greenbelt, most of Anchorage west of the New Seward Highway. The risk is moderately low on the hillside

and in East Anchorage. The area with the lowest risk of seismically induced ground failure is near the Chugach Mountains.

**Landslides**

It is hard to identify high and moderate hazard zones of hazard intensity for the different types of landslides. For example, hazard zones for rock falls can't be identified because the risk depends a lot on the size of the rocks involved. It is known that the bluff near Points Campbell and Woronzof is a "narrow zone of very unstable material with a strong risk of landslide" (Mason, 1997: 198-199). The area near Campbell Lake has a high risk of landslides (Mason, 1997). "Debris flows occur in small, steep drainage basins throughout the" Glacier/Winner Creek area (Mears, 1993:13).

*Likelihood of Occurrence*

Ground failure events are hard to predict as many of them are triggered by other events such as an earthquake.

*Historic Events*

The 1964 earthquake triggered a wide variety of falls, slides and flows through Southcentral Alaska. The Anchorage area was heavily impacted because of Bootlegger Cove clay failures. Some of the more significant events occurred at Fourth Avenue, L Street, Government Hill, and Turnagain Heights. Several, less devastating slides occurred throughout town, including slides at Point Woronzof and the Potter Hill slides.

The Government Hill slide was a complex movement. The Government Hill Elementary school was severely damaged by the translational slide. The south wing of the school dropped about 30 feet while the east wing split lengthwise and collapsed. Part of this slide became an earth flow that spread 150 feet across the flats into the Alaska Railroad yards.

The Turnagain Heights landslide is also considered a complex movement. In fact, it was probably the most complex of all the Anchorage landslides associated with the Good Friday earthquake. The landslide likely began as a block slide but evolved to include lateral spreading, slumping and possibly other types of movement. This landslide caused serious damage to a housing development, in which three people died.

The earthquake caused at least one rock avalanche as a slab of rock became detached from the mountain peak overlooking Sherman Glacier. The rock slab disintegrated as it moved downhill, helping it achieve great velocities and extend a great distance over the glacier. Rockslides were also triggered including "one relatively significant event in the Winner Creek drainage" (Mears, 1993:12).

Extensive subsidence also occurred as a result of the 1964 Good Friday Earthquake. The zone of subsidence covered about 110,039 square miles, including the north and west parts of Prince William Sound, the west part of the Chugach Mountains, most of Kenai Peninsula, and almost all the Kodiak Island group. Some areas saw subsidence that exceeded 7 feet but most areas subsided less. For example, part of the Seward area is about 3.5 feet lower than before the earthquake and portions of Whittier subsided more than 5 feet. The village of Portage, at the head of Turnagain Arm of Cook Inlet, experienced 6 feet of tectonic subsidence during the earthquake.

*Vulnerability*

An earthquake could cause seismically induced ground failure. The susceptibility for seismically induced ground failure has only been determined for the part of the Municipality shown in Map 4.13. Table 4.36 gives the size of each susceptibility zone.

**Table 4.36 Area in each Seismically Induced Ground Failure Zone**

| Zone | Acres |
|---|---|
| Lowest | 26,287 |
| Moderately Low | 39,603 |
| Moderate | 20,021 |
| High | 3,740 |
| Very High | 1,085 |

The values in tables 4.37 to 4.41 reflect the area that has been mapped.

**Table 4.37 Very High Ground Failure Susceptibility Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 1,359 | $110,104,200 | $214,441,000 | $324,504,694 |
| **Commercial** | 129 | $15,662,900 | $93,312,900 | $108,621,762 |
| **Industrial** | 35 | $4,796,300 | $7,631,000 | $12,396,240 |
| **Institutional** | 23 | $318,500 | $1,905,700 | $2,224,200 |
| **Parks, Open Space & Recreation Areas** | 59 | $0 | $0 | $0 |
| **Transportation Related** | 13 | $0 | $0 | $0 |
| **Other** | 4 | $0 | $0 | $0 |
| **Vacant** | 165 | $10,754,400 | $4,348,300 | $14,940,100 |
| **Unidentified** | 25 | $2,061,400 | $3,344,000 | $5,405,400 |
| **Total** | **1,812** | **$143,697,700** | **$324,982,900** | **$468,092,396** |

**Table 4.38 High Ground Failure Susceptibility Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 3,141 | $235,070,600 | $512,578,800 | $747,347,452 |
| **Commercial** | 478 | $62,848,000 | $254,915,600 | $316,879,914 |
| **Industrial** | 150 | $12,129,000 | $26,953,100 | $39,040,474 |
| **Institutional** | 44 | $0 | $0 | $0 |
| **Parks, Open Space & Recreation Areas** | 162 | $0 | $0 | $0 |
| **Transportation Related** | 31 | $0 | $0 | $0 |
| **Other** | 23 | $46,400 | $0 | $46,400 |
| **Vacant** | 381 | $30,861,500 | $22,109,000 | $52,921,564 |
| **Unidentified** | 112 | $13,426,300 | $29,085,600 | $42,449,722 |
| **Total** | **4,522** | **$354,381,800** | **$845,642,100** | **$1,198,685,526** |

**Table 4.39 Moderate Ground Failure Susceptibility Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 16,808 | $789,993,400 | $2,231,684,700 | $3,021,577,100 |
| **Commercial** | 1,049 | $210,474,400 | $564,456,300 | $771,096,678 |
| **Industrial** | 827 | $120,562,000 | $188,263,500 | $307,831,147 |
| **Institutional** | 150 | $14,041,700 | $151,156,900 | $43,565,084 |
| **Parks, Open Space & Recreation Areas** | 355 | $53,100 | $33,700 | $86,800 |
| **Transportation Related** | 337 | $0 | $0 | $0 |
| **Other** | 44 | $0 | $0 | $0 |
| **Vacant** | 3,013 | $202,860,100 | $158,722,900 | $361,513,561 |
| **Unidentified** | 1,106 | $213,396,300 | $522,872,500 | $734,240,581 |
| **Total** | **23,689** | **$1,551,381,000** | **$3,817,190,500** | **$5,239,910,951** |

**Table 4.40 Moderately Low Ground Failure Susceptibility Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 26,611 | $1,312,291,600 | $3,625,135,700 | $4,936,308,714 |
| **Commercial** | 1,543 | $199,196,700 | $496,178,100 | $652,487,228 |
| **Industrial** | 468 | $38,570,000 | $58,612,400 | $96,716,684 |
| **Institutional** | 349 | $27,900 | $0 | $27,900 |
| **Parks, Open Space & Recreation Areas** | 394 | $0 | $0 | $0 |
| **Transportation Related** | 29 | $27,900 | $0 | $27,900 |
| **Other** | 56 | $213,700 | $131,176,000 | $284,766,254 |
| **Vacant** | 2,485 | $154,728,400 | $131,176,000 | $284,766,254 |
| **Unidentified** | 1,664 | $127,518,200 | $259,607,100 | $387,073,528 |
| **Total** | **33,599** | **$1,832,574,400** | **$4,701,885,300** | **$6,642,174,462** |

**Table 4.41 Lowest Ground Failure Susceptibility Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 1,684 | $122,906,200 | $384,745,400 | $507,651,600 |
| **Commercial** | 0 | $0 | $0 | $0 |
| **Industrial** | 4 | $357,400 | $7,500 | $322,564 |
| **Institutional** | 1 | $0 | $0 | $0 |
| **Parks, Open Space & Recreation Areas** | 30 | $0 | $0 | $0 |
| **Transportation Related** | 0 | $0 | $0 | $0 |
| **Other** | 4 | $0 | $0 | $0 |
| **Vacant** | 835 | $180,763,000 | $438,169,700 | $84,168,500 |
| **Unidentified** | 158 | $12,575,500 | $14,172,200 | $26,747,700 |
| **Total** | **2,716** | **$316,602,100** | **$837,094,800** | **$618,890,364** |

## 4.1.7 TSUNAMI

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.

**Tsunami Magnitude and Height relationships**

| *Magnitude* | *Height (ft)* |
|---|---|
| -2 to –1 | <1.0 to 2.5 |
| -1 to 0 | 2.5 to 4.9 |
| 0 to 1 | 4.9 to 9.9 |
| 1 to 2 | 9.9 to 19.7 |
| 2 to 3 | 19.7 to 34.2 |
| 3 to 4 | 34.2 to 79.0 |
| 4 to 5 | 79 to >105.0 |

### *Types of Tsunamis*

*Tele-tsunami*

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. Therefore, tele-tsunamis are not a significant threat in Anchorage.

*Volcanic tsunamis*

There has been at least one confirmed volcanically triggered tsunami in Alaska. 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.

*Seismically-generated local tsunamis*
Most seismically-generated local tsunamis have occurred along the Aleutian Arc. Other locations include the back arc area in the Bering Sea and the eastern boundary of the Aleutian Arc plate. They generally reach land 20 to 45 minutes after starting.

*Landslide-generated tsunamis*
Submarine and subaerial landslides can generate large tsunamis. Subaerial landslides have more kinetic energy associated with them so they trigger larger tsunamis. An earthquake usually, but not always, triggers this type of landslide and they are usually confined to the bay or lake of origin. One earthquake can trigger multiple landslides and landslide-generated tsunamis. Low tide is a factor for submarine landslides because low tide leaves part of the water-saturated sediments exposed without the support of the water. Loading on the delta from added weight such as trains or a warehouse or added fill can add to an area's instability.

These events usually occur in the heavily glaciated areas of Prince William Sound and parts of Southeast Alaska.

Landslide–generated tsunamis are responsible for most of the tsunami deaths in Alaska because there is little warning.

Tsunamis generated by landslides in lakes occur more in Alaska than any other part of the U.S. They are associated with the collapse of deltas in glacial lakes having great depths. They may also be associated with delta deposits from rapidly flowing streams and rivers carrying glacial debris.

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.

*Location*
The tsunami risk in Anchorage is considered low, as tsunamis strike low lying coastal areas and most of Anchorage is protected by bluffs. The shore near Birchwood may be susceptible (Mason, 1997). The Ship Creek/Port of Anchorage area may be affected.

*Likelihood of Occurrence*
While seismic activity frequently occurs in the Anchorage area and along the Pacific Rim, it is believed that Anchorage has a low tsunami risk.

*Historic Events*
There have been no known tsunamis in the MOA.

*Vulnerability*
Only coastal areas are vulnerable to a tsunami. The number of parcels has not been calculated because the tsunami run-up has not been determined.

### 4.1.8 VOLCANO

A volcano is a vent at the Earth's surface through which magma (molten rock) and associated gases erupt, and also the landform built by effusive and explosive eruptions.

Volcanoes display a wide variety of shapes, sizes, and behavior, however they are commonly classified among three main types: cinder cone, composite, and shield.

***Types of Volcanoes***

*Cinder cones*
A cinder cone is the simplest type of volcano. They are built from particles and blobs of congealed lava ejected from a single vent. As the lava is blown into the air, it breaks into small fragments that solidify and fall as cinders and bombs around the vent to form a circular or oval cone. Most cinder cones have a bowl-shaped crater or craters at the summit and are rarely more than a thousand feet above their surroundings. Cinder cones may form as flank vents on the sides of larger composite or shield volcanoes. They often occur in clusters and produce lava flows. Cinder cones are common in western North America as well as other volcanic terrain


Redoubt Volcano is one of the active volcanoes of the Cook Inlet region. Here, steam and volcanic gas rise above the summit crater of the volcano following the 1989 to 1990 eruptions. Iliamna Volcano is on the skyline at left. Photograph courtesy of C. Neal, USGS.

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

feet above their bases. Some of the most conspicuous and beautiful mountains in the world are composite volcanoes, including Mount Shasta in California, Mount Hood in Oregon, Mount St. Helens and Mount Rainier in Washington, Mt Fuji in Japan, Mt. Vesuvius in Italy, and Shishaldin in Alaska.

Composite volcanoes have a principal conduit system through which magma from a reservoir deep in the Earth's crust rises to the surface repeatedly to cause eruptions. The volcano is built up by the accumulation of material erupted through the conduit and increases in size as lava, ash, and other materials, are added to its slopes. Stratovolcanoes tend to erupt explosively because of the silica-based nature of magmas associated with these volcanoes. Some stratovolcanoes produce enormous explosive eruptions that destroy a large part of the volcano itself, leaving a wide, roughly circular depression called a caldera. Eruptions that produce calderas are among the most explosive and largest eruptions known.

Most Alaskan volcanoes are stratovolcanoes, including Redoubt, Spurr and Iliamna.

*Shield volcanoes*

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

Mount Wrangell, the shield volcano on the right skyline, is the only volcano in the Wrangell Mountains to have had documented historical activity consisting of several minor eruptions in the early 1900's. Image courtesy B. Cella, U.S. National Park Service.

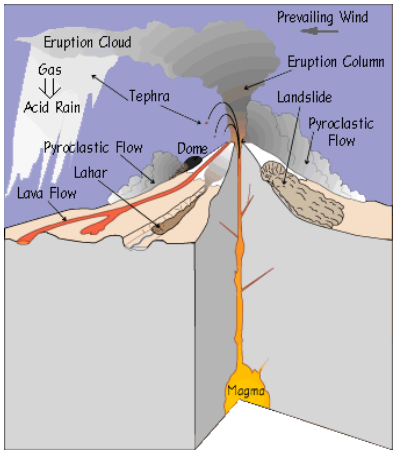
Volcanoes are also categorized according to the age of their eruptive activity. Active volcanoes are those that are currently erupting or showing signs of unrest, such as unusual earthquake activity or significant new gas emissions. Dormant volcanoes are those that are not currently active, but could become restless or erupt again. Extinct volcanoes are those that are considered unlikely to erupt again. This can be difficult to determine as a volcano could go tens of thousands of years, or longer, between eruptions. There are more than 80 volcanic centers in the State but only 41 are considered active.

*Volcanic Hazards*

Volcanic eruptions create the following hazards:

*Lava Flows*

Lava flows are streams of molten rock that flow from a volcano. The distance traveled by a flow is dependant on several variables including viscosity, volume, slope steepness, and obstructions in the flow path. A typical flow is between 6 and 30 miles. Lava flows cause damage by burning, crushing, or burying everything they contact. They can also melt ice and snow, causing flooding or move into a wooded area triggering wildland fires.



Volcanic hazards.

*Pyroclastic Flows*

Pyroclastic flows are high-density mixtures of hot gasses and dry rock that are usually released explosively from a volcano. They are hazardous because of their rapid movement and high temperatures. They travel at speeds of 30 to more than 90 mph and can destroy or sweep away objects due to the impact of debris or associated high winds, or cause burns.

*Pyroclastic Surges*

Pyroclastic surges are turbulent low-density clouds of rock debris, air, and other gases that move over the ground at speeds similar to pyroclastic flows. There are two types: hot surges consisting of dry materials over 212°F and cold surges consisting of cooler rock debris and water or steam.

*Lava Domes*

Volcanic or lava domes are formed when viscous lava erupts slowly from a vent. This causes it to solidify near the vent forming the dome instead of flowing away from the vent. A dome grows largely by expansion from within. As it grows its outer surface cools and hardens, then shatters, spilling loose fragments down its sides. Volcanic domes commonly occur within the craters or on the flanks of large composite volcanoes. Novarupta Dome was formed during the 1912 eruption of Katmai Volcano, Alaska, measures 800 feet across and 200 feet high.

*Volcanic Ash and Bombs*

Volcanic ash, also called tephra, is fine fragments of solidified lava ejected into the air by an explosion or rising hot air. The fragments range in size, with the larger falling nearer the source. Ash is a problem near the source because of its high temperatures (may cause fires), burial (the weight can cause structural collapses), and impact of falling fragments. Further away, the primary hazard to humans are decreased visibility and inhaling the fine ash. Ash will also interfere with the operation of mechanical equipment

including aircraft. In Alaska, this is a major problem as many of the major flight routes are near historically active volcanoes.

*Volcanic Gases*
Volcanic gases consist mostly of steam, carbon dioxide, and sulfur and chlorine compounds, but may include other substances. The gases can damage eyes, respiratory systems and cause suffocation. They can also be very corrosive.

*Lateral Blasts*
Lateral blasts are inflated mixtures of gases, ash, and hot rock debris. They may be hundreds of feet thick and travel at speeds up to 370 miles per hour. They cause damage through abrasion, impact, burial, and heat. They may also trigger pyroclastic flows or surges.

*Debris Avalanches*
Debris avalanches are is a sudden downward movement of unconsolidated material (mostly rock and soil). They occur without warning and travel quickly. Debris avalanches can extend for miles and cover up to 300 square miles, causing damage from impact or burial.

*Debris Flows*
Debris flows, also known as lahars, are rapidly flowing mixtures of rock debris and water that originate on the slopes of a volcano. They form in a variety of ways, primarily by the rapid melting of snow and ice by pyroclastic flows, intense rainfall on loose volcanic rock deposits, breakout of a lake dammed by volcanic deposits, and as a consequence of debris avalanches. They generally have the consistency of wet cement and have the ability to destroy or bury anything in their path.

Alaska is home to 41 historically active volcanoes although none are within the Municipality of Anchorage (see Map 4-14). Because of the distance between any volcano and Anchorage, Anchorage will not be affected by most elements of a volcanic eruption occurring in Alaska. Anchorage does have to be concerned about ash.

*Likelihood of Occurrence*
Volcanic activity in Alaska is rare. The Alaska Volcano Observatory (AVO) actively monitors the activity of 25 volcanoes for signs of unrest.

*Historic Events*

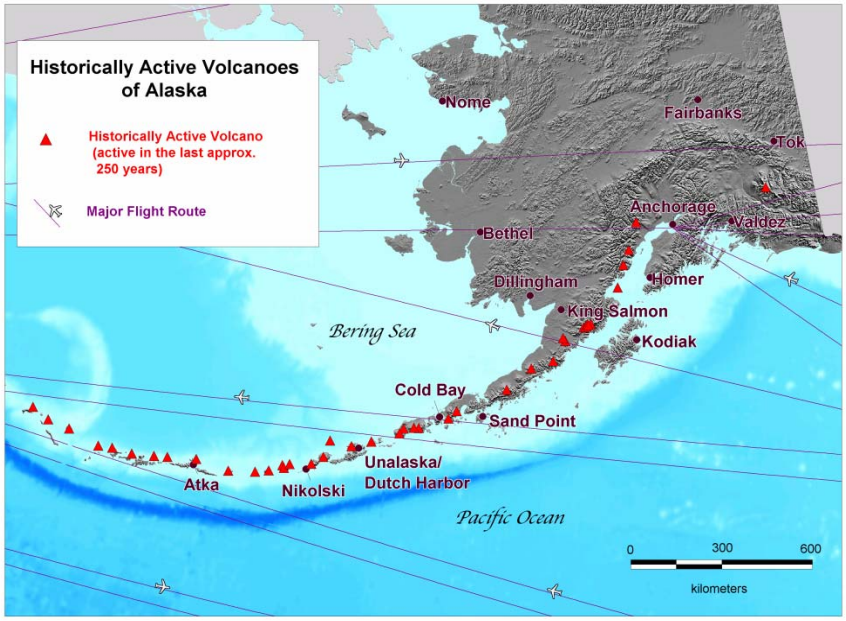
Anchorage had to deal with ash from the recent eruptions of Redoubt, Spurr and Augustine Volcanoes.

*Mt. Spurr*

On September 21, 1992, eruptions on Mt. Spurr triggered a disaster declaration. The eruption caused health problems and property damage.

*Redoubt*

Redoubt Volcano erupted in 1989-1990 and debris flows caused temporary closing of the Drift River Oil Terminal. KLM's 747 jet aircraft, flight 867, temporarily lost power in all four engines when it entered the volcanic ash plume. It would have crashed into the mountains had they not be able to restart their engines about 4,000 feet above ground.




Alaska's active volcanoes and a schematic depiction of selected major air routes across Alaska. SOURCE: AVO

*Augustine*

A more recent eruption occurred on Augustine Volcano in 1986. An ash plume disrupted air traffic and deposited ash in Anchorage. A dome formed in the crater, and caused some to fear it would subsequently collapse and trigger a tsunami along the east shore of Cook Inlet, as happened in 1883.

*Vulnerability*

As the ash from a volcanic eruption could affect the entire Municipality, the entire MOA is represented in Table 4.42.

**Table 4.42 Volcanic Ash Vulnerability**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 59,426 | $3,066,038,500 | $8,334,412,600 | $11,398,571,591 |
| **Commercial** | 3,419 | $605,885,600 | $1,579,095,500 | $2,132,773,711 |
| **Industrial** | 1,610 | $180,641,800 | $290,159,100 | $469,225,809 |
| **Institutional** | 702 | $26,876,800 | $188,839,300 | $90,308,164 |
| **Parks, Open Space & Recreation Areas** | 1,319 | $107,600 | $203,400 | $311,000 |
| **Transportation Related** | 419 | $236,100 | $165,900 | $402,000 |
| **Other** | 300 | $352,000 | $44,400 | $307,600 |
| **Vacant** | 10,326 | $570,157,400 | $450,103,500 | $1,015,367,523 |
| **Unidentified** | 4,325 | $419,913,000 | $924,182,300 | $1,341,953,131 |
| **Total** | **81,846** | **$4,870,208,800** | **$11,767,206,000** | **$16,449,220,529** |

## 4.1.9 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.

Erosion rarely causes death or injury. However, erosion causes the destruction of property, development and infrastructure. In Alaska, coastal erosion is the most destructive, riverine erosion a close second, and wind erosion a distant third.

Classifying erosion can be confusing, as there are multiple terms used to refer to the same type of erosion. For example, riverine erosion may be called stream erosion, stream bank erosion, or riverbank erosion, among other terms. Coastal erosion is sometimes referred to as tidal erosion. Sometimes, bluff erosion is included in coastal erosion, other times they are two separate processes. The same goes for beach erosion. For this plan, coastal erosion encompasses bluff and beach erosion while riverine erosion will be considered synonymous for stream erosion, stream bank erosion and riverbank erosion.

Bluff erosion is when water runs off the land forming gullies. It is also caused by wave action at the toe of the bluff or when a bluff collapses under the weight of a heavy snow or rainfall.

Beach erosion occurs when the wave action takes away the light sand.

**Coastal Erosion**

Coastal erosion is the wearing away of land resulting in loss of beach, shoreline, or dune material from natural activity or human influences. Coastal erosion occurs over the area roughly from the top of the bluff out into the near-shore region to about the 30 foot water depth. It is measured as the rate of change in the position or horizontal displacement of a shoreline over a period of time. Bluff recession is the most visible aspect of coastal erosion because of the dramatic change it causes in the landscape. As a result, this aspect of coastal erosion usually receives the most attention.

On the coast, the forces of erosion are embodied in waves, currents, and wind. Surface and ground water flow, and freeze-thaw cycles may also play a role. Not all of these forces may be present at any particular location.

Coastal erosion can occur from rapid, short-term daily, seasonal, or annual natural events such as waves, storm surge, wind, coastal storms, and flooding or from human activities including boat wakes and dredging. The most dramatic erosion often occurs during storms, particularly because the highest energy waves are generated under storm conditions. Coastal erosion also may be from multi-year impacts and long-term climatic change such as sea-level rise, lack of sediment supply, subsidence or long-term human factors such as the construction of shore protection structures and dams or aquifer depletion. Studies are underway to determine the effects generated from global warming.

Ironically, attempts to control erosion through shoreline protective measures such as groins, jetties, seawalls, or revetments, can actually lead to increased erosion activity. This is because shoreline structures eliminate the natural wave run-up and sand deposition processes and can increase reflected wave action and currents at the waterline. The increased wave action can cause localized scour both in front of and behind structures and prevent the settlement of suspended sediment.

Fortunately in Alaska, erosion is hindered by bottomfast ice, which is present on much of the Arctic coastline during the winter. These areas are fairly vulnerable while the ice is forming. The winds from a fall storm can push sea ice into the shorefast ice, driving it onto the beach. The ice will then gouge the beach and cause other damage.

*Factors Influencing the Erosion Process*

There are a variety of natural and human-induced factors that influence the erosion process. For example, shoreline orientation and exposure to prevailing winds, open ocean swells, and waves all influence erosion rates. Beach composition influences erosion rates as well. For example, a beach composed of sand and silt, such as those near Shishmaref, are easily eroded whereas beaches primarily consisting of boulders or large rocks are more resistant to erosion. Other factors may include:

- Shoreline type
- Geomorphology of the coast
- Structure types along the shoreline
- Density of development
- Amount of encroachment into the high hazard zone
- Proximity to erosion inducing coastal structures
- Nature of the coastal topography
- Elevation of coastal dunes and bluffs
- Shoreline exposure to wind and waves.

**Riverine Erosion**

Rivers constantly alter their course, changing shape and depth, trying to find a balance between the sediment transport capacity of the water and the sediment supply. This process, called riverine erosion, is usually seen as the wearing away of riverbanks and riverbeds over a long period of time.

Riverine erosion is often initiated by failure of a riverbank causing high sediment loads or heavy rainfall. This generates high volume and velocity run-off which will concentrate in the lower drainages within the river's catchment area. When the stress applied by these river flows exceeds the resistance of the riverbank material, erosion will occur. As the sediment load increases, fast-flowing rivers will erode their banks downstream. Eventually, the river becomes overloaded or velocity is reduced, leading to the deposition of sediment further downstream or in dams and reservoirs. The deposition

Definitions:

***Groin*** - A narrow, elongated coastal-engineering structure built on the beach perpendicular to the trend of the beach. Its purpose is to trap longshore drift to build up a section of beach.

***Jetty*** - A narrow, elongated coastal-engineering structure built perpendicular to the shoreline at inlets to stabilize the position of a navigation channel, to shield vessels from wave forces, and to control the movement of sand along adjacent beaches to minimize the movement of sand into a channel.

***Seawall*** - A vertical, wall-like coastal-engineering structure built parallel to the beach or duneline and usually located at the back of the beach or the seaward edge of the dune. They are designed to halt shoreline erosion by absorbing the impact of waves.

***Revetment*** - An apron-like, sloped, coastal-engineering structure built on a dune face or fronting a seawall. Designed to dissipate the force of storm waves and prevent undermining of a seawall, dune or placed fill.

may eventually lead to the river developing a new channel.

While all rivers change in the long-term, short-term rates of change vary significantly. In less stable braided channel reaches, erosion and deposition of material are a constant issue. In more stable meandering channels, episodes of erosion may only occur occasionally. The erosion rate depends on the sediment supply and amount of run-off reaching the river. These variables are affected by many things including earthquakes, floods, climatic changes, loss of bank vegetation, urbanization, and the construction of civil works in the waterway.

Riverine erosion has many consequences including the loss of land and any development on that land. It can cause increased sedimentation of harbors and river deltas. It can hinder channel navigation and affect marine transportation.

Other problems include reduction in water quality due to high sediment loads, loss of native aquatic habitats, damage to public utilities (roads, bridges and dams) and maintenance costs from trying to prevent erosion sites.

*Location*

Most of Anchorage is not impacted by riverine erosion. It may occur in some localized areas. Map 4-15 shows areas with potential riverine erosion hazards. In particular, "Peters, Meadow and Rabbit Creeks experience high-velocity flows that can lead to extensive erosion of banks and washouts at inadequate stream crossings" (FEMA, 2002:11). Table 4.42 shows Anchorage's number of parcels at risk from riverine erosion.

*Likelihood of Occurrence*

Riverine erosion will always occur in Anchorage as rivers and other flowing water bodies are constantly altering their course.

*Historic Events*

No significant riverine erosion events have been identified.

*Vulnerability*

Table 4.43 shows the parcels that may be affected by riverine erosion.

**Table 4.43 Parcels Vulnerable to Riverine Erosion**

| Land Use | # of Parcels | Taxable Value (Land) | Taxable Value (Buildings) | Total |
|---|---|---|---|---|
| **Residential** | 37 | $4,542,700 | $2,782,700 | $7,325,400 |
| **Commercial** | 5 | $179,900 | $411,300 | $591,200 |

| | | | | |
|---|---|---|---|---|
| **Industrial** | 1 | $0 | $0 | $0 |
| **Institutional** | 1 | $0 | $0 | $0 |
| **Parks, Open Space & Recreation Areas** | 28 | $0 | $0 | $0 |
| **Transportation Related** | 1 | $0 | $0 | $0 |
| **Other** | 0 | $0 | $0 | $0 |
| **Vacant** | 6 | $4,100 | $80,600 | $84,700 |
| **Unidentified** | 9 | $0 | $313,500 | $313,500 |
| **Total** | **88** | **$4,726,700** | **$3,588,100** | **$8,314,800** |

## Wind Erosion

Wind erosion is when wind is responsible for the removal, movement and redeposition of land. It occurs when soils are exposed to high-velocity wind. The wind will pick up the soil and carry it away. The wind moves soil particles 0.1-0.5 mm in size in a hopping or bouncing fashion (known as saltation) and those greater than 0.5 mm by rolling (known as soil creep). The finest particles (less than 0.1 mm) are carried in suspension. Wind erosion can increase during periods of drought.

Wind erosion can cause a loss of topsoil, which can hinder agricultural production. The dust can reduce visibility causing automobile accidents, hinder machinery, and have a negative effect on air and water quality creating animal and human health concerns. Wind erosion can also cause damage to public utilities and infrastructure.

*Location*

Every parcel in MOA could be affected by wind erosion. Those in higher wind areas are more likely to experience wind erosion.

*Likelihood of Occurrence*

In Anchorage, wind erosion is not a significant problem but it can occur whenever there is a weather event with strong winds.

*Historic Events*

No significant wind erosion events have been identified.

*Vulnerability*

Every parcel in MOA could be vulnerable to wind erosion. However, this is not a significant threat.

## Coastal Erosion

Coastal erosion is the long term landward movement of the shoreline. It is generally associated with high energy events such as a coastal storm, flooding, etc, Coastal erosion can be the result of a series of short term

events such as storms. Alternatively, it could be the result of long-term processes such as a change in sea level or subsidence.

Coastal erosion is a natural process but can be influenced by human activity such as dredging and boat wakes. Coastal erosion rarely causes death or injuries but it can destroy buildings and infrastructure.

According to NHIRA, the degree of exposure to coastal erosion may be related to:

- Shoreline type
- The geomorphology of the coast
- Structure type along the shoreline
- Development density
- Amount of encroachment into the high-hazard zone
- Shoreline exposure to waves and wind
- Proximity to erosion-inducing coastal structures
- Nature of the coastal topography
- Elevation of coastal dunes and bluffs

*Location*

Coastal erosion is occurring west of Anchorage International Airport, as "several hundred yards of bluff have eroded in this century, much of it since 1949. The bluffs erode when high-energy storms enter Cook Inlet and generate large waves at their bases. Storms arriving in the fall are the most dangerous because the bluffs are not yet frozen and their sediment can be easily eroded" (Mason, 1997: 193).

Coastal erosion is also occurring near the coastal trail as "piles of construction or earthquake rubble plus a rock revetment built by the state to protect the bike path are increasing local rates of shoreline erosion by blocking lateral beach sand transport" (Mason, 1997:198).

Point Woronzof has a lack of vegetation, lack of a pile of talus at the base, and the lack of a protective mudflat indicates erosion about 2 feet per year (Mason, 1997). Point Campbell is also eroding but at a slightly slower rate (Mason, 1997).

*Likelihood of Occurrence*

Coastal erosion is a natural process and continually occurs. Unlike other parts of Alaska, it would be rare to have an single event associated with a significant amount of coastal erosion.

*Historic Events*

No significant coastal erosion events have been identified.

*Vulnerability*
Only coastal areas are vulnerable to coastal erosion.

## 4.2 TECHNOLOGICAL HAZARDS

Technological hazards are generally caused by human error or omission. The following technological hazards will be addressed in a future update:

- 4.2.1 Air Pollution
- 4.2.2 Dam Failure
- 4.2.3 Energy Emergency: Fuel/Resource Shortage
- 4.2.4 Fire: Explosion/Structural
- 4.2.5 Hazardous Materials Accident
- 4.2.6 Hazardous Materials Release
- 4.2.7 Power Failure (Outage)
- 4.2.8 Radiation Release
- 4.2.9 Transportation Accident: Aircraft
- 4.2.10 Transportation Accident: Marine
- 4.2.11 Transportation Accident: Motor Vehicle

## 4.3 HUMAN/SOCIETAL HAZARDS

These events are the result of deliberate human acts. The following human/societal hazards will be addressed in a future update:

- 4.3.1 Attack
- 4.3.2 Civil Disturbance
- 4.3.3 Terrorism
- 4.3.4 WMD: Biological, Chemical, Nuclear

# CHAPTER 5

# MITIGATION STRATEGY

The purpose of this chapter is to document Anchorage's mitigation strategy which is based on the findings presented in the preceding chapters. This chapter is divided into the following sections:

- Hazard Mitigation Goals and Objectives
- Hazard Mitigation Strategies
- Action Plan

The goals, objectives and action items provided in this chapter are intended to guide everyday activities and provide a long-term hazard mitigation approach for the MOA to follow. The goals are broad statements about what Anchorage wants to achieve in terms of hazard mitigation. Objectives identify how Anchorage will achieve their goals. The Action Plan items are specific actions or projects that will be taken to implement this mitigation plan.

## 5.1 GOALS

Goal 1: Education/Coordination: Develop coordinated and proactive public policies, emergency plans and procedures, and educational programs that minimize the risk to the community from natural hazards and disasters.

From Anchorage 2020, LRTP, Housing & Community Development Consolidated Plan, Work Force & Economic Development Plan

*Objective 1.1* *Increase coordination among Municipal departments*

*Objective 1.2* *Educate individuals and businesses about hazards, disaster preparedness and mitigation*

*Objective 1.3* *Increase coordination between hazard mitigation goals and existing and future plans including the incorporation of effective hazard mitigation strategies into the Capital Improvement Program*

*Objective 1.4* *Coordinate with the Alaska Division of Insurance*

*Objective 1.5* *Educate public officials, developers, realtors, contractors, building owners and the general public about hazard risks and building requirements*

*Objective 1.6* *Partner with Municipal Departments and other agencies serving vulnerable populations to minimize harm in the event of an emergency*

Goal 2: Land Use/Planning: Develop an urban place that develops in

harmony with its natural setting and is mindful of its natural hazards.

From Anchorage 2020, LRTP, Housing & Community Development Consolidated Plan

*Objective 2.1* *Continue to provide for floodplain management to protect residents and property from the hazards of development in floodplains*

*Objective 2.2* *Land use regulations shall include new design requirements that are responsive to Anchorage's climate and natural setting.*

*Objective 2.3* *Use environmentally and conservation friendly materials in mitigation projects whenever possible and economically feasible*

*Objective 2.4* *Adopt and enforce public policies to minimize impacts of development and enhance safe construction in high hazard areas*

*Objective 2.5* *Integrate new hazard and risk information into building codes and land use planning mechanisms*

Goal 3: Emergency Management: Create and maintain a community where people and property are safe.

From Anchorage 2020, LRTP, Housing & Community Development Consolidated Plan, Work Force & Economic Development Plan

*Objective 3.1* *Develop mechanisms in advance of a major emergency to cope with the subsequent rebuilding and recovery phases*

*Objective 3.2* *Consider the secondary effects of disasters, such as hazardous waste and hazardous materials spills, when planning and developing mitigation projects*

*Objective 3.3* *Minimize increases in hazard vulnerability*

*Objective 3.4* *Ensure compliance with the Emergency Planning and Community Right-to-Know Act of 1986*[1]

*Objective 3.5* *Improve road connectivity for evacuation purposes*

*Objective 3.6* *Promote disaster contingency planning and facility safety among institutions that provide essential services such as food, clothing, shelter and health care after hazard events*

*Objective 3.7* *Improve disaster warning systems.*

*Objective 3.8* *Promote appropriate hazard mitigation of all public and privately-owned property within the Municipality of*

[1] The Emergency Planning and Community Right-to-Know Act "establishes requirements for Federal, State and local governments, Indian Tribes, and industry regarding emergency planning and "Community Right-to-Know" reporting on hazardous and toxic chemicals. The Community Right-to-Know provisions help increase the public's knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment. States and communities, working with facilities, can use the information to improve chemical safety and protect public health and the environment" (EPA, 2000).

*Anchorage including, but not limited to, residential units, commercial structures, educational institutions, health care facilities, public gathering places, and infrastructure systems*

*Objective 3.9* *Promote mitigation of historic buildings*

*Objective 3.10* *Promote post-disaster mitigation as part of repair and recovery*

Goal 4: Protection of Public/Critical Facilities: Make MOA owned facilities as disaster resistant as feasible

*Objective 4.1* *Encourage a structural review of new facilities*

*Objective 4.2* *Consider known hazards when siting new facilities and systems*

*Objective 4.3* *Perform structural retrofitting of existing structures*

*Objective 4.4* *All public facilities should have a pollution prevention plan*

*Objective 4.5* *Incorporate non-structural mitigation into existing buildings*

*Objective 4.6* *Implement mitigation programs that protect critical Municipal facilities and services and promote reliability of lifeline systems to minimize impacts from hazards, to maintain operations, and to expedite recovery in an emergency.*

*Objective 4.7* *Create redundancies for critical networks such as water, sewer, digital data, power and communications*

*Objective 4.8* *Formalize best practices for protecting systems and networks*

Goal 5: Support Wildfire mitigation

*Objective 5.1* *Support the AFD Wildfire Strategic Plan*

*Objective 5.2* *Promote FireWise Building design, siting and construction material*

*Objective 5.3* *Continue and Maintain vegetation management*

*Objective 5.4* *Maintain the wildfire risk model*

*Objective 5.5* *Develop additional water resources to reduce the ISO rating*

Goal 6: Information: Ensure information is easy to access and up-to-date

*Objective 6.1* *Convert all hazard maps to a GIS format*

*Objective 6.2* *Identify hazards not already mapped*

*Objective 6.3* *Map all currently unmapped regulated flood-prone areas*

*Objective 6.4* *Record information about MOA declared disaster events including location, extent, and damage caused on a standardized template*

*Objective 6.5* *Update drainage studies*

Goal 7. Economy/Business: Maintain Anchorage's (and the State's) economic vitality

*Objective 7.1 Partner with private sector, including small businesses, to promote structural and non-structural hazard mitigation as part of standard business practice*

*Objective 7.2 Educate businesses about contingency planning citywide, targeting small businesses and those located in high risk areas*

*Objective 7.3 Partner with private sector to promote employee education about disaster preparedness while on the job and at home*

*Objective 7.4 Minimize economic loss*

## 5.2 IMPLEMENTATION

### 5.2.1 Strategies

The MOA will implement the mitigation measures identified in this plan by using the comprehensive plan, capital Improvement Plan, and other hazard mitigation tools they have at their disposal.

While there are many different ways to mitigate hazards, not all are appropriate for all situations. Each situation must be evaluated in order to decide what activities are the most appropriate. General strategies that can be used to mitigate hazards include:

**Structural Features**

These features are designed to control the hazard and restrict the exposed area. The construction of a structure such as a dam, levee or avalanche deflection wall can lessen the impact of a hazard event. Structures are most appropriate to protect existing development. Structures can be incorporated into new development but this should be discouraged as in hazard prone areas. The following departments can implement this strategy:

- PM&E
- Public Works

**Land Use Planning**

Land use planning can guide development away from hazard prone areas. Planning is more effective at protecting future development. The responsibility for land use planning is with the Planning Department.

**Zoning**

Zoning ordinances regulate development by dividing a community into areas and by establishing development criteria for each area. They may restrict certain uses in hazard prone areas or add restrictions such as minimum elevations. Zoning is more effective with future development. Zoning can:

- Prevent new development in hazard prone areas
- Preserve or establish low densities in hazard prone areas
- Control changes in use and occupancy of structures in hazard prone areas
- Establish performance standards
- Require special use permits

The Planning department and the Planning and Zoning Commission have the primary responsibility for zoning in the MOA.

**Subdivision Regulations**

Subdivision regulations govern how a parcel of land can be subdivided into two or more smaller parcels. It is better to incorporate mitigation measures into subdivision regulations before a parcel of land is developed. These regulations are better are protecting future development than existing development. The Planning Department and the Platting Board administers the MOA's subdivision regulations.

**Capital Improvement Plan**

A Capital Improvement Plan (CIP) is used to guide major public expenditures for physical improvements over a given period of time. These expenditures can use used to mitigation existing and future development. For example, funds could be used to retrofit an existing structure. The lack of investment in infrastructure in hazard prone areas may also act to restrict development as it is too costly for a private developer to build the necessary improvements. All municipal departments have input into the CIP but the Office of Management & Budget is the coordinating department.

**Open Space Preservation**

Open space preservation is a tool to keep existing open spaces in hazard prone areas from being developed. This prevents putting more people and facilities at risk. Open space is usually managed by the Parks & Recreation department.

**Acquisition**

Acquisition involves purchasing property in high risk areas and demolishing any structures on it to prevent the structure from being damaged during a hazard event. The structure is demolished to ensure that is not re-used in the future. This technique is more appropriate for mitigation existing structures. Many departments would be involved in the acquisition of property and structures.

**Relocation**

Relocation is similar to acquisition except that any structures on the property are relocated out of a hazard prone area. The structure may be relocated to a different parcel or within the same parcel. This technique is also more

appropriate for existing structures. Many departments would be involved in the relocation of structures.

### Building Codes

Building codes are a compilation of laws, regulations, ordinances, or other statutory requirements adopted by a government legislative authority relating to the physical structure of buildings. They establish minimum requirements regarding the construction of a structure to protect public health, safety, and welfare. They apply to new buildings as well as ones undergoing significant renovations which make them helpful in protecting new and existing development. Enforcement is essential in order for building codes to be an effective hazard mitigation tool. It is also less expensive and easier to incorporate mitigation measures into new structures than it is to retrofit existing ones. The Development Services department is responsible for administering the building code in Anchorage.

### Insurance

Insurance provides the funding to rebuild a structure and replace its contents after a hazard event. Insurance is appropriate for mitigating existing structures. The problem with insurance is that it can make it easier to rebuild in a hazard prone area creating a repetitive loss situation. The Risk Management department is responsible for ensuring the MOA's insurance needs are met.

### Education

Education involves teaching the public about potential natural hazards, the importance of mitigation, and how to prepare for emergency situations. It is used to inform residents, business owners, visitors, etc about the hazards in the area and what they can do to protect themselves and their property. Examples include real estate disclosure and training. Many departments within MOA can undertake education activities including OEM, Mayor's Office, and Planning.

## 5.2.2 ACTION PLAN

The action plan consists of specific activities or projects that will be used to implement the goals and objects of this hazard mitigation plan. The action plan contains many items that have no funding sources identified. The timelines are dependant upon obtaining funding. If and when funding becomes available, more specific timelines will be established. This list is just starting to be developed and will be updated as needed. For each item, several characteristics are listed including:

- Purpose – why is this item included in the action plan?
- How identified – how the action item was identified
- Coordination organization - the primary organization to implement the action item
- Objective – the objectives being implemented
- Hazard – what hazard is being addressed

- Status/Timeline – what stage the project is at or the target start date
- Priority – the priority of the project as determined by the process established in Appendix G (Departments have not begun to use this tool and priorities will be included in the next version of the mitigation plan.)
- Cost – the estimated cost of the project
- Potential funding sources – possible sources of funding

Action 1: Have semi-annual meetings of the hazard mitigation committee
Purpose: To discuss hazard mitigation related items on a regular basis
How Identified: Consultant
Coordinating Organization: OEM
Objective: 1.1
Hazard: All
Status/Timeline: ongoing
Priority: High
Cost: to be completed
Potential Funding Sources: general revenue

Action 2: The City shall develop a program to educate the community on the various methods of making structures and their contents more disaster resistant, which would include: workshops, literature and public safety announcements
Purpose: To educate people about hazard mitigation
How Identified: to be completed
Coordinating Organization: Planning/AFD
Objective: 1.2, 1.5, 7.1, 7.2, 7.3, 1.4, 5.1, 5.2
Hazard: All
Status/Timeline: 2-3 years
Priority: to be completed
Cost: to be completed
Potential Funding Sources: to be completed

Action 3: Continue the A.W.A.R.E. Program
Purpose: To continue educating residents on basic emergency response strategies
How Identified: Consultant
Coordinating Organization: Mayor's Office
Objective: 1.2, 1.5, 3.8
Hazard: All
Status/Timeline: ongoing
Priority: to be completed
Cost: to be completed
Potential Funding Sources: current funding/FEMA grant

Action 4: Develop a recovery plan
Purpose: To identify how hazard mitigation can be incorporated into the re-construction of the MOA after a hazard event
How Identified: Consultant
Coordinating Organization: OEM
Objective: 3.1, 3.10, 4.2
Hazard: All
Status/Timeline: 2 years
Priority: low
Cost: to be completed
Potential Funding Sources: FEMA grant

Action 5: The City shall continue to apply floodplain management regulations for development in the flood plain and floodway
Purpose: To continue to minimize vulnerability to flooding
How Identified: Consultant
Coordinating Organization: PM&E
Objective: 2.1
Hazard: Flood
Status/Timeline: ongoing
Priority: to be completed
Cost: $100,000
Potential Funding Sources: current funding

Action 6: The City shall continue to utilize the Federal Emergency Management Agency's Flood Insurance Rate Map to define the special flood hazard area, the floodway and the floodplain
Purpose: To define the special flood hazard area, the floodway, and the floodplain in a consistent manner
How Identified: Consultant
Coordinating Organization: PM&E
Objective: 2.1
Hazard: Flood
Status/Timeline: ongoing
Priority: to be completed
Cost: $100,000 per year
Potential Funding Sources: current funding

Action 7: Develop a list of possible sites to purchase for floodplain mitigation
Purpose: To identify sites the MOA would like to consider purchasing
How Identified: MOA Mitigation Planning Team
Coordinating Organization: PM&E
Objective: 2.1, 2.3

Hazard: Flood
Status/Timeline: 1 year
Priority: to be completed
Cost: to be completed
Potential Funding Sources: current funding

Action 8: Implement the four essential strategies to implement policy #41 of Anchorage 2020. The four strategies are: design standards, land clearing standards, land use regulation amendment (Central Business zones), and landscape ordinance
Purpose: To make hazard mitigation better integrated with other Municipal plans and regulations
How Identified: Anchorage 2020
Coordinating Organization: Planning
Objective: 1.3, 2.2, 2.4, 2.5
Hazard: All
Status/Timeline: 5-10 years
Priority: to be completed
Cost: to be completed
Potential Funding Sources: to be completed

Action 9: Evaluate existing development guidelines to identify which ones, if any, should be revised to incorporate hazard mitigation activities.
Purpose: To help incorporate hazard mitigation into the activities of the MOA.
How Identified: Consultant
Coordinating Organization: Planning
Objective: 2.5, 5.1, 5.2
Hazard: All
Status/Timeline: 5-10 years
Priority: to be completed
Cost: to be completed
Potential Funding Sources: to be completed

Action 10: Create of a dam inundation overlay zone in the MOA GIS System of known dam inundation areas.
Purpose: To determine if a dam inundation overlay zone is the appropriate way to minimize increases in vulnerability
How Identified: Consultant
Coordinating Organization: Project Management & Engineering/Planning
Objective: 6.1, 6.2
Hazard: Dam Failure

Status/Timeline: 1 year
Priority: to be completed
Cost: 1 week of staff time
Potential Funding Sources: current funding

Action 11: Conduct vulnerability analysis of shelters and traditional housing serving vulnerable populations.
Purpose: Promote mitigation of all property
How Identified: by a Special Committee formed after a major earthquake exercise in 1994
Coordinating Organization: OEM
Objective: 1.6, 3.6
Hazard: All
Status/Timeline: On going project as staff and time allow (under 2 years)
Priority: to be completed
Cost: 5-10 Million
Potential Funding Sources: Existing Funding – seek additional funding from FEMA mitigation grant or other outside sources to expand program.

Action 12: Identify alternate connections between Eagle River and the Anchorage Bowl
Purpose: Provide additional access for response and evacuation purposes.
How Identified: MOA Mitigation Planning Team
Coordinating Organization: Transportation Planning
Objective: 3.5
Hazard: All
Timeframe: 2-3 years
Priority: to be completed
Cost: to be completed
Potential Funding Source: to be completed

Action 13: Review existing zoning to determine if additional wildfire mitigation measures could be incorporated
Purpose: To help incorporate wildfire mitigation measures into future development.
How Identified: Consultant
Coordinating Organization: Planning/AFD
Objective: 1.3, 2.2, 2.4, 2.5, 5.2
Hazard: Wildfire
Status/Timeline: 2-3 years
Priority: to be completed

Cost: to be completed
Potential Funding Source: to be completed

Action 14: Create a prioritized list of FIRMs that need to be updated
Purpose: As all the FIRMs can not be updated simultaneously, having a prioritized list would tell the city what to update when resources are available.
How Identified: MOA Mitigation Planning Team
Coordinating Organization: PM&E
Objective: 6.3
Hazard: Flooding
Status/Timeline: 1 year
Priority: to be completed
Cost: to be completed
Potential Funding Sources: General revenue, FEMA grant

Action 15: Digitize the ground failure maps from the Snow Avalanche & Mass-Wasting Hazard Analysis Glacier/Winner Creek Area, Alaska report.
Purpose: To make the data more accessible
How Identified: Consultant
Coordinating Organization: Planning
Objective: 6.1
Hazard: Ground Failure
Status/Timeline: 1 year
Priority: to be completed
Cost: 1 week of staff time
Potential Funding Sources: current funding

Action 16: Continue to require new MOA buildings to go through the FM Global Engineering Review
Purpose: To ensure MOA buildings are as disaster-resistant as feasible
How Identified: MOA Mitigation Planning Team
Coordinating Organization: Risk Management
Objective: 6.1
Hazard: All
Status/Timeline: ongoing
Priority: to be completed
Cost: to be completed
Potential Funding Sources: current funding

Action 17: Develop siting requirements for facilities built with Municipal funds
Purpose: To minimize increases in vulnerability

How Identified: Consultant
Coordinating Organization: PM&E
Objective: 4.2, 3.3, 3.2
Hazard: All
Status/Timeline: 6 months
Priority: to be completed
Cost: under $10,000
Potential Funding Sources: current funding

Action 18: The City shall pursue funding to seismically retrofit City-owned facilities built before 1950.
Purpose: To limit the amount of damage caused by an earthquake
How Identified: MOA Mitigation Planning Team
Coordinating Organization: M&O
Objective: 3.9, 4.3, 2.3
Hazard: Earthquake
Status/Timeline: ongoing
Priority: to be completed
Cost: to be completed
Potential Funding Sources: to be completed

Action 19: Install gas shut off valves in all MOA owned public facilities
Purpose: To reduce the possibility of gas leaks after a hazard event
How Identified: MOA Mitigation Planning Team
Coordinating Organization: M&O
Objective: 4.3, 4.6
Hazard: Earthquake
Status/Timeline: 3-5 years
Priority: to be completed
Cost: to be completed
Potential Funding Sources: to be completed

Action 20: Install gas shut off valves in all ASD public schools
Purpose: To reduce the possibility of gas leaks after a hazard event
How Identified: ASD
Coordinating Organization: ASD
Objective: 4.3, 4.6
Hazard: Earthquake
Status/Timeline: 10-20 years
Priority: to be completed
Cost: $1,000,000
Potential Funding Sources: to be completed

Action 21: Ensure school windows are shatter-resistant by installing a coating on the window or replacing the window.
Purpose: To prevent people from being injured by broken glass
How Identified: ASD
Coordinating Organization: ASD
Objective: 4.3, 4.5, 4.6
Hazard: Earthquake
Status/Timeline: 20 years
Priority: to be completed
Cost: to be completed
Potential Funding Sources: to be completed

Action 22: Repair/replace the Lower Fire Lake Dam
Purpose: Prevent a failure of the dam
How Identified: PM&E
Coordinating Organization: PM&E
Objective: 4.3
Hazard: Dam Failure
Timeframe: 1 – 5 years
Cost: $530,000
Priority: High
Cost: to be completed
Potential Funding Sources: HMGP Grant, Legislature appropriation

Action 23: Retrofit the Lake of the Hills Dam
Purpose: The Lake of the Hill Dam does not meet current standards. It needs to be upgraded to reduce the chance of a dam failure.
How Identified: PM&E
Coordinating Organization: PM&E
Objective: 4.3
Hazard: Dam Failure
Status/Timeline: 1 – 5 years
Priority: to be completed
Cost: to be completed
Potential Funding Sources: to be completed

Action 24: Port of Anchorage - Seismic Retrofit Terminal I Piles
Purpose: The pile thickness underneath terminal I is below standard and could fail during an earthquake
How Identified: Port of Anchorage
Coordinating Organization: Port of Anchorage
Objective: 7.4
Hazard: Earthquake
Timeframe: to be completed

Cost: to be completed
Priority: to be completed
Cost: to be completed
Potential Funding Sources: to be completed

Action 25: Port of Anchorage - Seismic Retrofit Terminal I Wells
Purpose: The wells beneath Terminal I need pile sleeves to prevent them from failing during an earthquake
How Identified: Port of Anchorage
Coordinating Organization: Port of Anchorage
Objective: 7.4
Hazard: Earthquake
Status/Timeline: to be completed
Priority: to be completed
Cost: to be completed
Potential Funding Sources: to be completed

Action 26: Port of Anchorage - Seismic Retrofit Terminal II – Crane Tie Downs
Purpose: Crane tie downs are necessary to keep the cranes from falling over during an earthquake
How Identified: Port of Anchorage
Coordinating Organization: Port of Anchorage
Objective: 7.4
Hazard: Earthquake
Status/Timeline: to be completed
Priority: to be completed
Cost: to be completed
Potential Funding Sources: to be completed

Action 27: Identify municipal fire stations, police stations and emergency facilities that need to be seismically retrofit or rebuild to current seismic standards
Purpose: To ensure the availability of emergency responders and their equipment after a hazard event
How Identified: Consultant
Coordinating Organization: M&O
Objective: 4.6, 4.7, 4.3
Hazard: Earthquake
Status/Timeline: 1 year
Priority: to be completed
Cost: to be completed

Potential Funding Sources: Possible Capital Improvement Bond Issue. Seek grant funding from FEMA mitigation grant programs or other outside source as needed.

Action 28: Identify all municipal facilities that need a pollution prevention plan
Purpose: To manage storm water runoff
How Identified: MOA Planning Team
Coordinating Organization: PM&E
Objective: 4.4, 2.3
Hazard: Hazardous Materials
Timeframe: 1 year
Cost: to be completed
Priority: to be completed
Cost: to be completed
Potential Funding Sources: current funding

Action 29: Establish a template that documents the information FEMA wants on each hazard event
Purpose: To provide easy access to information regarding declared disaster events. A template would ensure the information being recorded on each event is consistent.
How Identified: Consultant
Coordinating Organization: OEM
Objective: 6.4
Hazard: All
Status/Timeline: 1 year
Priority: High
Cost: to be completed
Potential Funding Sources: current funding

Action 30: Increase the use of HAZUS
Purpose: Obtain improved vulnerability information.
How Identified: OEM
Coordinating Organization: OEM
Objective: 3.3
Hazard: All
Status/Timeline: 5 year
Priority: to be completed
Cost: to be completed
Potential Funding Sources: current funding

Action 31: Investigate the culvert near Arctic Boulevard and the Valley of the Moon Park as it is a source of localized flooding.

Purpose: To reduce localized flooding.
How Identified: OEM
Coordinating Organization: OEM
Objective: 2.1, 3.8
Hazard: All
Status/Timeline: 2 years
Priority: to be completed
Cost: to be completed
Potential Funding Sources: current funding

Action 32: Maintain the wildfire risk model
Purpose: To ensure the risk model is using the most current information
How Identified: AFD
Coordinating Organization: AFD
Objective: 5.4
Hazard: Wildfire
Status/Timeline: on-going
Priority: to be completed
Cost: to be completed
Potential Funding Sources: to be identified

Action 33: Continue and maintain vegetation management
Purpose: To limit the amount of fuel available for wildfires
How Identified: AFD
Coordinating Organization: OEM
Objective: 5.3
Hazard: Wildfire
Status/Timeline: 1 year
Priority: to be completed
Cost: to be completed
Potential Funding Sources: current funding

Action 34: Develop additional water resources
Purpose: Developing additional water resources would assist in fighting wildfires.
How Identified: AFD
Coordinating Organization: AFD
Objective: 5.5
Hazard: Wildfire
Status/Timeline: to be completed
Priority: to be completed
Cost: to be completed
Potential Funding Sources: to be completed

Action 35: Develop a list of drainage studies needing updating
Purpose: To identify which drainage studies need to be updated and to identify the order they should updated in.
How Identified: MOA Mitigation Planning Team
Coordinating Organization: Watershed Management
Objective: 6.5
Hazard: Flood
Status/Timeline: 1 year
Priority: to be completed
Cost: to be completed
Potential Funding Sources: current funding

Action 36: Continue to comply with Right to Know Act
Purpose: To remain in compliance with the Emergency Planning & Community Right to Know Act.
How Identified: MOA Mitigation Planning Team
Coordinating Organization: Anchorage Local Emergency Planning Committee
Objective: 3.4
Hazard: Hazardous Materials
Status/Timeline: on-going
Priority: to be completed
Cost: to be completed
Potential Funding Sources: current funding

Action 37: Identify necessary warning system improvements
Purpose: To provide improved warnings to the residents of Anchorage
How Identified: OEM
Coordinating Organization: OEM
Objective: 3.7
Hazard: All
Status/Timeline: on-going
Priority: to be completed
Cost: to be completed
Potential Funding Sources: current funding although grants and other funds may be needed to implement the improvements

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# Abbreviations

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# Prioritization

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# Survey Results

# ABBREVIATIONS

| | |
|---|---|
| ACS | Alaska Communications Systems |
| ADGGS | Alaska Division of Geological & Geophysical Survey |
| ADHS&EM | Alaska Division of Homeland Security & Emergency Management |
| AEIC | Alaska Earthquake Information Center |
| AFD | Anchorage Fire Department |
| AFEM | Anchorage Fire Exposure Model |
| AHRS | Alaska Heritage Resource Survey |
| AKRR | Alaska Railroad |
| ANCSA | Alaska Native Claims Settlement Act |
| ANVSA | Alaska Native Village Statistical Area |
| APD | Anchorage Police Department |
| ARDSA | Anchorage Roads and Drainage Service Areas |
| ASD | Anchorage School District |
| AST | Alaska State Troopers |
| AVO | Alaska Volcano Observatory |
| AWARE | Anchorage Watchful, Alert and Ready for Emergencies |
| AWWU | Anchorage Water & Wastewater Utility |
| CBERRRSA | Chugiak, Birchwood, Eagle River Rural Road Service Area |
| CEMP | Comprehensive Emergency Management Plan |
| CIP | Capital Improvement Plan |
| DHHS | Department of Health & Human Services |
| DMA 2000 | Disaster Mitigation Act of 2000 |
| FBI | Federal Bureau of Investigation |
| FCC | Federation of Community Councils |
| FEMA | Federal Emergency Management Agency |
| FIRM | Flood Insurance Rate Map |
| GIS | Geographical Information System |
| HMGP | Hazard Mitigation Grant Program |
| ISER | Institute of Social & Economic Research |
| ISO | Insurance Service Organization |
| LRTP | Long Range Transportation Plan |
| M&O | Maintenance & Operations |
| $M_L$ | Richter Scale (local magnitude) |
| MMI | Modified Mercalli Intensity scale |
| MOA | Municipality of Anchorage |
| MTA | Matanuska Telephone Association |
| $M_W$ | Moment magnitude |
| N/A | Not Available |
| NWS | National Weather Service |
| OEM | Office of Emergency Management |
| PDM | Pre-Disaster Mitigation |
| PGA | Peak Ground Acceleration |
| PIP | Public Involvement Plan |
| PM&E | Project Management & Engineering |

| | |
|---|---|
| SHMO | State Hazard Mitigation Officer |
| SHPO | State Historical Preservation Office |
| UAA | University of Alaska Anchorage |
| UAF-GI | University of Alaska, Fairbanks – Geophysical Institute |
| USACE | US Army Corps of Engineers |
| USDA | US Department of Agriculture |
| USGS | United States Geological Survey |
| WMD | Weapons of Mass Destruction |

# Anchorage All Hazard Mitigation Plan

## Public Involvement Plan

**Prepared for:**

**Municipality of Anchorage**
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**Anchorage AK**

**Prepared by:**

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**October 2004**

# Table of Contents

## 1.0 Overview

### FEMA's Mission

To protect lives and prevent the loss of property from hazards. Examples of hazards that the Anchorage All-Hazard Mitigation Plan will address are listed below:

- Earthquakes
- Wildfires
- Weather Events
- Volcanic Ash
- Dam Failure
- Hazardous Materials Accident
- Tsunami
- Avalanche

The Anchorage All-Hazard Mitigation Plan is a project to develop a Federal Emergency Management Agency (FEMA) approved local hazard mitigation plan for the Municipality of Anchorage (MOA). Effective November 1, 2004, a mitigation plan approved by FEMA and the state is required from any community that wishes to obtain funding from the Hazard Mitigation Grant Program (HMGP) or the Pre-Disaster Mitigation (PDM) Program to reduce potential damages. This requirement is a result of a federal initiative to place more emphasis on the planning process to promote and support sustainable, disaster resistant communities. To support that goal, the Anchorage All-Hazard Mitigation Plan will:

- Identify hazards that could affect the community.
- Assess the community's vulnerability to hazards.
- Determine how to eliminate the effects of these hazards.

The main phases of the project are:

- Draft Mitigation Plan Development
- Final Mitigation Plan Development

### Anchorage All-Hazard Mitigation Plan Goal

Through a collaborative process,

- Identify hazards that could affect the community.
- Assess the community's vulnerability to hazards.
- Determine how to eliminate the effects of these hazards.

The MOA has contracted with HDR Alaska, Inc., (HDR) through November 2004 to develop the draft mitigation plan and the draft final mitigation plan, as well as to support the MOA's public involvement process, as outlined in this public participation plan.

This document sets forth strategies for communicating with the public and other interested parties about the project. It defines the tools, timing, and strategies for obtaining public and agency input.

## 2.0 Participation Plan

This section defines the approach and methods to be used to obtain agency and public participation in the project. The section is organized by phases relating to the project development process. The goal of this section is to establish a framework for sharing information throughout the entire project. This framework is designed to ensure continuous coordination among project staff and stakeholders, agency staff, community members, and other affected and interested parties.

### Phase 1: Draft Mitigation Plan Development

This phase represents activities associated with project start-up and the development of the draft mitigation plan. Public involvement tools anticipated during this phase of the project are discussed below.

## Phase 1: Draft Mitigation Plan Development

**Schedule**

September – November 2003

**Goals**

- Lay the groundwork for a successful public process.
- Identify stakeholders (agency and public).
- Develop stakeholder (agency and public) understanding of the project.
- Develop and solicit input on the draft plan.

- ✓ Strategies and Action Plan
- ✓ Develop Public Involvement Plan.
- ✓ Establish Municipal Core Planning Team.
- ✓ Hold Core Planning Team Meeting #1.
- ✓ Develop project mailing list
- ✓ Establish project website.
- ✓ Hold Core Planning Team Meeting #2.
- ✓ Present project to Federation of Community Councils and solicit feedback.
- ✓ Hold public meeting in Anchorage.
  - ✓ Prepare meeting material.
- ✓ Advertise meeting.
  - ✓ Publish ad in *Anchorage Daily News*.
  - ✓ Publish project newsletter #1
- ✓ Respond to requests for information.

### *Public Involvement Plan*

The public involvement plan, contained in this document, establishes the public involvement process. This plan is a dynamic document that will be updated as the need arises during the project.

### *Municipal Core Planning Team Meetings*

The core planning team consists of representatives of the key municipal departments. Three meetings will be held before the end of November. The first meeting will introduce the project and solicit general comments and concerns. The second meeting will focus on the identification of mitigation goals and projects. The third meeting will focus on the draft mitigation plan and issues arising from public input.

### *Project Mailing List*

A project mailing list will be created to identify and maintain contact with interested residents, agencies, and other stakeholders. The list will be used to distribute project information such as meeting notices and the availability of documents. It will be updated after each public meeting (using sign-in sheets) and upon receiving comments from the public. The preferred method of contact will be email but information will be mailed upon request.

### *Website*

A website will be developed and linked to the existing www.muni.org site in September 2003. All reports and newsletters will be posted to the website for the public's easy access. Links will also be provided to the project website from other appropriate sites, including from MOA's Wildfire and Office of Emergency Management web sites.

### *Public Meeting*

One public meeting will be held during the development of a draft mitigation plan (in early November 2003). The meeting will be an opportunity to introduce the project and the project team, and to present the information gathered to date. It will also be an opportunity for people to ask questions about any aspect of the project. The team will provide meeting materials such as display graphics, comments sheets, and sign-in sheets. The meeting will be advertised in the *Anchorage Daily News,* the What's Up email list and the Federation of Community Councils email list.

### *Survey*

A survey asking residents for feedback on the final draft mitigation plan will be available through the website, at the public meeting, or in hardcopy form upon request.

### *Newsletter*

Newsletters will be developed and distributed to convey project information. Each newsletter will be double-sided and 8.5 by 11 inches in size. The first newsletter will be timed to notify people of the public meeting. Newsletters will also be posted on the project website. These on-line newsletters will be available easily to people who want additional copies or who want a copy following the official publication date.

### *Community Group Coordination*

A presentation will also be made to the Federation of Community Councils, with a request that the plan's development be announced in each community council's newsletter. Other community or agency groups may request presentations. The team will provide meeting material such as display graphic, comments sheets, and sign-in sheets.

### *Requests for Information*

The team will also respond to requests for information as needed throughout the project.

## Phase 2: Final Mitigation Plan Development

The remainder of this section provides an overview of public involvement activities associated with the development of the final mitigation plan.

### *Municipal Planning Team Meetings*

The planning team will convene during this stage to provide input on the final draft plan.

### *Assembly Briefing*

Prior to adoption by the Anchorage Assembly, the team will present the draft final plan to the Assembly. This briefing will help address concerns and ensure the plan's adoption by the Anchorage Assembly.

### *Public Meeting*

After the final draft has been developed but before adoption by the Anchorage Assembly (Fall 2004), three public meetings will be held: one in the Anchorage Bowl, one in Girdwood, one in Chugiak/Birchwood. The meetings will include a presentation and a question and answer session. Presentation materials and handouts will be prepared. The meetings will be advertised in the *Anchorage Daily News, Alaska Star,* the *Turnagain Times,* the What's Up email list and the Federation of Community Councils email list.

### *Project Mailing List*

A project mailing list will be updated to reflect public meeting sign-in sheets and general comment sheets.

**Phase 2: Final Mitigation Plan**

Schedule
November 2003 to Fall 2004

Goals
- Maintain communication channels.
- Communicate in a variety of ways, and offer a variety of tools and opportunities for feedback.
- Have our communications received and understood.
- Receive and understand all the information that is communicated to us.
- Demonstrate how we have infused the project alternatives with public input (or, if necessary, explain why input could not be used).
- Develop and solicit input on the draft plan.

- ✓ Strategies and Action Plan
- ✓ Conduct web-based survey.
- ✓ Post final draft plan on website.
- ✓ Hold Municipal Planning Team Meeting #3.
- ✓ Hold public meeting in Anchorage
- ✓ Hold public meeting in Girdwood.
- ✓ Hold public meeting in Chugiak/Birchwood.
- ✓ Advertise meeting.
  - ✓ Publish newspaper ads.
  - ✓ Publish project newsletter #2.
- ✓ Update mailing list.
- ✓ Hold Municipal Planning Team Meeting #4.
- ✓ Update website.
- ✓ Post final plan on the website.
- ☐ Publish project newsletter #3.

### *Website*

The website will be updated periodically to include reports and newsletters published.

### *Newsletter*

The second newsletter will be developed to advertise the second round of public meetings. The third newsletter will announce the completion of the project and the availability of the final plan. The newsletters will also be posted on the project website.

### *Requests for Information*

Throughout the project, the team will respond to requests for information.

# Appendix A:

# Project Team Contacts


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## Appendix B:

## Municipal Core Planning Team


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# Appendix C:

# Public Meeting Materials

# Appendix D:

# Public Meeting Ads

# Appendix E:

# GBOS Sign-in Sheet

# Appendix F:

# Survey Results

# HAZARD MITIGATION PLAN SURVEY

To solicit public input into the hazard mitigation plan, a survey was conducted through the PM&E website. The survey ran from October 2003 to October 2004. The results are summarized below.

Question 1: How concerned are you about the following hazards?

| HAZARD | Very Concerned | Somewhat Concerned | No Opinion | Not Very Concerned | Not At All Concerned | No Answer |
|---|---|---|---|---|---|---|
| Avalanche | 4 | 12 | 2 | 5 | 10 | 4 |
| Earthquake | 19 | 14 | 0 | 0 | 1 | 3 |
| Flood | 5 | 3 | 2 | 18 | 4 | 4 |
| Landslide | 3 | 5 | 1 | 17 | 6 | 4 |
| Severe Wind Storm | 7 | 18 | 0 | 6 | 0 | 5 |
| Tsunami | 4 | 9 | 2 | 13 | 4 | 4 |
| Volcanic Ashfall | 6 | 17 | 0 | 8 | 1 | 4 |
| Wildfire | 19 | 8 | 1 | 3 | 1 | 4 |
| Winter Storm | 11 | 11 | 1 | 7 | 3 | 4 |
| Air Pollution | 8 | 12 | 1 | 9 | 3 | 4 |
| Dam Failure | 3 | 4 | 5 | 6 | 16 | 3 |
| Energy Emergency: Fuel/Resource Shortage | 8 | 16 | 1 | 5 | 3 | 3 |
| Fire: Explosion/Structural | 6 | 12 | 1 | 13 | 1 | 3 |
| Hazardous Materials Accident | 5 | 15 | 1 | 8 | 2 | 5 |
| Hazardous Materials Release | 10 | 12 | 0 | 8 | 2 | 4 |
| Infrastructure Failure | 8 | 14 | 4 | 5 | 1 | 4 |
| Radiation Release | 3 | 11 | 3 | 9 | 5 | 5 |
| Transportation Accident: Aircraft | 9 | 11 | 2 | 6 | 4 | 4 |
| Transportation Accident: Marine | 3 | 8 | 4 | 11 | 6 | 4 |
| Transportation Accident: Motor Vehicle | 8 | 14 | 2 | 3 | 5 | 4 |
| Attack | 1 | 8 | 3 | 12 | 9 | 4 |
| Civil Disturbance | 1 | 7 | 1 | 14 | 10 | 4 |
| Terrorism, WMD: Biological, Chemical, Nuclear | 3 | 12 | 2 | 11 | 5 | 3 |

Question 2: Has one or more of these directly affected you while living in the Municipality of Anchorage (MOA)? If yes, which ones?

| Hazard | Number of Responses |
|---|---|
| Avalanche | 5 |
| Earthquake | 21 |
| Flood | 5 |
| Landslide | 2 |
| Severe Wind Storm | 26 |
| Tsunami | 1 |
| Volcanic Ashfall | 18 |
| Wildfire | 5 |
| Winter Storm | 17 |
| Air Pollution | 11 |
| Dam Failure | 1 |
| Energy Emergency: Fuel/Resource Shortage | 5 |
| Fire: Explosion/Structural | 1 |
| Hazardous Materials Accident | 3 |
| Hazardous Materials Release | 2 |
| Infrastructure Failure | 4 |
| Radiation Release | 1 |
| Transportation Accident: Aircraft | 2 |
| Transportation Accident: Marine | 2 |
| Transportation Accident: Motor Vehicle | 10 |
| Attack | 1 |
| Civil Disturbance | 1 |
| Terrorism, WMD: Biological, Chemical, Nuclear | 1 |

Question 3: In your opinion, what steps should the Municipality take to reduce possible damage and loss of life from natural and technological hazards?

| Mitigation Measure | Strongly Agree | Agree | No Opinion | Disagree | Strongly Disagree | No Answer |
|---|---|---|---|---|---|---|
| Make hazard mitigation part of every land use proposal | 10 | 13 | 6 | 3 | 0 | 4 |
| Restrict construction in areas with a high risk for natural hazards such as flooding or avalanches | 19 | 9 | 1 | 2 | 0 | 5 |
| Building code changes | 12 | 12 | 6 | 1 | 2 | 4 |
| Increase accuracy of floodplain mapping | 9 | 17 | 4 | 2 | 0 | 4 |
| Increase accuracy of other hazard maps | 14 | 15 | 2 | 0 | 0 | 5 |
| Encourage the creation of firebreaks | 15 | 13 | 3 | 1 | 0 | 4 |
| Encourage FireWise building practices | 18 | 12 | 2 | 0 | 0 | 4 |
| Clear spruce bark beetle killed trees | 14 | 16 | 1 | 1 | 1 | 4 |
| Improve hazard education | 21 | 10 | 0 | 0 | 1 | 4 |

Question 4: What other measures should the Municipality be taking?

| |
|---|
| Please continue to work with FEMA, Alaska State Emergency Agencies, the Military, Municipality of Anchorage Emergency Operations Center and communities to the north and south of Anchorage to better plan for disasters, practice with live exercises, and educate the public on emergency preparedness and wise implementation of public safety procedures. Continue to support the AWARE Academy, AWARE Neighborhoods,AWARE Schools, and Think AHEAD business programs. Make each citizen ready and wise in ord |
| Increase education of the citizens of Anchorage. Building code changes should only occur if justified by the on-going research. |
| Designate a week when the municipality will haul away spruce bark beetle killed trees. Chip them and allow the public to use the chips for mulch in gardens. |
| Insure that person's that live in high risk area's or those that decide to build in high risk area's, such as flood plains, have adequate insurance so that no funds need to come from FEMA or other government agencies need to pay for property when it floods. |
| Actively encourage alternate roadways for use should major roadways become unusable. Girdwood has only one road and one bridge access. A |

| |
|---|
| second road into Girdwood and a second bridge should be priorities. |
| Evaluating the limited transportation corridors that will be impacted by disaster operations creating isolation of persons. |
| Continue CERT program--first portion encourages preparedness |
| 1) Ability for Muni to warn residents (text message, email alert etc)especially multiple alerts (size of earthquake, tsanami on way. Help DOT spread the word about Call 511 too!)<br>2) Ability for prepared residents to respond (minimal panic)<br>3) Ability for emergency personnel and local residents to communicate<br>4) Local calls take precedence on the comm network (people calling San Diego to say I''m okay should not take priority over people needing to reach first responder aid.<br>5) use GIS to interpr |
| Put some actual thought into development patterns - more development keeps going into very hazardous areas (Turnagain View subdivisions, etc). Land use decisions are not made with sustainable development in mind. |
| Make hazard mitigation info more accessible on the muni website. |
| Require removal of beetle killed spruce within 90 Days of identification. Should apply to park land, utility rights of way and private property of less than 20,000 square feet. |
| Infrastructure redundancies, so that if part is damaged, the rest can be rerouted, especially transportation, water, and electricity. |
| Keep an eye on the Alaska Railroad. |

Question 5: Have you ever received information about how to make your family and home safer from a disaster?

| **Answer** | **Number of Responses** |
|---|---|
| Yes | 27 |
| No | 7 |
| Did not answer | 3 |

Question 6: Have you developed a family emergency plan? If yes, have you practiced it?

| **Answer** | **Number of Responses** |
|---|---|
| Yes, and have practiced it | 12 |
| Yes, but have not practiced it | 14 |
| No | 8 |
| Did not answer | 3 |

Question 7: Have you participated in an AWARE Academy class?

| Answer | Number of Responses |
|---|---|
| Yes | 4 |
| No | 30 |
| Did not answer | 3 |

Question 8: Did you consider the possible occurrence of a disaster when you bought/moved into your current home?

| Answer | Number of Responses |
|---|---|
| Yes | 26 |
| No | 8 |
| Did not answer | 3 |

Question 9: Would you be willing to spend more money on a home that had features that made it more disaster resistant?

| Answer | Number of Responses |
|---|---|
| Yes | 26 |
| No | 7 |
| Did not answer | 4 |

Question 10: How much money are you willing to spend to better protect your family and home from a disaster?

| Answer | Number of Responses |
|---|---|
| $5,000 and above | 15 |
| $2,500 - $4,999 | 1 |
| $1,000 – $2,499 | 6 |
| $500 – $999 | 0 |
| $100 – $499 | 2 |
| Under $100 | 1 |
| Nothing | 1 |
| Don't know | 6 |
| Other | 0 |
| Did not answer | 4 |

Question 11: What nonstructural or structural modifications that make your home more resistant to earthquakes have you made?

| **Answer** | **Number of Responses** |
|---|---|
| **Non Structural** | |
| Anchor bookcases, cabinets, etc. to wall | 13 |
| Secure water heater to wall | 25 |
| Install latches on drawers/cabinets | 8 |
| Fit gas appliances with flexible connections and individual shutoffs | 21 |
| **Structural** | |
| Secure home to foundation | 7 |
| Brace inside of cripple wall with sheathing | 2 |
| Brace unreinforced or mental chimneys | 4 |
| Other (please explain) | |
| Cleared property of excess brush. Have an emergency bag in our closet with winter clothes for the childern and ourselves. | |
| Live in a condo. Can only secure inside belongings | |
| Canned goods stored in wire drawers, rather than shelves. | |
| We practice fire drills with our 2 and 5 year old boys. We have winter to-go bag. We have a pretty good first aid kit. | |

Question 12: What modifications have you made to make your home more wildfire resistant?

| **Answer** | **Number of Responses** |
|---|---|
| Re-roofed with non-wood covering such as metal or asphalt shingles | 8 |
| Replaced single pane glass with tempered glass | 9 |
| Covered windows and skylights with non-flammable screening or shutters | 2 |
| Created a defensible space around the house | 15 |
| Ensure your driveway/access road provides easy access for fire trucks (minimum of 12 feet wide and has a slope less than 5%) | 13 |
| Installed fire-resistant signs and address numbers that are clearly visible from the street | 10 |
| Other | |
| Met with our AWARE Neighborhood group and discussed wildfire evacuation plan and neighborhood emergency action plan. | |

Question 13: What modifications have you made to make your home more resistant to extreme weather events?

| Answer | Number of Responses |
|---|---|
| Insulated walls and attic | 17 |
| Installed an alternative heat source | 10 |
| Other | |
| Generator | |
| gas fireplace, wood burning fireplace, generator circut and gasoline powered generator | |
| We have four heat and cooking sources in our home. | |
| have emergency generator hook up. | |
| Husband purchased small backup generator | |
| double and triple pane windows. | |

Question 14: Any other comments/suggestions?

| |
|---|
| Our family would be glad to assist in continuing public awareness and education for emergency preparedness and response. |
| What work is the MOA doing with the Carrs, Fred Myers and Cosco''s to better understand what food is available in the event of a prolonged interuption of supply chains. How about the folks at Bean''s Cafe'' and the Food Bank of Alaska, what is there ability to withstand a supply chain disruption? What is the total capacity of UST at all of the gas stations in the MOA? AT&T has 2 1.5 mega-watt standby generators over on Government Hill; is there an intertie to the grid? How long can Regional, |

Question 15: Age

| Answer | Number of Responses |
|---|---|
| Over 60 | 1 |
| 51-60 | 4 |
| 41-50 | 16 |
| 31-40 | 6 |
| 26-30 | 5 |
| 18 - 26 | |
| Under 18 | 1 |
| Did not answer | 4 |

Question 16: Gender

| Answer | Number of Responses |
|---|---|
| Male | 22 |
| Female | 12 |
| Did Not Answer | 3 |

Question 17: Level of education:

| Answer | Number of Responses |
|---|---|
| Post Graduate | 12 |
| College Graduate | 15 |
| Some College | 5 |
| Completed High School | 1 |
| Some or No High School | 0 |
| Did not answer | 4 |

Question 18: Zip code:

| Answer | Number of Responses |
|---|---|
| Did not answer | 3 |
| 852 | 1 |
| 44171 | 1 |
| 99502 | 1 |
| 99503 | 1 |
| 99504 | 5 |
| 99507 | 4 |
| 99508 | 3 |
| 99515 | 3 |
| 99516 | 4 |
| 99517 | 2 |
| 99518 | 1 |
| 99519 | 1 |
| 99577 | 4 |
| 99587 | 2 |
| 99654 | 1 |

Question 19: How long have you lived in the MOA?

| Answer | Number of Responses |
|---|---|
| More than 10 years | 20 |
| 6 -10 years | 4 |
| 1-5 years | 6 |
| Less than 1 year | 3 |
| Did not answer | 4 |

Question 20: Do you own or rent?

| Answer | Number of Responses |
|---|---|
| Own | 28 |
| rent | 4 |
| Did not answer | 5 |

Question 21: Do you rent/own a:

| Answer | Number of Responses |
|---|---|
| Single family home | 26 |
| Duplex | 2 |
| Apartment (3-4 units in structure) | 0 |
| Apartment (5 or more units in structure) | 1 |
| Condominium/townhouse | 3 |
| Manufactured home | |
| Other (please specify) | |
| Did not answer | 5 |

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## LOCAL HAZARD MITIGATION PLAN DETERMINATION — FEMA Region 10

Jurisdiction(s):

Title of Plan: Date of Plan:

Determination: (Check one)

- ☐ Approved – Criteria Met & Plan Adopted
- ☐ Not Approved – **Criteria Met** / Plan Not Adopted
- ☐ Not Approved – **Criteria Not Met** / Plan Adopted or Not Adopted

**The plan determination was based upon the review of each of the following plan criteria, excluding the shaded criteria, as required in 44 CFR Part 201. For a local plan to receive FEMA approval, all plan criteria must receive a Satisfactory (S) rating and the plan must be adopted by the local governing body. The Needs Improvement (N) rating indicates the criteria was not addressed or additional information is needed to met the criteria.**

| | *44 CFR Part 201* | N | S |
|---|---|---|---|
| 1. | Adoption by the Local Governing Body | | |
| 2. | Multi-Jurisdictional Plan Adoption | | |
| 3. | Multi-Jurisdictional Planning Participation | | |
| 4. | Documentation of Planning Process | | |
| 5. | Identifying Hazards | | |
| 6. | Profiling Hazard Events | | |
| 7. | Assessing Vulnerability: Identifying Assets | | |
| 8. | Assessing Vulnerability: Estimating Potential Losses | | |
| 9. | Assessing Vulnerability: Analyzing Development Trends | | |
| 10. | Multi-Jurisdictional Risk Assessment | | |
| 11. | Local Hazard Mitigation Goals | | |
| 12. | Identification and Analysis of Mitigation Measures | | |
| 13. | Implementation of Mitigation Measures | | |
| 14. | Multi-Jurisdictional Mitigation Strategy | | |
| 15. | Monitoring, Evaluating, and Updating the Plan | | |
| 16. | Implementation through Existing Programs | | |
| 17. | Continued Public Involvement | | |

| | *44 CFR Part 201* |
|---|---|
| 1. | Adoption by the Local Governing Body ..... *§201.6(c)(5)* |
| 2. | Multi-Jurisdictional Plan Adoption ..... *§201.6(c)(5)* |
| 3. | Multi-Jurisdictional Planning Participation ..... *§201.6(a)(3)* |
| 4. | Documentation of Planning Process ..... *§201.6(c)(1)* |
| 5. | Identifying Hazards ..... *§201.6(c)(2)(i)* |
| 6. | Profiling Hazard Events ..... *§201.6(c)(2)(i)* |
| 7. | Assessing Vulnerability: Identifying Assets ..... *§201.6(c)(2)(ii)(A)* |
| 8. | Assessing Vulnerability: Estimating Potential Losses ..... *§201.6(c)(2)(ii)(B)* |
| 9. | Assessing Vulnerability: Analyzing Development Trends ..... *§201.6(c)(2)(ii)(c)* |
| 10. | Multi-Jurisdictional Risk Assessment ..... *§201.6(c)(2)(iii)* |
| 11. | Local Hazard Mitigation Goals ..... *§201.6(c)(3)(i)* |
| 12. | Identification and Analysis of Mitigation Measures ..... *§201.6(c)(3)(ii)* |
| 13. | Implementation of Mitigation Measures ..... *§201.6(c)(3)(iii)* |
| 14. | Multi-Jurisdictional Mitigation Strategy ..... *§201.6(c)(3)(iv)* |
| 15. | Monitoring, Evaluating, and Updating the Plan ..... *§201.6(c)(4)(i)* |
| 16. | Implementation through Existing Programs ..... *§201.6(c)(4)(ii)* |
| 17. | Continued Public Involvement ..... *§201.6(c)(4)(iii)* |

**Comments:**

**Please refer to the attached Local Hazard Mitigation Plan Review Worksheet for additional information and comments on each criteria.**

**FEMA Reviewer:** **Date:**

**FEMA Mitigation Plans Manager:** **Date:**

| 1 Adoption by the Local Governing Body<br>***Requirement §201.6(c)(5)*** *[The local hazard mitigation plan **shall** include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council)…* | | NOT MET | MET |
|---|---|---|---|
| A. Is the local plan approved by the local governing body of the jurisdiction? | | | |
| B. Is supporting documentation, such as a resolution, included? | | | |

| 2 Multi-jurisdictional Plan Adoption<br>***Requirement §201.6(c)(5)*** *For multi-jurisdictional plans, each jurisdiction requesting approval of the plan **must** document that it has been formally adopted.* | | NOT MET | MET |
|---|---|---|---|
| A. Does the plan indicate the specific jurisdictions represented in the plan? | | | |
| B. For each jurisdiction, has the local governing body approved the plan? | | | |
| C. Are supporting documentations, such as resolutions, included? | | | |

| 3 Multi-jurisdictional Participation<br>***Requirement §201.6(a)(3)*** *Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process… Statewide plans will not be accepted as multi-jurisdictional plans.* | | NOT MET | MET |
|---|---|---|---|
| A. Does the plan identify how each jurisdiction participated in the plan's development? | | | |

Jurisdiction: Title of Plan: Date of Plan:

| 4 Documentation of the Planning Process | | N | S |
|---|---|---|---|
| ***Requirement §201.6(c)(1):*** *[The plan **must** document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.* | | | |
| A. Does the plan provide a narrative description that explains the plan's development process, including who led the development at the staff level and any external contributors such as contractors? | | | |
| B. Does the plan list who was involved and how they contributed to the planning process? (e.g., participated on plan committee, provided information, reviewed drafts) | | | |
| C. Does the plan indicate how the public was involved? | | | |

| 5 Identifying Hazards | | N | S |
|---|---|---|---|
| **Requirement §201.6(c)(2)(i):** *[The risk assessment **shall** include a] description of the type … of all natural hazards that can affect the jurisdiction…* | | | |
| A. Does the plan include a description of the types of all natural hazards that affect the jurisdiction?<br>DESCRIPTION – explain the characteristics of each hazard (e.g. for flooding hazard, is it coastal, riverine, stormwater)<br>ALL NATURAL HAZARDS – all probable hazards. For northwest communities, hazards include flood, earthquake, wind, and fire, and, possibly, tsunami, volcano, winter storms. Human-caused hazards (HAZMAT, Terrorism) may also be identified in the plan, but are not required. | | | |

Jurisdiction: Title of Plan: Date of Plan:

| 6 Profiling Hazard Events | | N | S |
|---|---|---|---|
| ***Requirement §201.6(c)(2)(i):*** *[The risk assessment **shall** include a] description of the … location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.* | | | |
| A. Does the risk assessment identify the location of each hazard being addressed in the plan? | | | |
| B. Does the risk assessment identify the extent of each hazard being addressed in the plan? | | | |
| C. Does the plan provide information on the previous occurrences of each natural hazard? | | | |
| D. Does the plan include the probability of future hazard events? | | | |

| 7 Assessing Vulnerability: Identifying Assets | | N | S |
|---|---|---|---|
| ***Requirement §201.6(c)(2) (ii)(A):*** *[The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community. The plan **should** describe vulnerability in terms of:§ The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas…* | | | |
| A. Does the plan include an overall summary description of the jurisdiction's vulnerability to the hazards? | | | |
| B. Does the plan address the impacts of the hazards on the jurisdiction? | | | |
| C. Recommended: Does the plan identify the types and numbers of buildings, infrastructure, and critical facilities in hazard areas? | **THIS ELEMENT OF CRITERIA NOT REQUIRED.** | | |

| 8 Assessing Vulnerability: Estimating Potential Losses | | N | S |
|---|---|---|---|
| ***Requirement §201.6(c)(2) (ii)(B):*** *[The plan **should** describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate…* | | | |
| A. Does the plan estimate potential dollar losses to vulnerable structures? | **CRITERIA NOT REQUIRED** | | |

Jurisdiction: Title of Plan: Date of Plan:

| 9 Assessing Vulnerability: Analyzing Development Trends | | N | S |
|---|---|---|---|
| ***Requirement §201.6(c)(2) (ii)(c):*** *[The plan **should** describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.* | | | |
| A. Does the plan describe future land use and development trends? | **CRITERIA NOT REQUIRED** | | |

| 10 Multi-Jurisdictional Risk Assessment | | N | S |
|---|---|---|---|
| ***Requirement §201.6(c)(2) (iii):*** *For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area..* | | | |
| A. Does the plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks? | | | |

| 11 Local Hazard Mitigation Goals | | N | S |
|---|---|---|---|
| ***Requirement §201.6(c)(3)(i):*** *[The hazard mitigation strategy shall include: a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.* | | | |
| A. Does the plan include a description of mitigation goals?<br>GOALS – usually long-term and represent what the community want to achieve, such as "eliminate flood damage." | | | |

| 12 Identification and Analysis of Mitigation Measures | | N | S |
|---|---|---|---|
| ***Requirement §201.6(c)(3) (ii):*** *[The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure* | | | |
| A. Does the plan identify a comprehensive range of specific mitigation actions and projects for each hazard? | | | |
| B. Does the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure? | | | |
| C. Does the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure? | | | |

Jurisdiction: Title of Plan: Date of Plan:

| 13 Implementation of Mitigation Measures | | N | S |
|---|---|---|---|
| ***Requirement: §201.6(c)(3) (iii):*** *[The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.* | | | |
| A. | Does the mitigation strategy include how the actions will be **prioritized**? | | |
| B. | Does the mitigation strategy address how the actions will be **implemented**? (i.e. existing resources and potential future resources) | | |
| C. | Does the mitigation strategy address how the actions will be **administered**? | | |
| D. | Does the prioritization process include an emphasis on the use of **cost-benefit review**? | | |

| 14 Multi-jurisdictional Mitigation Strategy | | N | S |
|---|---|---|---|
| ***Requirement §201.6(c)(3) (iv):*** *For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.* | | | |
| A. | Does the plan include separate, identifiable **action items** for each jurisdiction requesting FEMA approval of the plan? | | |

| 15 Monitoring, Evaluating, and Updating the Plan | | N | S |
|---|---|---|---|
| ***Requirement §201.6(c)(4)(i):*** *[The plan maintenance process shall include a section describing the] method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.* | | | |
| A. | Does the plan describe the **method for monitoring** the plan? (i.e. both staff position responsible for monitoring and the department overseeing the monitoring) | | |
| B. | Does the plan describe a **schedule** for monitoring, evaluating, and updating the plan within the five-year cycle? | | |

Jurisdiction: Title of Plan: Date of Plan:

| 16 Implementation Through Existing Programs<br>*Requirement §201.6(c)(4) (ii): [The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate…* | | N | S |
|---|---|---|---|
| A. Does the plan identify other local planning mechanisms available for incorporating the requirements of the mitigation plan? | | | |
| B. Does the plan include a process by which the local government will incorporate the requirements in other plans, when appropriate? | | | |

| 17 Continued Public Involvement<br>***Requirement §201.6(c)(4) (iii):*** *[The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.* | | N | S |
|---|---|---|---|
| A. Does the plan explain how continued public participation will be obtained? (e.g., public notices, an on-going mitigation plan committee, annual review meeting with stakeholders). | | | |

## – END REVIEW CHECKLIST –

# PREVIOUS WILDFIRE EVENTS

**Table F.1 Wildfire Events in 2000**

| Date | Type | Location |
|---|---|---|
| 1/1/2000 | Illegal Burn | 12741 Ridgewood Rd |
| 1/8/2000 | Illegal Burn | 0 POINT WORONZOF DR |
| 1/8/2000 | Illegal Burn | On Medfra btwn 15 / 16 |
| 1/17/2000 | Illegal Burn | 17510 Snowcrest Lane |
| 2/2/2000 | Brush/Grass Fire | 3900 ABBOTT RD |
| 2/29/2000 | Illegal Burn | 8210 Hartzell |
| 2/29/2000 | Illegal Burn | 4407 Spenard Rd |
| 3/1/2000 | Peat Fire | 19508 Highland Ridge |
| 3/3/2000 | Brush/Grass Fire | 2909 W 88th Ave |
| 3/3/2000 | Illegal Burn | Resurrection & Pioneer |
| 2/6/2000 | Illegal Burn | 8926 Golovin St |
| 2/13/2000 | Illegal Burn | Campbell Airstrip Rd |
| 2/15/2000 | Trash Fire | 5530 E Northern Lights |
| 2/17/2000 | Trash Fire | 1111 E 56th |
| 2/20/2000 | Illegal Burn | Reeve & Commercial |
| 2/21/2000 | Illegal Burn | 17824 Teklanika |
| 2/27/2000 | Illegal Burn | 3529 E 88th |
| 3/12/2000 | Illegal Burn | 4700 Natrona |
| 3/15/2000 | Garbage/Rubbish Fire | 3rd & Gambell |
| 3/15/2000 | Illegal Burn | 2361 Cinnabar Loop |
| 3/19/2000 | Illegal Burn | 701 S Klevin |
| 3/19/2000 | Illegal Burn | 701 S Klevin |
| 3/20/2000 | Illegal Burn | 8210 Hartzell |
| 4/2/2000 | Illegal Burn | 4401 Traverse Way |
| 4/5/2000 | Illegal Burn | 1800 W Northern Lights |
| 4/8/2000 | Illegal Burn | New Glenn & Bragaw |
| 4/8/2000 | Illegal Burn | Clarks Rd & Kings Way |
| 4/9/2000 | Illegal Burn | Basher Dr & Kalmia |
| 4/14/2000 | Brush/Grass Fire | Viking & Reeve |
| 4/14/2000 | Illegal Burn | 3411 Willow |
| 4/15/2000 | Brush/Grass Fire | 7800 Debarr |
| 4/15/2000 | Illegal Burn | 3327 Illiamna |
| 4/17/2000 | Illegal Burn | Lake Otis & 20th |
| 4/17/2000 | Brush/Grass Fire | Spruce & Lore |
| 4/17/2000 | Illegal Burn | 1940 Salem Ct |
| 4/17/2000 | Illegal Burn | S end of Regency off Business Blvd |
| 5/11/2000 | Illegal Burn | 34th & Iowa |
| 5/11/2000 | Brush/Grass Fire | Hunter Dr & Caravelle |

| Date | Type | Location |
|---|---|---|
| 5/11/2000 | Illegal Burn | 6900 Crawford |
| 5/11/2000 | Brush/Grass Fire | John's Park |
| 5/11/2000 | Illegal Burn | 18731 2nd |
| 5/12/2000 | Illegal Burn | 740 Old Klatt Rd |
| 5/12/2000 | Brush/Grass Fire | 9450 NEW GLENN HWY |
| 5/12/2000 | Illegal Burn | 5320 Whispering Spruce Dr |
| 5/12/2000 | Trash Fire | 88th & Dewberry |
| 5/12/2000 | Brush/Grass Fire | E Dimond & Dimond D Cir |
| 5/12/2000 | Illegal Burn | 24242 Alpenglow Dr |
| 5/12/2000 | Illegal Burn | Golden view & PROMINENCE POINTE |
| 5/12/2000 | Illegal Burn | 9750 Brien St |
| 5/12/2000 | Illegal Burn | 6th & Pine |
| 5/12/2000 | Illegal Burn | 17709 S Juanita Loop |
| 5/12/2000 | Illegal Burn | 401 N PINE ST |
| 5/12/2000 | Illegal Burn | 18646 Talarik Dr |
| 5/13/2000 | Illegal Burn | 6411 Italy Cir |
| 5/13/2000 | Illegal Burn | 16461 Virgo |
| 5/13/2000 | Illegal Burn | 4800 NATRONA |
| 5/13/2000 | Brush/Grass Fire | 3911 E 7th |
| 5/13/2000 | Illegal Burn | 3321 Rabbit Creek |
| 5/13/2000 | Illegal Burn | 4700 Talus |
| 5/13/2000 | Illegal Burn | 1300 Birch |
| 5/13/2000 | Brush/Grass Fire | 7700 Old Harbor |
| 5/13/2000 | Illegal Burn | 15721 Noble Point |
| 5/13/2000 | Illegal Burn | Birch & OMalley |
| 5/13/2000 | Illegal Burn | 11600 Moose Road |
| 5/13/2000 | Illegal Burn | Port Orford & Panorama |
| 5/13/2000 | Illegal Burn | 16619 Eleonora |
| 5/14/2000 | Illegal Burn | 4202 North Star Street |
| 5/14/2000 | Illegal Burn | 12000 Lipscomb Dr |
| 5/14/2000 | Illegal Burn | 17000 Carl St |
| 5/14/2000 | Brush/Grass Fire | Pt Woronzof Enviromental Center |
| 4/18/2000 | Illegal Burn | 2160 BAXTER RD |
| 4/18/2000 | Peat Fire | 3rd & Bragaw |
| 4/20/2000 | Illegal Burn | 5th & McCarrey |
| 4/20/2000 | Illegal Burn | 16837 Elenora |
| 4/21/2000 | Illegal Burn | Winners Cir & Mentra St |
| 4/21/2000 | Illegal Burn | 3131 Spinnaker Dr |
| 4/22/2000 | Illegal Burn | 635 W 74th |
| 4/22/2000 | Brush/Grass Fire | 8226 Duben |
| 4/22/2000 | Illegal Burn | 1570 Beaver Pl |

| Date | Type | Location |
|---|---|---|
| 4/22/2000 | Illegal Burn | 15939 Kings Way |
| 4/23/2000 | Illegal Burn | Opal & Ruby |
| 4/23/2000 | Illegal Burn | Opal Cir & Ruby Dr |
| 4/23/2000 | Illegal Burn | 9821 Chelatna |
| 4/23/2000 | Brush/Grass Fire | 69th & Lake Otis |
| 4/23/2000 | Illegal Burn | 5331 Eielson |
| 4/24/2000 | Brush/Grass Fire | 74th & Nancy |
| 4/24/2000 | Illegal Burn | 4316 Kingston |
| 4/24/2000 | Illegal Burn | 6700 Fernhill |
| 4/24/2000 | Illegal Burn | 8828 Juliana |
| 4/25/2000 | Illegal Burn | 14940 Elmore |
| 4/26/2000 | Brush/Grass Fire | 6653 Air Guard Rd |
| 4/26/2000 | Brush/Grass Fire | 4221 Grape |
| 4/27/2000 | Illegal Burn | 1560 G St |
| 4/27/2000 | Illegal Burn | 3904 Northwood Dr |
| 4/27/2000 | Illegal Burn | 7441 Tobuk Cir |
| 4/28/2000 | Illegal Burn | Caress Cir & Spruce |
| 4/28/2000 | Illegal Burn | 217 Orange Leaf Cir |
| 4/28/2000 | Illegal Burn | 2203 W Dimond |
| 4/28/2000 | Brush/Grass Fire | 68th & Meadow |
| 4/28/2000 | Garbage/Rubbish Fire | 4231 Laurel |
| 4/28/2000 | Brush/Grass Fire | 17350 Toakoana Dr |
| 4/29/2000 | Illegal Burn | Conifer Park |
| 4/30/2000 | Illegal Burn | 5330 Dorbrandt |
| 5/1/2000 | Illegal Burn | 9231 Geese Cir |
| 5/2/2000 | Illegal Burn | 6924 e 6th |
| 5/2/2000 | Illegal Burn | 2802 Richmond Ave |
| 5/3/2000 | Brush/Grass Fire | Benson Blvd & Lois Dr |
| 5/3/2000 | Illegal Burn | 6500 E 112th |
| 5/3/2000 0 | Brush/Grass Fire | 16500 NEW SEWARD HWY |
| 5/3/2000 0 | Brush/Grass Fire | Northern Lights & Muldoon |
| 5/3/2000 0 | Brush/Grass Fire | 515 Cherry St |
| 5/4/2000 0 | Brush/Grass Fire | 500 E Benson |
| 5/5/2000 0 | Illegal Burn | 15300 Old Seward |
| 5/5/2000 0 | Illegal Burn | 530 Fairbanks |
| 5/5/2000 0 | Trash Fire | Northway Dr & San Jeronimo |
| 5/5/2000 0 | Illegal Burn | End of Campbell Airstrip Road |
| 5/6/2000 0 | Illegal Burn | Northern Lights & WESLEYAN |
| 5/6/2000 0 | Brush/Grass Fire | Pago Pago & Mego St |
| 5/6/2000 0 | Illegal Burn | 1000 S Hoyt |
| 5/6/2000 0 | Illegal Burn | Hillside & Whist dr |

| Date | Type | Location |
|---|---|---|
| 5/6/2000 0 | Brush/Grass Fire | Pago Pago & Mego |
| 5/6/2000 0 | Illegal Burn | 1405 Patterson |
| 5/6/2000 0 | Illegal Burn | 712 W Tudor Rd |
| 5/6/2000 0 | Brush/Grass Fire | 1801 Elcadore |
| 5/6/2000 0 | Brush/Grass Fire | Debarr & Northway |
| 5/6/2000 0 | Illegal Burn | 1405 Patterson |
| 5/6/2000 0 | Illegal Burn | 3447 Abbott Rd |
| 5/7/2000 0 | Brush/Grass Fire | Debarr & Northway |
| 5/7/2000 0 | Illegal Burn | 8160 Opal Cir |
| 5/7/2000 0 | Brush/Grass Fire | 560 E 34th |
| 5/7/2000 0 | Brush/Grass Fire | 4900 E 145th |
| 5/7/2000 0 | Illegal Burn | 12555 Hillside Dr |
| 5/7/2000 0 | Illegal Burn | Huffman & Elmore |
| 5/7/2000 0 | Brush/Grass Fire | 1801 Elcadore |
| 5/7/2000 0 | Illegal Burn | Lucky & Lee |
| 5/7/2000 0 | Illegal Burn | 11113 Aurora Cir |
| 5/7/2000 0 | Brush/Grass Fire | Debarr & Northway |
| 5/7/2000 0 | Illegal Burn | 8801 Solar |
| 5/7/2000 0 | Brush/Grass Fire | 401 N PINE ST |
| 5/7/2000 0 | Illegal Burn | 7427 Hennings Way |
| 5/8/2000 0 | Brush/Grass Fire | Taft & Tudor |
| 5/8/2000 0 | Illegal Burn | DE ARMOUN & Gunnison |
| 5/8/2000 0 | Illegal Burn | 11816 Wilderness |
| 5/9/2000 0 | Illegal Burn | 3447 Abbott |
| 5/9/2000 0 | Brush/Grass Fire | Northwood Park |
| 5/10/2000 | Illegal Burn | 5001 Klondike |
| 5/10/2000 | Illegal Burn | 4701 Cambridge |
| 5/10/2000 | Brush/Grass Fire | Stephenson |
| 5/10/2000 | Illegal Burn | Campbell Airstrip & Tudor |
| 5/11/2000 | Brush/Grass Fire | 8920 Solar Dr |
| 5/11/2000 | Illegal Burn | Jamie & West Skyline |
| 5/11/2000 | Brush/Grass Fire | Lakeshore & Wisconsin |
| 5/14/2000 | Brush/Grass Fire | 4125 Debarr |
| 5/14/2000 | Illegal Burn | 16321 Sandpiper Dr |
| 5/14/2000 | Brush/Grass Fire | Anchorage Memorial Park |
| 5/15/2000 | Illegal Burn | 8235 Sundi |
| 5/15/2000 | Brush/Grass Fire | 2111 Muldoon |
| 5/15/2000 | Illegal Burn | 72nd & Spruce |
| 5/15/2000 | Illegal Burn | Virginia Ct & W 16th Ave |
| 5/15/2000 | Illegal Burn | 4202 North Star |
| 5/16/2000 | Brush/Grass Fire | 9th & Pine |

| Date | Type | Location |
|---|---|---|
| 5/16/2000 | Illegal Burn | 7800 Maryland |
| 5/16/2000 | Illegal Burn | 15721 NOBLE POINT |
| 5/16/2000 | Illegal Burn | NOBLE POINT & Southpark Bluff |
| 5/17/2000 | Illegal Burn | Huffman & New Seward |
| 5/17/2000 | Illegal Burn | 2301 E 66th Ave |
| 5/17/2000 | Illegal Burn | 3509 Willow St |
| 5/19/2000 | Illegal Burn | 11446 Jerome |
| 5/20/2000 | Brush/Grass Fire | 36th & Eureka |
| 5/20/2000 | Illegal Burn | 10550 Pacer Pl |
| 5/20/2000 | Illegal Burn | Hillside & Huffman |
| 5/20/2000 | Illegal Burn | De Armoun & Bainbridge |
| 5/20/2000 | Illegal Burn | 2200 E 79th |
| 5/20/2000 | Illegal Burn | 1801 W 56TH AVE |
| 5/21/2000 | Illegal Burn | 15620 Jensen Cir |
| 5/21/2000 | Brush/Grass Fire | MOUNTAIN VIEW & N Bunn |
| 5/22/2000 | Brush/Grass Fire | Tudor & Northwood |
| 5/24/2000 | Garbage/Rubbish Fire | Tudor & C |
| 5/24/2000 | Brush/Grass Fire | Peterkin Ave & Meyer St |
| 5/24/2000 | Illegal Burn | Dimond & Minnesota |
| 5/24/2000 | Illegal Burn | 7311 Meadow St |
| 5/25/2000 | Illegal Burn | 4200 E 145th |
| 5/25/2000 | Brush/Grass Fire | Williwa Ave & Skipper St |
| 5/25/2000 | Illegal Burn | 3104 Linden |
| 5/26/2000 | Brush/Grass Fire | New Glenn & Bragaw |
| 5/26/2000 | Brush/Grass Fire | 47th & Northwood |
| 5/26/2000 | Illegal Burn | 1315 Hyder |
| 5/26/2000 | Brush/Grass Fire | 7th & G |
| 5/26/2000 | Illegal Burn | Taku & Campbell Park |
| 5/26/2000 | Brush/Grass Fire | Clarks & Hosken |
| 5/27/2000 | Brush/Grass Fire | Basher Rd |
| 5/27/2000 | Illegal Burn | 6300 Omalley |
| 5/27/2000 | Illegal Burn | 6300 OMalley |
| 5/27/2000 | Illegal Burn | 3505 Dorbrandt St |
| 5/27/2000 | Illegal Burn | 22300 EAGLE RIVER RD |
| 5/27/2000 | Brush/Grass Fire | Northgate Dr in woods behind SBS |
| 5/27/2000 | Illegal Burn | 7241 Huffman |
| 5/28/2000 | Illegal Burn | 17111 Betty Jean |
| 5/28/2000 | Illegal Burn | 13001 Ridgeview |
| 5/28/2000 | Brush/Grass Fire | 22835 Glacier View |
| 5/28/2000 | Illegal Burn | 10750 Sun Beau |
| 5/28/2000 | Garbage/Rubbish Fire | Jewel Lake Park |

| Date | Type | Location |
|---|---|---|
| 5/28/2000 | Illegal Burn | 16800 Byron |
| 5/28/2000 | Illegal Burn | Centennial Park |
| 5/29/2000 | Illegal Burn | 10121 Marmot Ct |
| 5/29/2000 | Illegal Burn | 11221 Polar |
| 5/30/2000 | Trash Fire | 9 & E |
| 5/30/2000 | Brush/Grass Fire | 3950 E 66th Ave |
| 5/31/2000 | Peat Fire | 10721 Flagship |
| 5/31/2000 | Brush/Grass Fire | 7030 Burlwood |
| 5/31/2000 | Illegal Burn | 1800 blk West No Lights in woods |
| 5/31/2000 | Brush/Grass Fire | Along bike trail 50 yd west of Boniface |
| 6/1/2000 0 | Peat Fire | 2477 Arctic |
| 6/2/2000 0 | Brush/Grass Fire | 68th & OBrien |
| 6/2/2000 0 | Brush/Grass Fire | 10242 Jamestown |
| 6/2/2000 0 | Brush/Grass Fire | New Seww Hwy btn 36th & Tudor |
| 6/2/2000 0 | Brush/Grass Fire | 7331 Meadow |
| 6/2/2000 0 | Brush/Grass Fire | 16500 NEW SEWARD HWY |
| 6/2/2000 0 | Illegal Burn | Potter Heights Dr |
| 6/2/2000 0 | Illegal Burn | Regency Dr |
| 6/2/2000 0 | Illegal Burn | Jamestown & Independence |
| 6/2/2000 0 | Brush/Grass Fire | 7211 Jewel Lake |
| 6/3/2000 0 | Illegal Burn | Commercial & Viking |
| 6/3/2000 0 | Illegal Burn | Campbell Airstrip Rd |
| 6/3/2000 0 | Illegal Burn | 811 W 86th Ave |
| 6/3/2000 0 | Illegal Burn | 5130 E 98th Ave |
| 6/3/2000 0 | Illegal Burn | 5041 E 104th |
| 6/3/2000 0 | Illegal Burn | Debarr &Hoyt |
| 6/3/2000 0 | Illegal Burn | 6001 E 162nd |
| 6/3/2000 0 | Brush/Grass Fire | 23 & Cordova |
| 6/3/2000 0 | Illegal Burn | 4141 B St |
| 6/4/2000 0 | Illegal Burn | 12720 Saunders |
| 6/5/2000 0 | Brush/Grass Fire | Skyhills Dr & Dimond |
| 6/5/2000 0 | Illegal Burn | 13th & Cordova |
| 6/5/2000 0 | Brush/Grass Fire | OMalley & C |
| 6/7/2000 0 | Illegal Burn | Stuckagain Hts end of Basher Dr |
| 6/7/2000 0 | Illegal Burn | 6th & Karluk |
| 6/7/2000 0 | Brush/Grass Fire | 19201 Driftwood Bay Dr |
| 6/7/2000 0 | Illegal Burn | 2221 Muldoon |
| 6/8/2000 0 | Brush/Grass Fire | 4141 B St |
| 6/8/2000 0 | Brush/Grass Fire | 11912 Town Park Cir |
| 6/8/2000 0 | Brush/Grass Fire | 2301 Timothy |
| 6/9/2000 0 | Brush/Grass Fire | 4141 B St |

| Date | Type | Location |
|---|---|---|
| 6/9/2000 0 | Illegal Burn | 14650 Sanderlin |
| 6/9/2000 0 | Illegal Burn | 10661 Elies Dr |
| 6/9/2000 0 | Illegal Burn | 13141 Elmhurst Dt |
| 6/9/2000 0 | Brush/Grass Fire | Debarr & Northway |
| 6/9/2000 0 | Illegal Burn | 3220 E NORTHERN LIGHTS BLVD |
| 6/10/2000 | Illegal Burn | Eagle River between IB and OB Glen Highway |
| 6/10/2000 | Illegal Burn | OMalley & Abbott Loop |
| 6/10/2000 | Illegal Burn | 19514 1st St |
| 6/11/2000 | Illegal Burn | 2739 E 154th |
| 6/11/2000 | Brush/Grass Fire | Reeve & Commercial |
| 6/11/2000 | Brush/Grass Fire | Mountain View & Mccarrey |
| 6/12/2000 | Brush/Grass Fire | 3146 Old Seward |
| 6/12/2000 | Peat Fire | 100 & Minnesota |
| 6/12/2000 | Brush/Grass Fire | S end of Reef Pl |
| 6/12/2000 | Illegal Burn | 13215 Spendlove Dr |
| 6/12/2000 | Brush/Grass Fire | Juanita & Beaujolais |
| 6/13/2000 | Brush/Grass Fire | Old Glenn Hwy N of SBS |
| 6/13/2000 | Illegal Burn | 955 E 81st |
| 6/13/2000 | Brush/Grass Fire | 23835 NEW SEWARD HWY |
| 6/13/2000 | Peat Fire | 2426 Marian Bay Cir |
| 6/14/2000 | Peat Fire | Columbine & Debarr |
| 6/14/2000 | Illegal Burn | 15th & A |
| 6/15/2000 | Illegal Burn | 4404 Parsons |
| 6/15/2000 | Brush/Grass Fire | 3100 Mountain View |
| 6/15/2000 | Peat Fire | 7985 West End Rd |
| 6/15/2000 | Brush/Grass Fire | 1750 Patterson |
| 6/16/2000 | Illegal Burn | 3034 Rose St |
| 6/16/2000 | Illegal Burn | 10921 Kasilof |
| 6/16/2000 | Illegal Burn | 3500 Mountain View Dr |
| 6/16/2000 | Illegal Burn | W Klatt & Southport |
| 6/16/2000 | Illegal Burn | 11900 Juniper |
| 6/17/2000 | Illegal Burn | 7621 Upper De Armoun |
| 6/17/2000 | Illegal Burn | 2727 Illiamna Ave |
| 6/17/2000 | Illegal Burn | 8051 Rabbit Creek |
| 6/20/2000 | Brush/Grass Fire | E side New Seward bet Dimond & OMalley |
| 6/20/2000 | Brush/Grass Fire | 16624 Riddell Cir |
| 6/21/2000 | Illegal Burn | 15721 Noble Point |
| 6/21/2000 | Illegal Burn | 7740 Homer Dr |
| 6/22/2000 | Trash Fire | 400 W 70th |

| Date | Type | Location |
|---|---|---|
| 6/22/2000 | Trash Fire | Mile 6 Eagle River Rd |
| 6/23/2000 | Trash Fire | Old Seward & OMalley |
| 6/24/2000 | Brush/Grass Fire | 2801 Richmond Ave |
| 6/24/2000 | Brush/Grass Fire | New Seward N/B Between Huffman/Omalley |
| 6/24/2000 | Brush/Grass Fire | Jennifer Anne Cir |
| 6/24/2000 | Brush/Grass Fire | International & Minnesota |
| 6/24/2000 | Brush/Grass Fire | Minnesota & Northern Lights |
| 6/24/2000 | Brush/Grass Fire | 14th & Eagle |
| 6/24/2000 | Illegal Burn | 6301 JEWEL LAKE RD |
| 6/25/2000 | Brush/Grass Fire | 210 Galleon Dr |
| 6/25/2000 | Peat Fire | Centennial Park |
| 6/25/2000 | Illegal Burn | 1510 Shore Dr |
| 6/25/2000 | Illegal Burn | Nicoli Way |
| 6/26/2000 | Illegal Burn | Fairbanks Park |
| 6/26/2000 | Illegal Burn | E side Old Glenn N of Car Wash @ constr site |
| 6/26/2000 | Illegal Burn | 6924 E 6th |
| 6/26/2000 | Brush/Grass Fire | 316 N Park |
| 6/26/2000 | Illegal Burn | 3130 Norm Cir |
| 6/27/2000 | Illegal Burn | 608 N Park |
| 6/28/2000 | Illegal Burn | 9301 Noblewood |
| 6/28/2000 | Illegal Burn | 7311 Meadow St |
| 6/28/2000 | Brush/Grass Fire | Northwood & 90th |
| 6/30/2000 | Illegal Burn | 3103 Spenard |
| 6/30/2000 | Brush/Grass Fire | 36th & old seward |
| 6/30/2000 | Brush/Grass Fire | Karluk & 16th |
| 6/30/2000 | Illegal Burn | 2801 Merganser |
| 7/1/2000 0 | Brush/Grass Fire | 502 Bragaw |
| 7/2/2000 0 | Brush/Grass Fire | 2 23835 NEW SEWARD HWY |
| 7/2/2000 0 | Brush/Grass Fire | 8 Klatt & Victor |
| 7/2/2000 0 | Brush/Grass Fire | 2 5836 E Northern Lights |
| 7/3/2000 0 | Illegal Burn | 5 W 75th & Rovenna |
| 7/3/2000 0 | Brush/Grass Fire | 9 6th & Hoyt |
| 7/3/2000 0 | Brush/Grass Fire | 5 700 N Pine |
| 7/3/2000 0 | Brush/Grass Fire | 8 7501 Hennings |
| 7/3/2000 0 | Brush/Grass Fire | 2 S Hoyt St & San Roberto Ave |
| 7/3/2000 0 | Brush/Grass Fire | 5 Discovery Bay Dr & Discovery Heights Cir |
| 7/4/2000 0 | Brush/Grass Fire | 4 Cedrus & Brayton |
| 7/4/2000 0 | Brush/Grass Fire | 4 Elm & Hollywood |
| 7/4/2000 0 | Brush/Grass Fire | 2 441 N Bragaw |

| Date | Type | Location |
|---|---|---|
| 7/4/2000 0 | Brush/Grass Fire | 3 Mumford St |
| 7/4/2000 0 | Brush/Grass Fire | 5 Tower Estates Cir |
| 7/4/2000 0 | Brush/Grass Fire | 1 N Park & N Bliss |
| 7/4/2000 0 | Brush/Grass Fire | 5 A & 12th |
| 7/4/2000 0 | Brush/Grass Fire | 6 along river from 19240 Trail Bay Dr |
| 7/5/2000 0 | Brush/Grass Fire | 2 4670 Reka |
| 7/5/2000 0 | Brush/Grass Fire | 2 3139 Discovery Bay Dr |
| 7/5/2000 0 | Illegal Burn | 5 13551 Westwind Dr |
| 7/5/2000 0 | Illegal Burn | 1 Farm & End |
| 7/6/2000 0 | Brush/Grass Fire | 3 Northway & San Jeronimo |
| 7/6/2000 0 | Brush/Grass Fire | 2 RR Tracks near 800 E Dimond |
| 7/10/2000 | Illegal Burn | 3 11720 Business |
| 7/13/2000 | Brush/Grass Fire | 4 333 Concrete |
| 7/13/2000 | Illegal Burn | 2 4202 North Star St |
| 7/14/2000 | Trash Fire | 0 Lions Park |
| 7/16/2000 | Illegal Burn | 8 Prominence Point |
| 7/16/2000 | Illegal Burn | 3 18940 1st |
| 7/22/2000 | Illegal Burn | 2 2104 McKinley |
| 7/23/2000 | Trash Fire | 2 1205 E Street |
| 7/23/2000 | Illegal Burn | 0 2326 Cordova St |
| 7/23/2000 | Illegal Burn | 1 De Armoun & Elmore |
| 7/24/2000 | Brush/Grass Fire | 3 New Glenn & Bragaw |
| 7/24/2000 | Illegal Burn | 9 25721 Berryhill |
| 7/24/2000 | Peat Fire | 8 8445 SkyHills Dr |
| 7/27/2000 | Illegal Burn | 1 Minnesota & International |
| 7/27/2000 | Trash Fire | 4 2908 Commercial |
| 7/27/2000 | Illegal Burn | 3 100 meters into park Upper Huffman |
| 7/28/2000 | Trash Fire | 3 2500 McKenzie |
| 7/29/2000 | Brush/Grass Fire | 1 Eaglewood Dr & Eagle River Rd |
| 8/1/2000 0 | Brush/Grass Fire | 8 King St & E 76th Ave |
| 8/5/2000 0 | Illegal Burn | 7 5000 Vaquero Rd |
| 8/6/2000 0 | Brush/Grass Fire | 2 84th & Gordon |
| 8/6/2000 0 | Illegal Burn | 4 5330 Shaun Cir |
| 8/6/2000 0 | Illegal Burn | 7 5534 Chilkoot Ct |
| 8/6/2000 0 | Illegal Burn | 9 7100 Oline Cir |
| 8/7/2000 0 | Illegal Burn | 8 608 N Park |
| 8/7/2000 0 | Illegal Burn | 0 Bass & 72nd |
| 8/7/2000 0 | Illegal Burn | 2 Boniface Pkwy & Chilkoot |
| 8/9/2000 0 | Brush/Grass Fire | 2 Homer Bet Tudor & Intl |
| 8/10/2000 | Peat Fire | 5 4141 B |

| Date | Type | Location |
|---|---|---|
| 8/11/2000 | Brush/Grass Fire | 6 5 & Medfra |
| 8/12/2000 | Illegal Burn | 4 2805 W 32nd |
| 8/13/2000 | Illegal Burn | 0 8415 Rangeview |
| 8/13/2000 | Trash Fire | 3 88th & MOLANARY |
| 8/15/2000 | Brush/Grass Fire | 0 Toloff n & Abbott |
| 8/16/2000 | Illegal Burn | 8 1200 W Dimond |
| 8/17/2000 | Peat Fire | 8 4201 B St |
| 8/17/2000 | Brush/Grass Fire | 6 9499 Brayton Dr |
| 8/20/2000 | Brush/Grass Fire | 7 1566 Valarian St |
| 8/21/2000 | Illegal Burn | 4 13th & Denali |
| 8/22/2000 | Illegal Burn | 8 2104 Lincoln |
| 8/22/2000 | Peat Fire | 0 2301 Timothy |
| 8/22/2000 | Illegal Burn | 7 10018 Nantucket |
| 8/24/2000 | Illegal Burn | 2 Northern Lights Blvd & Forest Park Dr |
| 8/26/2000 | Illegal Burn | 8 2100 Campbell Pl |
| 8/27/2000 | Illegal Burn | 3 3400 W 86th Ave |
| 8/29/2000 | Illegal Burn | 7 5305 Dorbrandt St |
| 8/30/2000 | Illegal Burn | 9 36th & McInnes |
| 8/30/2000 | Illegal Burn | 7 2120 North Star |
| 9/3/2000 0 | Trash Fire | 3 87th & Arctic |
| 9/4/2000 0 | Illegal Burn | 8 Hampton bet Elies & Whist |
| 9/4/2000 0 | Illegal Burn | 0 13431 Windrush Cir |
| 9/4/2000 0 | Illegal Burn | 2 8400 Rangeview Ave |
| 9/5/2000 0 | Brush/Grass Fire | 3 Minnesota s/b by Hillcrest Offramp on hill |
| 9/5/2000 0 | Brush/Grass Fire | 8 NEW GLENN S OFF BONIFACE RAMP |
| 9/8/2000 0 | Illegal Burn | 2 Lot 6 Harp Cir |
| 9/9/2000 0 | Brush/Grass Fire | 9 8300 JODHPUR ST |
| 9/9/2000 0 | Illegal Burn | 3 64th & Quinhagak |
| 9/9/2000 0 | Illegal Burn | 2 9140 Seal Point |
| 9/11/2000 | Brush/Grass Fire | 3 8300 JODHPUR ST |
| 9/11/2000 | Illegal Burn | 7 6460 Rabbit Creek |
| 9/12/2000 | Illegal Burn | 9 15701 Amberwood |
| 9/13/2000 | Illegal Burn | 0 8000 Brayton Dr |
| 9/15/2000 | Brush/Grass Fire | 0 104th & Abbott Loop |
| 9/15/2000 | Illegal Burn | 3 Milky Way & Wisconsin |
| 9/17/2000 | Illegal Burn | 9 3413 Oregon |
| 9/17/2000 | Illegal Burn | 6 5237 E 22nd Ave |
| 9/17/2000 | Illegal Burn | 4 6007 Acheson |
| 9/20/2000 | Brush/Grass Fire | 9 8411 Owen Cir |

| Date | Type | Location |
|---|---|---|
| 9/20/2000 | Illegal Burn | 5 809 E 76th Ave |
| 9/20/2000 | Illegal Burn | 8 E 80th Ave & Briarwood St |
| 9/21/2000 | Peat Fire | 0 W Klatt & Spyglass |
| 9/21/2000 | Brush/Grass Fire | 0 460 Dailey |
| 9/22/2000 | Illegal Burn | 3 338 E 12th Ave |
| 9/26/2000 | Illegal Burn | 3 701 Potter |
| 9/29/2000 | Illegal Burn | 2 2307 E 88th |
| 9/29/2000 | Illegal Burn | 9 11309 Avion |
| 9/29/2000 | Illegal Burn | 6 New Glenn & Bragaw |
| 10/2/2000 | Illegal Burn | 6 6820 E 11th |
| 10/2/2000 | Illegal Burn | 0 5848 E Tudor |
| 10/3/2000 | Illegal Burn | 1 8400 Rangeview |
| 10/3/2000 | Illegal Burn | 0 3324 Orion |
| 10/4/2000 | Garbage/Rubbish Fire | 6 Farm Ave & End St |
| 10/7/2000 | Illegal Burn | 6 27509 Paramount |
| 10/7/2000 | Illegal Burn | 8 18731 2nd Ave |
| 10/8/2000 | Brush/Grass Fire | 8 Boniface & Turpin |
| 10/8/2000 | Brush/Grass Fire | 4 Flat Top |
| 10/8/2000 | Illegal Burn | 8 18452 Jude Island Cir |
| 10/8/2000 | Brush/Grass Fire | 5 3rd & Orca |
| 10/9/2000 | Illegal Burn | 7 end of White Spruce off BerryHill |
| 10/9/2000 | Illegal Burn | 5 4917 Roger Dr |
| 10/11/2000 | Illegal Burn | 8 OMalley & Our Rd |
| 10/11/2000 | Illegal Burn | 4 Sharon & Gardner |
| 10/12/2000 | Illegal Burn | 5 W Skyline Dr & Rainwater Cr |
| 10/14/2000 | Illegal Burn | 4 1127 F St |
| 10/17/2000 | Illegal Burn | 4 46th & Folker |
| 10/18/2000 | Illegal Burn | 0 14315 Old Seward |
| 10/20/2000 | Illegal Burn | 7 9600 Basher |
| 10/20/2000 | Illegal Burn | 2 Basher & Farpoint |
| 10/21/2000 | Brush/Grass Fire | 1 Westwind & Cutwater |
| 10/21/2000 | Illegal Burn | 3 6300 OMalley |
| 10/21/2000 | Illegal Burn | 9 Oceanview & Lagoon |
| 10/25/2000 | Illegal Burn | 8 1407 Nelchina St |
| 10/26/2000 | Illegal Burn | 9 36th & Oregon |
| 10/26/2000 | Illegal Burn | 2 Forest Park & Hillcrest |
| 10/27/2000 | Illegal Burn | 4 LaHonda & Forest Park |
| 10/27/2000 | Brush/Grass Fire | 7 9401 Spring Hill Dr |
| 10/27/2000 | Illegal Burn | 0 16100 Noble Point |
| 10/29/2000 | Brush/Grass Fire | 8 Rabbit Creek Rifle Range |
| 10/29/2000 | Illegal Burn | 3 5300 Davis Dr |

| Date | Type | Location |
|---|---|---|
| 10/30/2000 | Illegal Burn | 4 across Seward Hwy fr AK RR Historic Station |
| 10/31/2000 | Illegal Burn | 8 8525 Cormorant Cove Cir |
| 10/31/2000 | Trash Fire | 6 Northway & Penland |
| 11/2/2000 | Peat Fire | 6 end of Viscount Cir |
| 11/2/2000 | Brush/Grass Fire | 4 1545 S Hoyt |
| 11/3/2000 | Illegal Burn | 1 17639 Tedrow Dr |
| 11/3/2000 | Illegal Burn | 5 Sidorof & Kasilof |
| 11/3/2000 | Illegal Burn | 7 6655 Macbeth |
| 11/4/2000 | Illegal Burn | 2 8513 Cormorant Cove Cir |
| 11/5/2000 | Illegal Burn | 3 9660 Basher |
| 11/7/2000 | Brush/Grass Fire | 9 New Seward & Tudor |
| 11/7/2000 | Illegal Burn | 3 C St & 15th |
| 11/8/2000 | Illegal Burn | 1 3700 W 27th |
| 11/9/2000 | Illegal Burn | 7 6th & Newell |
| 11/11/2000 | Illegal Burn | 3 6701 Fernwood Ave |
| 11/11/2000 | Illegal Burn | 8 12241 Wagner St |
| 11/16/2000 | Illegal Burn | 9 Lake Otis & MERGANSER |
| 11/17/2000 | Illegal Burn | 1 2716 Strawberry |
| 11/18/2000 | Illegal Burn | 1 2317 Raspberry |
| 11/19/2000 | Brush/Grass Fire | 4 5410 Mockingbird |
| 11/21/2000 | Illegal Burn | 6 E 56th Ave & Denali St |
| 11/23/2000 | Illegal Burn | 7 25500 Muldoon Rd |
| 11/24/2000 | Illegal Burn | 7 MARIAN Bay Cir |
| 11/25/2000 | Brush/Grass Fire | 3 3332 Tarwater |
| 11/25/2000 | Illegal Burn | 6 3021 W 91st |
| 11/26/2000 | Illegal Burn | 3 Hiland & Riverview |
| 11/27/2000 | Trash Fire | 8 1428 W 25th |
| 11/27/2000 | Illegal Burn | 1 208 McCarrey |
| 11/30/2000 | Illegal Burn | 2 1300 Floral |
| 12/1/2000 | Illegal Burn | 6 633 N Bunn |
| 12/8/2000 | Illegal Burn | 4 Wright & Tudor |
| 12/10/2000 | Illegal Burn | 0 2811 E 46th |
| 12/15/2000 | Illegal Burn | 8 725 N Flower |
| 12/16/2000 | Illegal Burn | 8 14630 Park Hills Dr |
| 12/26/2000 | Illegal Burn | 1 Sand Lake & Dimond |
| 12/27/2000 | Brush/Grass Fire | 3 1016 W 25th Ave |
| 12/28/2000 | Trash Fire | 5 OMalley & New Seward |
| 12/29/2000 | Illegal Burn | 3 2801 Richmond Ave |
| 12/31/2000 | Illegal Burn | 2 8831 Juliana St |
| 12/31/2000 | Illegal Burn | 1 6471 Askeland Dr |

| Date | Type | Location |
|---|---|---|
| 12/31/2000 | Illegal Burn | 1 440 N Bragaw |

Source AFD, 2004

**Table F.2 Wildfire Events in 1999**

| Date | Type | Location |
|---|---|---|
| 1/1/1999 | Illegal Burn | 9521 JEWEL LAKE RD |
| 1/1/1999 | Illegal Burn | Flattop Mtn Parking Glen Alps |
| 1/3/1999 | Illegal Burn | 9201 Blackberry St |
| 1/3/1999 | Illegal Burn | 3410 North Shore Dr |
| 1/6/1999 | Illegal Burn | 10800 Janet Lee |
| 1/9/1999 | Brush/Grass Fire | Mile 10 Eagle River Rd |
| 1/11/1999 | Illegal Burn | Vanguard&Cannoneer |
| 1/20/1999 | Illegal Burn | 4110 E Northern Lights |
| 1/20/1999 | Illegal Burn | E Northern Lights & Career Center |
| 1/21/1999 | Illegal Burn | 7085 Weimer |
| 1/22/1999 | Illegal Burn | Pine& Debarr |
| 1/23/1999 | Illegal Burn | 22701 Glacier View |
| 1/27/1999 | Illegal Burn | Ptarmigan& Raven |
| 1/27/1999 | Illegal Burn | 19546 3rd Ave |
| 1/29/1999 | Illegal Burn | 705 Muldoon |
| 1/31/1999 | Illegal Burn | 802 N Price |
| 2/3/1999 | Garbage/Rubbish Fire | 3600 Denali |
| 2/11/1999 | Brush/Grass Fire | 6820 Rosewood St |
| 2/16/1999 | Garbage/Rubbish Fire | 3020 Minnesota |
| 2/20/1999 | Illegal Burn | Jewel Lake Park |
| 2/27/1999 | Illegal Burn | Dimond & Dewberry |
| 3/4/1999 | Garbage/Rubbish Fire | 649 W International Airport Rd |
| 3/14/1999 | Illegal Burn | 10011 Point Resolution |
| 3/22/1999 | Illegal Burn | 13th & A |
| 3/30/1999 | Illegal Burn | 426 N Bragaw |
| 4/3/1999 | Illegal Burn | 3529 E 88th |
| 4/5/1999 | Illegal Burn | 8540 Moss Ct |
| 4/6/1999 | Trash Fire | 12001 Business Blvd |
| 4/8/1999 | Brush/Grass Fire | International & C |
| 4/12/1999 | Trash Fire | 36 & Arctic |
| 4/16/1999 | Garbage/Rubbish Fire | Lake Otis & Northern Lights |
| 4/16/1999 | Illegal Burn | 2000 Turnagain Pkwy |
| 4/17/1999 | Brush/Grass Fire | 47 Northwood |
| 4/17/1999 | Illegal Burn | 8041 Country Wood Dr |
| 4/17/1999 | Brush/Grass Fire | 107 Seward Hwy |
| 4/18/1999 | Illegal Burn | 2100 Lake Otis |
| 4/18/1999 | Illegal Burn | 3725 McCain Lp |

| Date | Type | Location |
|---|---|---|
| 4/19/1999 | Illegal Burn | 3027 E Tudor |
| 4/20/1999 | Brush/Grass Fire | 4461 W Lake Cr |
| 4/20/1999 | Illegal Burn | 5310 Woodcrest |
| 4/20/1999 | Illegal Burn | 7926 Old Seward |
| 4/21/1999 | Illegal Burn | Viking & Reeve |
| 4/21/1999 | Illegal Burn | 9061 Toloff |
| 4/21/1999 | Brush/Grass Fire | Old Seward Hwy btwn 64 and 66 |
| 4/21/1999 | Illegal Burn | Spenard & McCain |
| 4/21/1999 | Illegal Burn | 3110 W 29th |
| 4/21/1999 | Brush/Grass Fire | 3428 E 88 |
| 4/23/1999 | Illegal Burn | 2906 W 30th Ave |
| 4/23/1999 | Illegal Burn | 3418 Sagan Cir |
| 4/23/1999 | Illegal Burn | 4500 Rabbit Creek |
| 4/23/1999 | Illegal Burn | 8350 Stratton Cir |
| 4/23/1999 | Illegal Burn | 4500 Rabbit Creek Rd |
| 4/24/1999 | Illegal Burn | 7427 Hennings |
| 4/24/1999 | Brush/Grass Fire | 11500 Bayshore Dr |
| 4/24/1999 | Trash Fire | 6th & Pine |
| 4/24/1999 | Illegal Burn | 4500 Rabbit Creek Rd |
| 4/25/1999 | Illegal Burn | 3704 Iowa |
| 4/25/1999 | Illegal Burn | 5950 Alpine Woods Dr |
| 4/25/1999 | Illegal Burn | 3660 North Point |
| 4/25/1999 | Illegal Burn | 68th & Winchester |
| 4/25/1999 | Brush/Grass Fire | 6th & Izembeck |
| 4/25/1999 | Trash Fire | 32nd & A |
| 4/25/1999 | Brush/Grass Fire | Debarr & Columbine |
| 4/26/1999 | Brush/Grass Fire | 11500 Bayshore Dr |
| 4/26/1999 | Brush/Grass Fire | 9988 Maintree Drive |
| 4/28/1999 | Brush/Grass Fire | 3800 Parsons |
| 4/28/1999 | Illegal Burn | 3027 E Tudor Rd |
| 4/29/1999 | Illegal Burn | 74& Meadow |
| 4/29/1999 | Brush/Grass Fire | W 88th & Gloralee |
| 4/29/1999 | Illegal Burn | Raven Dr & Wren Ln |
| 4/29/1999 | Brush/Grass Fire | 816 N Bunn |
| 4/30/1999 | Illegal Burn | Wandering Dr & Sand Lake Rd |
| 4/30/1999 | Illegal Burn | Kruger & Hale |
| 4/30/1999 | Illegal Burn | McIntyre Rd & Eagle River Rd |
| 4/30/1999 | Illegal Burn | 10401 STROGANOF |
| 5/1/1999 | Illegal Burn | Upper Canyon Rd |
| 5/2/1999 | Illegal Burn | 1412 Norene |
| 5/2/1999 | Illegal Burn | 3212 Creekside |

| Date | Type | Location |
|---|---|---|
| 5/2/1999 | Illegal Burn | 2550 E 88th |
| 5/2/1999 | Brush/Grass Fire | Hilltop & W 121st |
| 5/2/1999 | Illegal Burn | 4700 Rabbit Creek Rd |
| 5/2/1999 | Illegal Burn | 4901 Rabbit Creek Rd |
| 5/2/1999 | Illegal Burn | 14401 Buffalo |
| 5/2/1999 | Illegal Burn | Skyline Dr near Mt Baldy |
| 5/2/1999 | Illegal Burn | Eagle River Rd & Crest View Ln |
| 5/2/1999 | Illegal Burn | 1532 Nelchina |
| 5/2/1999 | Trash Fire | Lake Shore & Wisconson |
| 5/3/1999 | Trash Fire | 12350 Division St |
| 5/3/1999 | Trash Fire | Mt View & Pine |
| 5/3/1999 | Illegal Burn | 6330 Habicht Ct |
| 5/4/1999 | Brush/Grass Fire | Northern Lights & Bragaw |
| 5/4/1999 | Brush/Grass Fire | 6th & Fairbanks |
| 5/5/1999 | Brush/Grass Fire | 5777 Lake Otis |
| 5/5/1999 | Brush/Grass Fire | 20th & New Seward |
| 5/6/1999 | Brush/Grass Fire | 2030 Tudor Hills Ct |
| 5/6/1999 | Brush/Grass Fire | Baxter & E 35th |
| 5/6/1999 | Garbage/Rubbish Fire | Checkmate & Vance |
| 5/6/1999 | Brush/Grass Fire | Debarr & Pine |
| 5/6/1999 | Illegal Burn | 1705 W 32 Ave |
| 5/7/1999 | Illegal Burn | 12600 Landmark |
| 5/7/1999 | Brush/Grass Fire | 11701 Brayton |
| 5/7/1999 | Brush/Grass Fire | NE Huffman&New Seward |
| 5/8/1999 | Illegal Burn | 7051 Clairmont Cr |
| 5/8/1999 | Illegal Burn | 11th & Orca |
| 5/8/1999 | Illegal Burn | 3931 Dora Ave |
| 5/8/1999 | Illegal Burn | 7417 Hennings Way |
| 5/8/1999 | Illegal Burn | 23000 EAGLE RIVER RD |
| 5/8/1999 | Illegal Burn | 7417 Hennings Way |
| 5/8/1999 | Illegal Burn | 88 & Vernon |
| 5/8/1999 | Illegal Burn | 310 High View |
| 5/8/1999 | Illegal Burn | 12145 Avion Dr |
| 5/8/1999 | Illegal Burn | 4500 Rabbit Creek Rd |
| 5/9/1999 | Illegal Burn | Totem Rd & E 112th |
| 5/9/1999 | Illegal Burn | 40th & Wilson |
| 5/9/1999 | Illegal Burn | 3212 W 29th |
| 5/9/1999 | Brush/Grass Fire | 15301 Longbow |
| 5/9/1999 | Illegal Burn | 4761 Mars Dr |
| 5/9/1999 | Brush/Grass Fire | Upper Skyline & Canyon View |
| 5/9/1999 | Illegal Burn | De Armoun & Bainbridge |

| Date | Type | Location |
|---|---|---|
| 5/10/1999 | Illegal Burn | Frontage Rd & across from fire station |
| 5/10/1999 | Illegal Burn | 1416 Nichols St |
| 5/10/1999 | Illegal Burn | 1613 Tamarra Cir |
| 5/11/1999 | Trash Fire | 9th & K |
| 5/11/1999 | Brush/Grass Fire | 701 E 72nd |
| 5/11/1999 | Brush/Grass Fire | 88th & Northwood |
| 5/11/1999 | Illegal Burn | 1606 Dolina Cir |
| 5/12/1999 | Illegal Burn | W 88th Ave & Northwood St |
| 5/12/1999 | Illegal Burn | 4109 Harrison |
| 5/12/1999 | Brush/Grass Fire | 1405 W 27th |
| 5/12/1999 | Illegal Burn | 4314 Beechcraft Dr |
| 5/12/1999 | Illegal Burn | 12206 Breckenridge |
| 5/12/1999 | Brush/Grass Fire | 91st & Vernon |
| 5/12/1999 | Brush/Grass Fire | End of Timberlane |
| 5/12/1999 | Illegal Burn | 16905 Mercy |
| 5/13/1999 | Illegal Burn | 8420 Heather Circle |
| 5/13/1999 | Garbage/Rubbish Fire | Lois & Jefferson |
| 5/13/1999 | Illegal Burn | 13215 Spendlove Dr |
| 5/13/1999 | Illegal Burn | 264 Yellow Leaf Cir |
| 5/13/1999 | Brush/Grass Fire | 3440 Southbluff Cir |
| 5/14/1999 | Illegal Burn | Goose Lake & Northern Lights |
| 5/14/1999 | Brush/Grass Fire | Old Seward btwn 34th&36th |
| 5/14/1999 | Brush/Grass Fire | Benson btwn Arctic and Spenard |
| 5/14/1999 | Peat Fire | 86th & Cranberry |
| 5/14/1999 | Brush/Grass Fire | 701 N Hoyt |
| 5/14/1999 | Brush/Grass Fire | Johns Park |
| 5/14/1999 | Illegal Burn | Driftwood Bay & Trail Bay |
| 5/14/1999 | Illegal Burn | HILL RD & SEWARD HWY |
| 5/15/1999 | Illegal Burn | 5601 E 115th Ave |
| 5/15/1999 | Illegal Burn | 2731 Wesleyan |
| 5/15/1999 | Illegal Burn | 3309 Tarwater |
| 5/15/1999 | Illegal Burn | 4640 Shoshoni |
| 5/15/1999 | Illegal Burn | 9620 Burning Brush Dr |
| 5/15/1999 | Brush/Grass Fire | Talus & Our Rd |
| 5/15/1999 | Brush/Grass Fire | Sycamore Lp |
| 5/15/1999 | Illegal Burn | 17601 Rosemont Dr |
| 5/15/1999 | Illegal Burn | 4821 Talus Dr |
| 5/15/1999 | Illegal Burn | 164th & Goldenview |
| 5/15/1999 | Illegal Burn | 8300 JODHPUR |
| 5/15/1999 | Illegal Burn | Brewsters Way & Kenai Terrace |

| Date | Type | Location |
|---|---|---|
| 5/15/1999 | Illegal Burn | 3rd & Gambell |
| 5/16/1999 | Brush/Grass Fire | 5000 Vaquero |
| 5/16/1999 | Brush/Grass Fire | 8101 Upper De armoun |
| 5/16/1999 | Illegal Burn | 15211 Evergreen |
| 5/16/1999 | Illegal Burn | 10100 Hillside Dr |
| 5/16/1999 | Brush/Grass Fire | 1306 W 42nd |
| 5/16/1999 | Brush/Grass Fire | Talus & Wilderness |
| 5/16/1999 | Illegal Burn | 411 W 42nd Av |
| 5/16/1999 | Brush/Grass Fire | 13521 Windward Ct |
| 5/16/1999 | Brush/Grass Fire | Mile 9.2 Eagle River Rd |
| 5/16/1999 | Illegal Burn | Robin btwn 32nd & 34th |
| 5/16/1999 | Illegal Burn | 3443 E 19th Av |
| 5/16/1999 | Illegal Burn | 508 Taku Dr |
| 5/17/1999 | Peat Fire | 4940 E 5th |
| 5/17/1999 | Illegal Burn | 2410 W 29th |
| 5/17/1999 | Peat Fire | 86th & Cranberry |
| 5/17/1999 | Illegal Burn | Westchester Lagoon |
| 5/18/1999 | Illegal Burn | Audubon & Huffman |
| 5/18/1999 | Brush/Grass Fire | Folker & 46 |
| 5/18/1999 | Illegal Burn | 8 & Juneau |
| 5/18/1999 | Brush/Grass Fire | Rangeview & Kluane |
| 5/18/1999 | Illegal Burn | 3521 E 84th |
| 5/18/1999 | Illegal Burn | Snowflake & Rabbit Creek |
| 5/18/1999 | Brush/Grass Fire | Point Woronzof Rd |
| 5/18/1999 | Illegal Burn | 1003 Chugach Way |
| 5/19/1999 | Brush/Grass Fire | Hiland Rd & South River Ln |
| 5/19/1999 | Illegal Burn | 7635 Hillside Wy |
| 5/19/1999 | Illegal Burn | Hosken & Clarks Rd |
| 5/19/1999 | Brush/Grass Fire | Johns Park off Botanical Heights Cir |
| 5/19/1999 | Illegal Burn | Old Rabbit Creek & Rabbit Creek |
| 5/19/1999 | Brush/Grass Fire | Eielson & W 54 |
| 5/19/1999 | Illegal Burn | 9631 Abbott Loop Rd |
| 5/20/1999 | Illegal Burn | W 40th Ave & Wilson St |
| 5/20/1999 | Illegal Burn | 10126 Lee St |
| 5/20/1999 | Brush/Grass Fire | 2702 W 29th |
| 5/20/1999 | Illegal Burn | 14510 Hosken |
| 5/21/1999 | Illegal Burn | MT MCKINLEY VIEW & Wolf Creek |
| 5/21/1999 | Illegal Burn | Honeysuckle & W 88th |
| 5/21/1999 | Illegal Burn | Eklund & Kogru |
| 5/21/1999 | Illegal Burn | 7231 Meadow St |
| 5/21/1999 | Illegal Burn | 13440 Lamb Dr |

| Date | Type | Location |
|---|---|---|
| 5/21/1999 | Brush/Grass Fire | Birch & OMalley |
| 5/21/1999 | Brush/Grass Fire | 20th & Lake Otis |
| 5/21/1999 | Illegal Burn | 4115 Terrace Dr |
| 5/22/1999 | Illegal Burn | Pearl & Fisher |
| 5/22/1999 | Illegal Burn | 4032 Kingston Dr |
| 5/22/1999 | Brush/Grass Fire | 30th & Arctic |
| 5/22/1999 | Illegal Burn | 11561 Trails End Rd |
| 5/22/1999 | Illegal Burn | 6261 Trappers Trail |
| 5/22/1999 | Brush/Grass Fire | 3644 W 88th |
| 5/22/1999 | Peat Fire | 1650 W Northern Lights |
| 5/23/1999 | Illegal Burn | 10600 Hillside Dr |
| 5/23/1999 | Illegal Burn | Shaw Cir |
| 5/23/1999 | Illegal Burn | 7041 Potter Hts Dr |
| 5/23/1999 | Illegal Burn | 3700 W 27th |
| 5/24/1999 | Illegal Burn | Wilshire & Dorbrandt |
| 5/24/1999 | Trash Fire | Tudor & Arctic |
| 5/24/1999 | Illegal Burn | 16505 Diane |
| 5/24/1999 | Illegal Burn | 13149 Shelbourne |
| 5/24/1999 | Brush/Grass Fire | 2221 Muldoon |
| 5/24/1999 | Brush/Grass Fire | 3547 Abbott Rd |
| 5/24/1999 | Brush/Grass Fire | Jade & Dimond |
| 5/25/1999 | Trash Fire | 7th & F |
| 5/25/1999 | Brush/Grass Fire | Dimond & Jade |
| 5/26/1999 | Illegal Burn | 8511 E 20th |
| 5/26/1999 | Illegal Burn | 12800 Bainbridge |
| 5/27/1999 | Illegal Burn | 4640 Virgo |
| 5/27/1999 | Illegal Burn | 11351 Hillside Dr |
| 5/29/1999 | Brush/Grass Fire | 5001 Cape Seville Dr |
| 5/29/1999 | Brush/Grass Fire | Northern Lights & UAA Dr |
| 5/30/1999 | Illegal Burn | 4000 Kutcher Dr |
| 5/29/1999 | Illegal Burn | 204 E 15th Ave |
| 5/30/1999 | Illegal Burn | Donna & Turpin |
| 5/30/1999 | Illegal Burn | 6640 Jollipan Ci |
| 5/31/1999 | Illegal Burn | 2827 Lore Rd |
| 5/31/1999 | Brush/Grass Fire | Windsong Park |
| 5/31/1999 | Illegal Burn | 631 W 90th |
| 5/31/1999 | Illegal Burn | 1125 Shore Dr |
| 5/31/1999 | Illegal Burn | 76th & King |
| 5/31/1999 | Illegal Burn | 436 Price St |
| 6/1/1999 | Illegal Burn | Heritage Center Dr & Muldoon |
| 6/1/1999 | Illegal Burn | 1003 Chugach Way |

| Date | Type | Location |
|---|---|---|
| 6/1/1999 | Illegal Burn | 11240 Latta |
| 6/1/1999 | Trash Fire | 1790 Hillcrest |
| 6/2/1999 | Illegal Burn | 17709 S Juanita Loop Rd |
| 6/4/1999 | Illegal Burn | 905 Muldoon Rd |
| 6/4/1999 | Illegal Burn | 5386 Sillary Cir |
| 6/4/1999 | Brush/Grass Fire | 4437 E 7th |
| 6/5/1999 | Illegal Burn | 4005 Arkansas |
| 6/5/1999 | Illegal Burn | 9311 Shorecrest Dr |
| 6/5/1999 | Illegal Burn | 2400 Cordova |
| 6/6/1999 | Brush/Grass Fire | 1331 Tidewater |
| 6/6/1999 | Brush/Grass Fire | 8520 Golden |
| 6/6/1999 | Illegal Burn | 12601 Lupine |
| 6/6/1999 | Illegal Burn | Old Rabbit Creek & Hillside Way |
| 6/6/1999 | Brush/Grass Fire | 100th & Minnesota |
| 6/7/1999 | Illegal Burn | 11500 Bayshore Dr |
| 6/8/1999 | Illegal Burn | 12631 Brandon St |
| 6/8/1999 | Brush/Grass Fire | 7943 Highlander Dr |
| 6/8/1999 | Illegal Burn | 1241 Muldoon Rd |
| 6/8/1999 | Illegal Burn | W Tudor & Arctic Blvd |
| 6/9/1999 | Peat Fire | 425 Daily |
| 6/9/1999 | Illegal Burn | 1160 W Dimond |
| 6/9/1999 | Illegal Burn | 2301 Timothy |
| 6/10/1999 | Illegal Burn | 17916 Baranof |
| 6/10/1999 | Illegal Burn | Farm & End St |
| 6/10/1999 | Brush/Grass Fire | 2450 Benz Cir |
| 6/11/1999 | Brush/Grass Fire | McPhee & Pine |
| 6/11/1999 | Brush/Grass Fire | VFW & Eagle River Rd |
| 6/12/1999 | Brush/Grass Fire | NEW GLENN HWY & D |
| 6/12/1999 | Peat Fire | WISCONSIN ST & W 32ND |
| 6/12/1999 | Illegal Burn | 801 Airport Heights |
| 6/12/1999 | Illegal Burn | Centennial Park |
| 6/13/1999 | Illegal Burn | 4901 Rabbit Creek |
| 6/13/1999 | Brush/Grass Fire | 22nd & Arctic |
| 6/13/1999 | Illegal Burn | BOUNDARY AVE & MULDOON |
| 6/14/1999 | Trash Fire | OB Glenn across from AK National Guard |
| 6/14/1999 | Brush/Grass Fire | North Tahiti Loop & Lake Otis |
| 6/14/1999 | Illegal Burn | E 20th & New Seward |
| 6/14/1999 | Illegal Burn | Jamie Dr & W Skyline |
| 6/14/1999 | Illegal Burn | 5353 Lake Otis |
| 6/14/1999 | Illegal Burn | Raspberry & Arctic Spur |

| Date | Type | Location |
|---|---|---|
| 6/15/1999 | Illegal Burn | 7721 Mentra |
| 6/15/1999 | Brush/Grass Fire | ARTILLERY & New Glenn |
| 6/15/1999 | Illegal Burn | 12125 Wilderness |
| 6/15/1999 | Brush/Grass Fire | Mayfield & Strawberry |
| 6/15/1999 | Illegal Burn | 20236 Eagle River |
| 6/16/1999 | Illegal Burn | Nen/b Glenn Hwy at ER bridge eastside |
| 6/16/1999 | Brush/Grass Fire | 4 & Hoyt |
| 6/16/1999 | Illegal Burn | 7700 Evander Dr |
| 6/17/1999 | Trash Fire | 1111 E 56th |
| 6/17/1999 | Illegal Burn | 6700 Macbeth |
| 6/19/1999 | Brush/Grass Fire | 3220 E NORTHERN LIGHTS |
| 6/19/1999 | Illegal Burn | 8th & Karluk |
| 6/19/1999 | Brush/Grass Fire | Mile 2.5 Campbell Airstrip Rd |
| 6/19/1999 | Trash Fire | FORAKER DR & ILLIAMNA |
| 6/19/1999 | Illegal Burn | 7500 Our Own Ln |
| 6/19/1999 | Illegal Burn | 10229 Louis |
| 6/19/1999 | Illegal Burn | 15th & A |
| 6/21/1999 | Illegal Burn | 11501 Snowline |
| 6/21/1999 | Illegal Burn | 11901 Business Blvd |
| 6/21/1999 | Illegal Burn | 10200 Schuss Dr |
| 6/21/1999 | Brush/Grass Fire | 19th & Gambell |
| 6/21/1999 | Illegal Burn | 9600 Abbott Loop Rd |
| 6/22/1999 | Illegal Burn | 4901 Chena |
| 6/22/1999 | Illegal Burn | Eagle River Lane |
| 6/22/1999 | Illegal Burn | 2707 Havitur Way |
| 6/22/1999 | Brush/Grass Fire | 4800 Lake Otis |
| 6/22/1999 | Illegal Burn | 13000 Foster |
| 6/23/1999 | Illegal Burn | 3027 E Tudor |
| 6/23/1999 | Illegal Burn | 8531 Leo St |
| 6/24/1999 | Illegal Burn | 1820 Minerva |
| 6/25/1999 | Illegal Burn | Old Klatt & Timberlane |
| 6/25/1999 | Brush/Grass Fire | 9544 Canton Lp |
| 6/25/1999 | Illegal Burn | 4805 Manytell |
| 6/25/1999 | Brush/Grass Fire | 8600 Sultna Dr |
| 6/26/1999 | Illegal Burn | 27605 Paramount |
| 6/26/1999 | Peat Fire | 5901 E 6th Av |
| 6/27/1999 | Illegal Burn | 8430 Berry Patch Dr |
| 6/28/1999 | Illegal Burn | Tudor & Bragaw |
| 6/28/1999 | Illegal Burn | Hoyt St & San Ernesto Ave |
| 6/28/1999 | Illegal Burn | Hoyt St & San Ernesto |

| Date | Type | Location |
|---|---|---|
| 6/29/1999 | Trash Fire | Lions Pk & E R Loop |
| 6/29/1999 | Brush/Grass Fire | 74 & Winchester |
| 6/29/1999 | Illegal Burn | Hokama Heights Sub |
| 6/29/1999 | Illegal Burn | N of Klatt-W of Old Seward&NB-along RR tracks |
| 6/30/1999 | Brush/Grass Fire | 20th & Sunrise |
| 6/30/1999 | Brush/Grass Fire | Northway & Penland Pkwy |
| 6/30/1999 | Illegal Burn | Tudor & Arctic |
| 6/30/1999 | Illegal Burn | 7221 Meadow St |
| 7/1/1999 | Illegal Burn | E 48th & Folker |
| 7/1/1999 | Illegal Burn | 32nd & Spenard |
| 7/1/1999 | Illegal Burn | 6500 Rockridge |
| 7/1/1999 | Illegal Burn | 4805 Manytell |
| 7/1/1999 | Illegal Burn | 5120 Point Woronzof |
| 7/2/1999 | Brush/Grass Fire | 5405 E 4th Ave |
| 7/3/1999 | Illegal Burn | 3424 Robin St |
| 7/3/1999 | Illegal Burn | 1544 Wintergreen St |
| 7/3/1999 | Brush/Grass Fire | Regency Dr |
| 7/3/1999 | Brush/Grass Fire | 4420 E 20th |
| 7/3/1999 | Brush/Grass Fire | Cheechaco Btwn 21st and Benson |
| 7/3/1999 | Brush/Grass Fire | W 17TH AVE & E |
| 7/3/1999 | Brush/Grass Fire | W Northern Lights & Minnesota |
| 7/3/1999 | Illegal Burn | W 43rd & Harrison |
| 7/3/1999 | Brush/Grass Fire | 5901 E 4th |
| 7/4/1999 | Brush/Grass Fire | 4 & Turpin |
| 7/4/1999 | Brush/Grass Fire | Kincaid Motocross |
| 7/4/1999 | Brush/Grass Fire | 2201 E 66th |
| 7/4/1999 | Brush/Grass Fire | 5100 E 4th |
| 7/4/1999 | Brush/Grass Fire | 1830 E 72nd |
| 7/4/1999 | Illegal Burn | 310 E 10th |
| 7/4/1999 | Peat Fire | 1793 Concord Hills |
| 7/4/1999 | Brush/Grass Fire | Beluga Point |
| 7/4/1999 | Peat Fire | Concord Hills & 104th |
| 7/5/1999 | Garbage/Rubbish Fire | 20 & Sunrise |
| 7/5/1999 | Brush/Grass Fire | New Seward btwn Dimond and OMalley |
| 7/5/1999 | Brush/Grass Fire | Tower Estates Rd |
| 7/5/1999 | Brush/Grass Fire | Seward Hwy btwn Tudor & Dowling |
| 7/5/1999 | Brush/Grass Fire | OMalley & C |
| 7/5/1999 | Brush/Grass Fire | 16th & Hoyt |
| 7/5/1999 | Brush/Grass Fire | 1600 Gambell |

| Date | Type | Location |
|---|---|---|
| 7/5/1999 | Illegal Burn | Bike Trail east of Service High |
| 7/5/1999 | Peat Fire | 1793 Concord Hill Dr |
| 7/5/1999 | Illegal Burn | 7020 Burlwood Dr |
| 7/5/1999 | Illegal Burn | 34th & Eureka |
| 7/5/1999 | Brush/Grass Fire | 13th & Ingra |
| 7/5/1999 | Brush/Grass Fire | New Seward & OMalley |
| 7/5/1999 | Peat Fire | 6400 Askeland |
| 7/5/1999 | Brush/Grass Fire | McPhee Park |
| 7/5/1999 | Illegal Burn | Steeple Drive - East side of second West curve |
| 7/5/1999 | Brush/Grass Fire | 3307 Boniface Pkwy |
| 7/5/1999 | Trash Fire | 725 N Hoyt St |
| 7/6/1999 | Peat Fire | 2143 Kimberly Lynn Circle |
| 7/6/1999 | Peat Fire | 2325 Casey Cusak Cir |
| 7/6/1999 | Brush/Grass Fire | 259 Zappa |
| 7/6/1999 | Peat Fire | 2308 Casey Cusak |
| 7/6/1999 | Brush/Grass Fire | Dogwood & Elm |
| 7/6/1999 | Brush/Grass Fire | 724 Irwin |
| 7/6/1999 | Brush/Grass Fire | 825 Irwin |
| 7/7/1999 | Illegal Burn | Mt View & Davis |
| 7/7/1999 | Brush/Grass Fire | 514 n Bragaw |
| 7/7/1999 | Illegal Burn | 12810 Stephenson |
| 7/8/1999 | Brush/Grass Fire | 2140 Patriot Cir |
| 7/8/1999 | Peat Fire | 5411 Mockingbird |
| 7/9/1999 | Brush/Grass Fire | N Bliss & Parsons |
| 7/9/1999 | Brush/Grass Fire | 1539 Harriet |
| 7/10/1999 | Illegal Burn | 6432 Rosemont |
| 7/10/1999 | Brush/Grass Fire | 4651 Kent |
| 7/10/1999 | Brush/Grass Fire | 7526 Old Harbor Av |
| 7/10/1999 | Illegal Burn | New Seward & Dearmoun |
| 7/11/1999 | Brush/Grass Fire | Patterson & Baxter Terrace |
| 7/11/1999 | Illegal Burn | 2051 Borealis Dr |
| 7/11/1999 | Illegal Burn | 19049 Eagle River Rd |
| 7/11/1999 | Illegal Burn | 5521 College Dr |
| 7/12/1999 | Illegal Burn | E 34th bet Old Seward & Denali |
| 7/12/1999 | Brush/Grass Fire | E 36th bet Old Seward & Denali |
| 7/13/1999 | Trash Fire | Rabbit Creek & Clark |
| 7/14/1999 | Illegal Burn | 17639 Kantishna |
| 7/14/1999 | Peat Fire | Ken Logan Cir - park at end of cul de sac |
| 7/14/1999 | Illegal Burn | 3700 W 27th Ave |

| Date | Type | Location |
|---|---|---|
| 7/14/1999 | Illegal Burn | 7221 Meadow St |
| 7/15/1999 | Illegal Burn | 3745 Mt View Dr |
| 7/15/1999 | Illegal Burn | 10441 Palos Verdes Circle |
| 7/16/1999 | Peat Fire | 88th & Jewel Lake |
| 7/18/1999 | Brush/Grass Fire | 11151 Calaska Ci |
| 7/20/1999 | Brush/Grass Fire | Peninsula Cir & C St |
| 7/20/1999 | Brush/Grass Fire | 111 W Ship |
| 7/20/1999 | Illegal Burn | University access road |
| 7/20/1999 | Brush/Grass Fire | Ken Logan CIrcle-across the bridge |
| 7/22/1999 | Illegal Burn | Merganser & Lake Otis |
| 7/23/1999 | Illegal Burn | 20th & Ingra |
| 7/23/1999 | Illegal Burn | 6930 Sand Lake |
| 7/23/1999 | Brush/Grass Fire | 121 W Fireweed Ln |
| 7/24/1999 | Garbage/Rubbish Fire | Hilltop Ski Area |
| 7/24/1999 | Illegal Burn | 18001 Baronoff |
| 7/24/1999 | Illegal Burn | E 20& New Seward |
| 7/25/1999 | Illegal Burn | 15th & A |
| 7/26/1999 | Illegal Burn | 8964 Blackberry Dr |
| 7/27/1999 | Illegal Burn | 16160 Sandpiper |
| 7/31/1999 | Illegal Burn | 5577 ABBOTT RD |
| 7/31/1999 | Brush/Grass Fire | Abbott & Jupiter |
| 8/1/1999 | Illegal Burn | 5701 JEWEL LAKE RD |
| 8/1/1999 | Brush/Grass Fire | 15th & A |
| 8/3/1999 | Brush/Grass Fire | Huffman & Lorraine |
| 8/3/1999 | Brush/Grass Fire | 3990 Alitak Bay Cir |
| 8/4/1999 | Brush/Grass Fire | Southport & W Klatt |
| 8/6/1999 | Illegal Burn | 6600 Homer Dr |
| 8/7/1999 | Illegal Burn | 7331 Meadow St |
| 8/7/1999 | Illegal Burn | 14720 Rabbit Creek Rd |
| 8/9/1999 | Garbage/Rubbish Fire | 1721 Stanford Dr |
| 8/9/1999 | Illegal Burn | 7333 Meadow St |
| 8/10/1999 | Illegal Burn | 7141 North Park |
| 8/10/1999 | Illegal Burn | 8070 Nadine St |
| 8/11/1999 | Illegal Burn | 905 Muldoon Rd |
| 8/11/1999 | Peat Fire | 7015 ABBOTT RD |
| 8/16/1999 | Illegal Burn | 17312 S Juanita Lp |
| 8/16/1999 | Illegal Burn | 7340 Hillside Dr |
| 8/16/1999 | Illegal Burn | E 16th bet A & Gambell &Mulchay Park |
| 8/16/1999 | Illegal Burn | 4966 E 4th Ave |
| 8/16/1999 | Illegal Burn | Campbell Creek Park |

| Date | Type | Location |
|---|---|---|
| 8/16/1999 | Illegal Burn | Telstar Circle |
| 8/17/1999 | Illegal Burn | E Northern Lights & Goose Lake Dr |
| 8/17/1999 | Brush/Grass Fire | 1780 W Northern Lights Blvd |
| 8/18/1999 | Illegal Burn | 4901 Rabbit Creek Rd |
| 8/18/1999 | Brush/Grass Fire | 10441 Loudermilk Circle |
| 8/19/1999 | Illegal Burn | 7910 Snowview Dr |
| 8/22/1999 | Brush/Grass Fire | Hilltop Ski Area |
| 8/22/1999 | Illegal Burn | 12330 Lilac Dr |
| 8/23/1999 | Illegal Burn | Lake Street |
| 8/24/1999 | Illegal Burn | 12300 Heritage Ct |
| 8/25/1999 | Illegal Burn | BOUNDARY AVE & MULDOON RD |
| 8/27/1999 | Illegal Burn | 20th & New Seward |
| 8/27/1999 | Illegal Burn | 5701 JEWEL LAKE RD |
| 8/28/1999 | Brush/Grass Fire | 1200 Columbine |
| 8/29/1999 | Trash Fire | Kempton Hills & Legacy Dr |
| 8/29/1999 | Illegal Burn | 72 Meadow St |
| 9/2/1999 | Illegal Burn | 11900 Hillside Dr |
| 9/5/1999 | Peat Fire | 16 & Cordova |
| 9/5/1999 | Illegal Burn | 8520 Blackberry |
| 9/6/1999 | Illegal Burn | 5400 E 104th |
| 9/6/1999 | Illegal Burn | 1441 E 12th Ave |
| 9/6/1999 | Illegal Burn | 2408 Northrup Circle |
| 9/7/1999 | Brush/Grass Fire | 1700 Hillcrest |
| 9/8/1999 | Illegal Burn | 1731 Tammy |
| 9/8/1999 | Illegal Burn | 16946 Eagle River Loop Rd |
| 9/9/1999 | Illegal Burn | 942 Tyonek Dr |
| 9/9/1999 | Illegal Burn | 3103 Cranberry |
| 9/9/1999 | Illegal Burn | 4910 W 88th Ave |
| 9/10/1999 | Illegal Burn | 17016 Aries |
| 9/11/1999 | Illegal Burn | 7321 Meadow across from |
| 9/11/1999 | Garbage/Rubbish Fire | 801 Airport Heights sp 120 |
| 9/12/1999 | Illegal Burn | 12330 Lilac Dr |
| 9/12/1999 | Peat Fire | Dimond & Sandlake |
| 9/17/1999 | Brush/Grass Fire | 16422 Marcus |
| 9/17/1999 | Trash Fire | Abbott Loop Btwn Abbott and Lore |
| 9/17/1999 | Brush/Grass Fire | 2221 Muldoon |
| 9/17/1999 | Brush/Grass Fire | 6700 Fernhill |
| 9/17/1999 | Illegal Burn | Illiamna & Foraker |
| 9/18/1999 | Illegal Burn | Hillside & Upper OMalley |
| 9/19/1999 | Illegal Burn | 20310 David Ave |
| 9/21/1999 | Illegal Burn | North Mitkoff Loop |

| Date | Type | Location |
|---|---|---|
| 9/23/1999 | Peat Fire | Naknek Ln & Badger Ln |
| 9/23/1999 | Illegal Burn | Schluss & Zermatt |
| 9/23/1999 | Illegal Burn | 10319 Colville |
| 9/23/1999 | Illegal Burn | 2221 Legacy |
| 9/24/1999 | Illegal Burn | 3800 James Dr |
| 9/24/1999 | Illegal Burn | 3130 Brookridge Cir |
| 9/25/1999 | Trash Fire | 2563 E 68th |
| 9/26/1999 | Illegal Burn | 6930 Sand Lake Rd |
| 9/26/1999 | Illegal Burn | 1104 Orca |
| 9/26/1999 | Trash Fire | Rives Ct & Lake Otis |
| 9/26/1999 | Illegal Burn | 16600 Golden View Dr |
| 9/26/1999 | Illegal Burn | 2910 Rocky Bay |
| 9/27/1999 | Trash Fire | 7505 Glenn |
| 9/29/1999 | Illegal Burn | 610 W Fireweed |
| 9/30/1999 | Illegal Burn | 68th & Abbott |
| 10/1/1999 | Illegal Burn | 6231 Trappers Trail |
| 10/3/1999 | Illegal Burn | 3215 Lois Dr |
| 10/4/1999 | Brush/Grass Fire | 8900 King St |
| 10/5/1999 | Illegal Burn | 1111 E 80th Ave |
| 10/6/1999 | Illegal Burn | 84th & Lake Otis |
| 10/9/1999 | Illegal Burn | 5910 West Tree Dr |
| 10/9/1999 | Trash Fire | Penland Pkwy Bus Stop |
| 10/9/1999 | Illegal Burn | 8421 Flamingo |
| 10/10/1999 | Illegal Burn | 3301 Huffman |
| 10/10/1999 | Illegal Burn | 4820 OMalley |
| 10/11/1999 | Illegal Burn | 3411 Willow Place |
| 10/14/1999 | Illegal Burn | 44th & Beechcraft |
| 10/15/1999 | Illegal Burn | Carl & Jamie |
| 10/16/1999 | Trash Fire | 209 Post |
| 10/16/1999 | Illegal Burn | 935 S Hoyt |
| 10/16/1999 | Illegal Burn | 2910 Rocky Bay Cir |
| 10/19/1999 | Illegal Burn | 7015 ABBOTT RD |
| 10/19/1999 | Brush/Grass Fire | 3101 Muldoon Rd |
| 10/20/1999 | Illegal Burn | 3107 Willow |
| 10/20/1999 | Illegal Burn | 3720 Barrow St |
| 10/21/1999 | Illegal Burn | Noble Point Dr |
| 10/21/1999 | Illegal Burn | Mile 8-1/2 Hiland Road |
| 10/23/1999 | Illegal Burn | 11824 Roads End |
| 10/25/1999 | Illegal Burn | 631 E 22nd |
| 10/31/1999 | Illegal Burn | 4115 E 88th Av |
| 11/9/1999 | Illegal Burn | 82nd & SANDLEWOOD |

| Date | Type | Location |
|---|---|---|
| 11/10/1999 | Illegal Burn | 4742 Potter Crest Cir |
| 11/14/1999 | Illegal Burn | 130 Jones |
| 11/18/1999 | Trash Fire | 8514 Cormoront Cove Circle |
| 11/28/1999 | Illegal Burn | Brewsters & Kings Way |
| 11/28/1999 | Trash Fire | Potter Valley & New Seward |
| 12/9/1999 | Illegal Burn | Golden Eagle & Canyon View |
| 12/12/1999 | Illegal Burn | University & Veco |
| 12/12/1999 | Illegal Burn | 3877 Veco Dr KAKM |
| 12/13/1999 | Trash Fire | 5802 Jennifer Cr |
| 12/14/1999 | Illegal Burn | 16740 Elenora St |
| 12/31/1999 | Illegal Burn | 7144 Linden Ct |

Source: AFD, 2004

# PRIORITIZATION

It is acknowledged that there will be many projects that should be undertaken but there is a limited amount of resources available. Given that, projects must be prioritized to determine how to allocate resources.

The prioritization will be done by the committee and will be based on several criteria including:

- Life safety
- Compliance with an existing program/regulation
- Cost Benefit Analysis
- Co-ordination with existing documents/programs

**Life safety**
Activities that protect human lives will have priority over those that solely protect of property.

**Compliance**
The failure to comply with existing requirements could have wide ranging consequences such the ineligibility to participate in funding programs.

**Cost Benefit Analysis**
When possible, FEMA's cost-benefit analysis tools will be used to determine a project's cost-benefit ration. Those projects with a higher cost benefit ratio will be given a higher priority.

A cost benefit analysis provides a common basis that can be used to compare projects. When calculating a cost benefit ratio, the cost amount includes funds spent by FEMA, state, local, tribal, private and other dollars. It should include administrative and maintenance costs as well as indirect costs. Examples of costs include:

## How to Determine Cost-Effectiveness Of Mitigation Projects

As the well-publicized devastation of floods, earthquakes, and hurricanes attests, disasters are random and inevitable events that we can't control. But how we reduce or mitigate, damage from disasters is something that we *can* control. That is why FEMA funds hazard mitigation projects: to reduce future damages, losses, casualties, and other devastating impacts from disasters. Some examples of flood mitigation projects include elevating buildings or upgrading culverts. Projects in earthquake-prone areas might focus on retrofitting buildings to lower future damages and casualties. So instead of continuously picking up the pieces after disasters, states and communities can identify and carry out hazard mitigation measures that will reduce damage and hardship .the "loss". due to future disasters. A key criterion for mitigation projects to be eligible for funding is that they must be cost-effective. If the project benefits are higher than the project costs, then the project is cost-effective. Benefit-cost analysis is used for all cost-effectiveness determinations, for flood and earthquake mitigation projects alike. At its most basic level, benefit-cost analysis determines whether the cost of investing in a mitigation project today (the "cost") will result in sufficiently reduced damages in the future (the "benefits") to justify spending money on the project. If the benefit is greater than the cost, then the project *is* cost-effective; if the benefit is less than the cost, then the project *is not* cost-effective.

- Direct expenditures of construction materials
- Costs to develop and administer a new overlay zone
- Increased business operation costs to comply with mitigation requirement

The benefits have to be estimated. The calculation includes direct and indirect benefits. Examples of benefits include the losses avoided due to mitigation activities, avoided loss of life, injury, property damage, environmental damage, community disruption and response costs avoided.

## Calculating the Benefit-Cost Ratio

Cost-effectiveness is determined by comparing the project cost, to the value of damages prevented *after* the mitigation measure. Because the dollar-value of benefits exceeds the costs of funding the project, the project is cost-effective. This relationship is depicted numerically by dividing the benefits by the costs, resulting in a benefit-cost ratio (BCR). The BCR is simply a way of stating whether benefits exceed project costs, and by how much. To derive the BCR, divide the benefits by the cost. If the result is 1.0 or greater, then the project is cost-effective.

By conducting a benefit-cost analysis, you determine one of two things: either the project is cost-effective (BCR > 1.0) or it is not (BCR < 1.0). If the project is cost-effective, then no further work or analysis needs to be done; there is no third step other than to move the project to the next phase in the approval process. If, however, the project is not cost-effective, then it is not eligible for funding.

FEMA utilizes a computer software program to calculate a project's cost-effectiveness. The following is a technical illustration of how benefit-cost analysis works. There are four key elements to all benefit-cost analyses of hazard mitigation projects:

1. an estimate of damages and losses *before* mitigation
2. an estimate of damages and losses *after* mitigation
3. an estimate of the frequency and severity of the hazard causing damages (e.g. floods), and
4. the economic factors of the analysis (i.e. discount rate and mitigation project useful lifetime)

These four key elements and their relationships to one another are detailed in the following example.

EXAMPLE: Consider a 1500 square foot, one-story, single family residence located in the Acorn Park subdivision along Squirrel Creek. A proposed mitigation project will elevate the structure four feet at a cost of $20,000. Whether this project is cost-effective depends on the damages and losses from flooding without the mitigation project; the effectiveness of the mitigation project in reducing those damages and losses; the frequency that the house is flooded and the depth of the flood water; and, the mitigation project's useful lifetime.

If the pre-mitigation damages are frequent and/or severe, then the project is more likely to be cost-effective. Even minor damage that occurs frequently can exceed, over the life of a project, the up-front costs of implementing a mitigation measure. On the other hand, if the building in the example above only flooded once, then it may not be cost-effective to elevate, unless the damages were significant in relation to the value of the structure and its contents.

FEMA is trying to maximize its investment in damage reduction by focusing mitigation resources on those projects that have the best chance of making an impact on losses in property and life. Determining cost-effectiveness of mitigation projects is of critical importance, therefore, to ensure that FEMA is fulfilling its mission of not just responding to disasters, but also in reducing the economic loss and suffering that they bring.

**Coordination**
A project that is integrated into several plans, has gone through the public involvement process, etc. will have a higher priority as they reflect the desires of multiple departments and the public. Projects that have been contained within a single plan, or has no public involvement may not reflect the wider viewpoint.

Table G.1 shows how the criteria will be considered using a point system to give each project a score. This score will then be used to rank the projects. The department responsible for the project will initially develop the score for the project. The scores will then be evaluated by the Hazard Mitigation Planning Team to ensure that the projects are being consistently scored. For the purposed of this plan, action items will be given a prioritization of high, medium or low. A high value represents a score above 72 while a medium is between 37 and 72 and low is 36 or below. For each project, additional factors to be considered can be listed. At their discretion, the Hazard Mitigation Planning Team can evaluate these factors and alter the project's priority.

Once the priority has been determined, the Table G.2 lists the action items in order of their priority.

**Table G.1 Prioritization of Projects**

| | Criteria | Weighting | Score | | | Total Points (weight X score) |
|---|---|---|---|---|---|---|
| | | | **Low** (1-3 possible points) | **Medium** (4-6 possible points) | **High** (7-9 possible points) | |
| 1. | Life Safety | 4 | No people at risk | Fewer than 10 people affected | More than 10 people affected | |
| 2. | Compliance with existing programs/regulations | 3 | Not needed | Encouraged | Required | |
| 3. | Cost-Benefit | 3 | No cost-benefit analysis performed or results less than 1 | Cost benefit between 1 and 2 | Cost benefit greater than 2 | |
| 4. | Coordination with existing documents | 2 | No ties to existing plans | Mentioned in one or 2 plans. Plans without public involvement. | Well integrated into plans. Plans have gone through public input process. | |
| TOTAL POINTS | | | | | | |

Additional factors to consider (please note special reasons why this project should be funded (legal liability, social and environmental impacts, high visibility, etc):

**Table G.2 Prioritized list of action items – To Be Completed**

| Ranking | Action Item | Hazard | Score |
|---|---|---|---|
| 1. | | | |
| 2. | | | |

# CRITICAL FACILITY EXPOSURE

## Natural Hazards

| Facility Name | Earthquake | Wildfire | Extreme Weather | Flood | Hazard Avalanche | Ground Failure | Volcano | Tsunami | Erosion |
|---|---|---|---|---|---|---|---|---|---|
| **Fire Departments** | | | | | | | | | |
| AFD Fire Station #1 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| AFD Fire Station #3 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| AFD Fire Station #4 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| AFD Fire Station #5 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| AFD Fire Station #6 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| AFD Fire Station #7 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| AFD Fire Station #8 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| AFD Fire Station #9 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| AFD Fire Station #10 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| AFD Fire Station #11 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| AFD Fire Station #12 | ✓ | ? | ✓ | ✓ | X | ✓ | ✓ | ? | X |
| South Fork Volunteer Fire Department | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Chugiak Volunteer Fire Department #1 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Chugiak Volunteer Fire Department #2 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Chugiak Volunteer Fire Department #3 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Chugiak Volunteer Fire Department #4 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Girdwood Volunteer Fire Department | ✓ | ? | ✓ | ✓ | X | ✓ | ✓ | ? | X |

| | Hazard | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Earthquake | Wildfire | Extreme Weather | Flood | Avalanche | Ground Failure | Volcano | Tsunami | Erosion |
| **Hospitals** | | | | | | | | | |
| UASF Elmendorf Hospital | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Anchorage Pioneer Home | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| VA Clinic | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Columbia Alaska Regional Hospital | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Charter North Behavioral Health System | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Providence Hospital | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Alaska Psychiatric Institute | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Alaska Native Hospital | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Providence Extended Care Facility | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| **Schools** | | | | | | | | | |
| **Charter** | | | | | | | | | |
| Aquarian | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Family Partnership | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Frontier Charter School | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Frontier Charter Secondary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Highland Tech High School | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Village Charter | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| **Elementary** | | | | | | | | | |
| Abbott Loop Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Airport Heights Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Alpenglow Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |

| | Hazard | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Earthquake | Wildfire | Extreme Weather | Flood | Avalanche | Ground Failure | Volcano | Tsunami | Erosion |
| Aurora Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Baxter Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Bayshore Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Bear Valley Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Birchwood ABC | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Bowman Willard Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Campbell Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Chester Valley Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Chinook Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Chugach Optional Elem. | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Chugiak Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| College Gate Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Creekside Park Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Denali Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Eagle River Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Fairview Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Fire Lake Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Gladys Wood Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Government Hill Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Homestead Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Huffman Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |

| | Hazard | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Earthquake | Wildfire | Extreme Weather | Flood | Avalanche | Ground Failure | Volcano | Tsunami | Erosion |
| Inlet View Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Kasuun Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Kincaid Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Klatt Elementary* | ✓ | | ✓ | X | X | ✓ | ✓ | ? | X |
| Lake Hood Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Lake Otis Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Mountain View Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Mt. Spurr Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Muldoon Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| North Star Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Northwood Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Nunaka Valley Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| O'Malley Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Ocean View Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Orion Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Ptarmigan Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Rabbit Creek Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Ravenwood Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Rogers Park Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Russian Jack Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Sand Lake Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |

| | Hazard | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Earthquake | Wildfire | Extreme Weather | Flood | Avalanche | Ground Failure | Volcano | Tsunami | Erosion |
| Scenic Park Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Spring Hill Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Susitna Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Taku Elementary School* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Trailside Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Tudor Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Turnagain Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Tyson William Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Ursa Major Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Ursa Minor Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Williwaw Elementary* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Willow Crest Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Wonder Park Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| **Middle** | | | | | | | | | |
| Central Middle School | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Clark Middle School | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Goldenview Middle School* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Gruening Middle School* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Hanshew Middle School | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Mears Middle School* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Mirror Lake Middle School* | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |

| | Hazard | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Earthquake | Wildfire | Extreme Weather | Flood | Avalanche | Ground Failure | Volcano | Tsunami | Erosion |
| Romig Middle School | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Wendler Middle School | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| **High** | | | | | | | | | |
| Bartlett High School | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Chugiak High School | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Dimond High School | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| East High School | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| SAVE | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Service High School | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| South Anchorage High School | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| **Other** | | | | | | | | | |
| ACE/ACT | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Alaska State School for the Deaf and Hard of Hearing | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| AVAIL | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Benny Benson | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Benson Search | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Booth Secondary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Continuation Program | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Crossroads | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Girdwood | ✓ | ? | ✓ | ? | X | ✓ | ✓ | ? | X |
| Jesse Lee | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| King Career Center | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |

| | Hazard | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Earthquake | Wildfire | Extreme Weather | Flood | Avalanche | Ground Failure | Volcano | Tsunami | Erosion |
| McKinley Heights | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| McLaughlin | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Mt. Iliamna | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| North Star Residential Secondary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Northern Lights ABC | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Polaris K-12 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Providence Heights Elementary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Providence Heights Secondary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Steller Secondary | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Whaley | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| **Law Enforcement** | | | | | | | | | |
| Alaska State Court Building | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Cook Inlet Pretrial Facility | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| FBI Building | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| 6th Ave Jail | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Alaska State Troopers Headquarters | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Anchorage Police Department Headquarters | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Eagle River Police Station | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Eagle River Police Station (City Hall) | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |

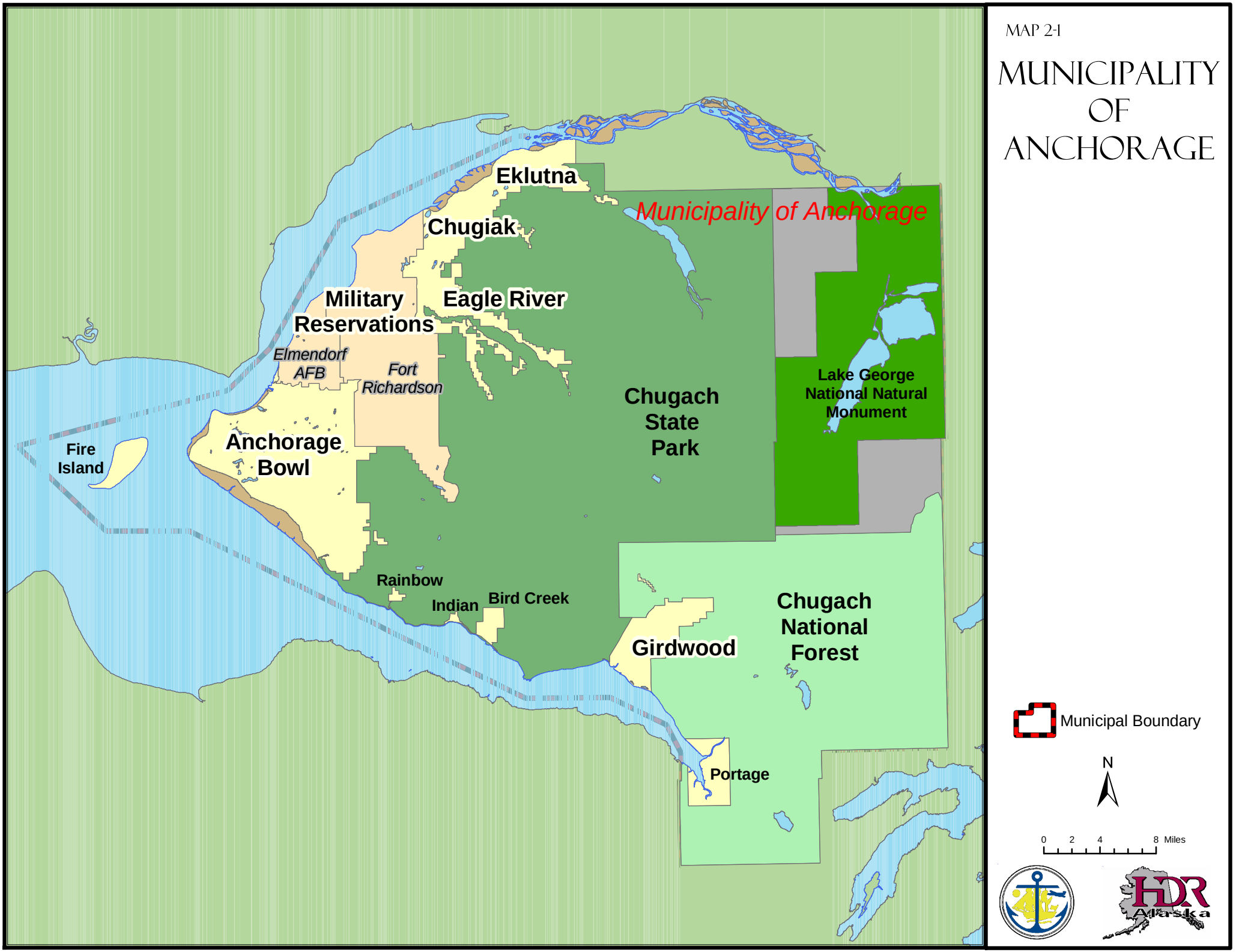
| | Hazard | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Earthquake | Wildfire | Extreme Weather | Flood | Avalanche | Ground Failure | Volcano | Tsunami | Erosion |
| Prosecutor's Office | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| APD Training/Misc | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| | | | | | | | | | |
| Shelters | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Chief William Tyson | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Spenard Recreation Center | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Fairview Recreation Center | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Boys & Gir's Club, Mt. View | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Egan Center | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Sullivan Area | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| | | | | | | | | | |
| **Other Municipal Facilities** | | | | | | | | | |
| Eklutna Water Treatment Facility | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Eagle River Waste Treatment Facility | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| ML&P Plant #2 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| AWWU Ship Creek Treatment Facility | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| ML&P Plant #1 | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| City Hall | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Department of Health & Human Services | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Point Woronzof Seward Facility | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| AWWU Headquarters | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |

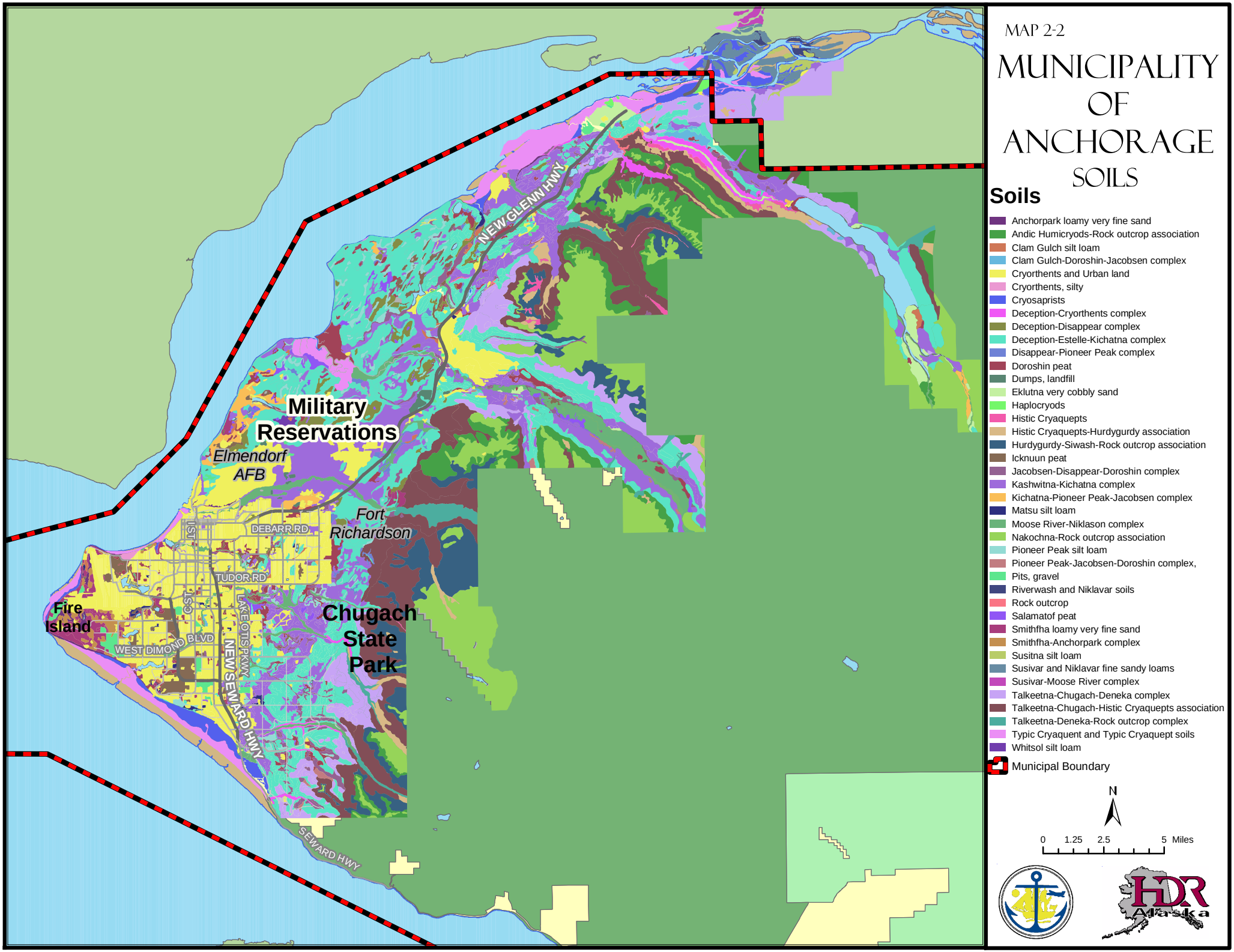
| | Hazard | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Earthquake | Wildfire | Extreme Weather | Flood | Avalanche | Ground Failure | Volcano | Tsunami | Erosion |
| Emergency Operations Center | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Municipal Parks & Recreation | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| Michael Building | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |
| John Thomas Building | ✓ | ? | ✓ | X | X | ✓ | ✓ | ? | X |

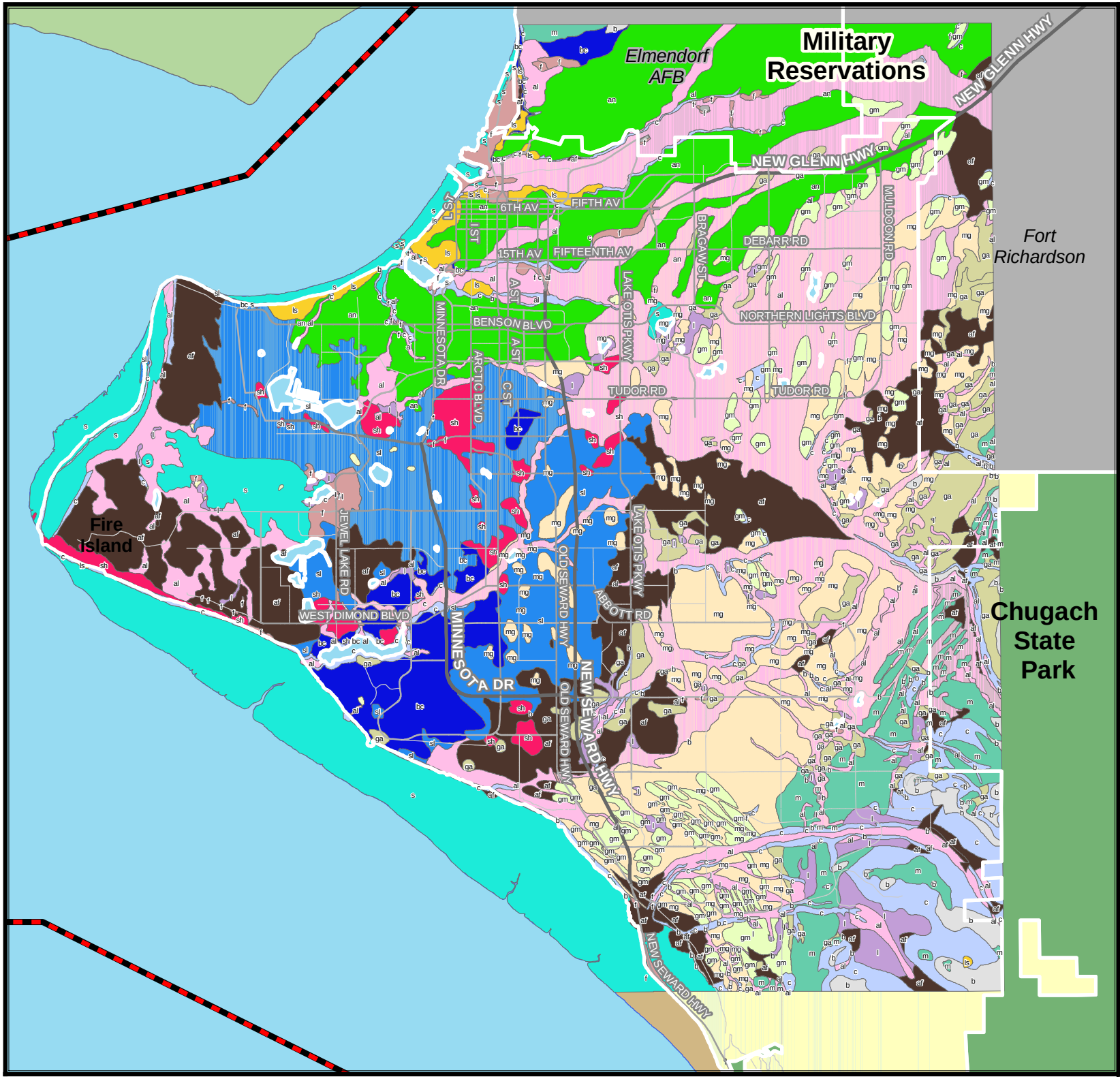
* Also acts as Shelter

**Legend**

| | |
|---|---|
| ✓ | Yes |
| ? | Unknown |
| X | No |


MAP 2-1
MUNICIPALITY OF ANCHORAGE
Eklutna
Municipality of Anchorage
Chugiak
Military Reservations
Eagle River
Elmendorf AFB
Fort Richardson
Chugach State Park
Lake George National Natural Monument
Fire Island
Anchorage Bowl
Rainbow
Indian
Bird Creek
Girdwood
Chugach National Forest
Portage
Municipal Boundary
N
0 2 4 8 Miles
HDR Alaska


MAP 2-2
MUNICIPALITY OF ANCHORAGE
SOILS
Soils
Anchorpark loamy very fine sand
Andic Humicryods-Rock outcrop association
Clam Gulch silt loam
Clam Gulch-Doroshin-Jacobsen complex
Cryorthents and Urban land
Cryorthents, silty
Cryosaprists
Deception-Cryorthents complex
Deception-Disappear complex
Deception-Estelle-Kichatna complex
Disappear-Pioneer Peak complex
Doroshin peat
Dumps, landfill
Eklutna very cobbly sand
Haplocryods
Histic Cryaquepts
Histic Cryaquepts-Hurdygurdy association
Hurdygurdy-Siwash-Rock outcrop association
Icknuun peat
Jacobsen-Disappear-Doroshin complex
Kashwitna-Kichatna complex
Kichatna-Pioneer Peak-Jacobsen complex
Matsu silt loam
Moose River-Niklason complex
Nakochna-Rock outcrop association
Pioneer Peak silt loam
Pioneer Peak-Jacobsen-Doroshin complex,
Pits, gravel
Riverwash and Niklavar soils
Rock outcrop
Salamatof peat
Smithfha loamy very fine sand
Smithfha-Anchorpark complex
Susitna silt loam
Susivar and Niklavar fine sandy loams
Susivar-Moose River complex
Talkeetna-Chugach-Deneka complex
Talkeetna-Chugach-Histic Cryaquepts association
Talkeetna-Deneka-Rock outcrop complex
Typic Cryaquent and Typic Cryaquept soils
Whitsol silt loam
Municipal Boundary
N
0 1.25 2.5 5 Miles
HDR Alaska
Military Reservations
Elmendorf AFB
Fort Richardson
Chugach State Park
Fire Island
NEW GLENN HWY
DEBARR RD
TUDOR RD
WEST DIMOND BLVD
LAKE OTIS PKWY
NEW SEWARD HWY
SEWARD HWY




MAP 2-3

# MUNICIPALITY OF ANCHORAGE

## SURFICIAL GEOLOGY

## Legend

**Surface Geology**

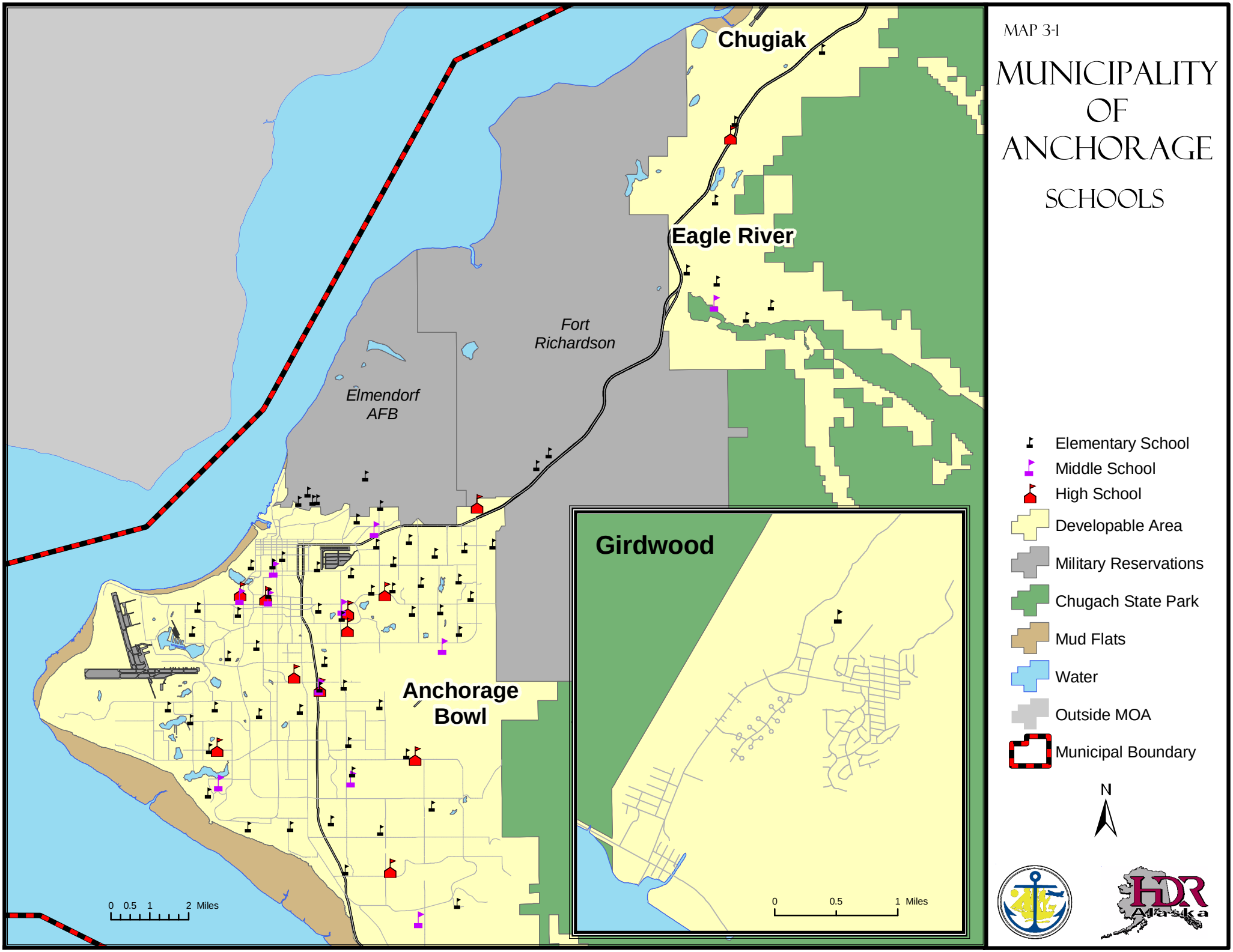
- af - Alluvial fans, conves and emerged deltas
- al - Alluvium in abandoned channels and in stream ter
- an, Alluvium of the Anchorage Plain
- b - Bedrock, chiefly metamorphic
- bc - Bootlegger Cove Clay
- c - Colluvium (slope deposits)
- f - Fill in causeways and other large projects
- ga - Glacial alluvium in irregular-shaped hills
- gm - Glaciel and/or marine deposits in elongate hill
- l - Lake and pond sediments
- ls - Landslide deposits
- m - Morainal deposits
- mg - Marine, glacial and/or lake deposits
- s - Silt
- sh - Sand in broad low hills and cliffhead dunes
- sl - Sand in low-lying belt around Connors Lake

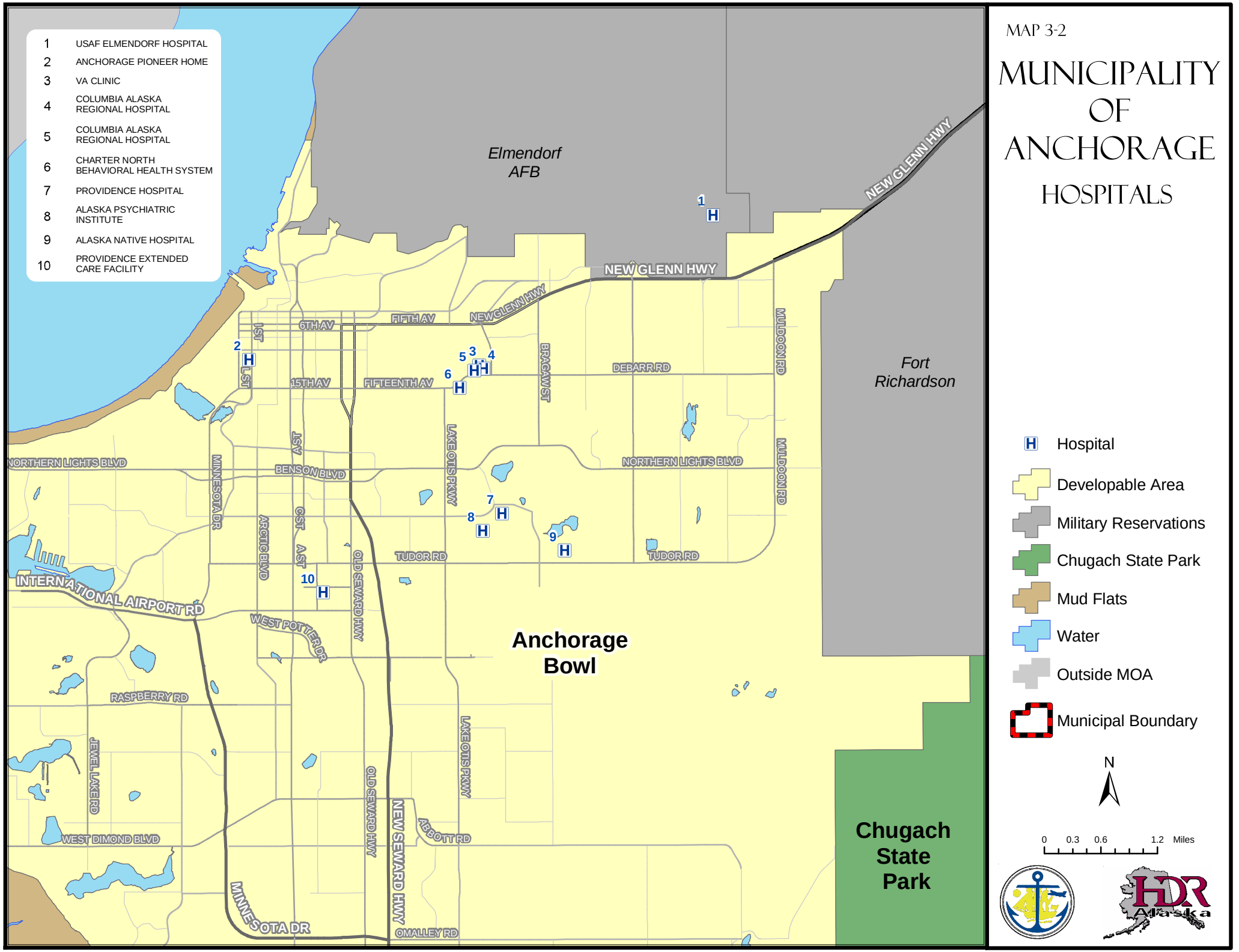
Municipal Boundary

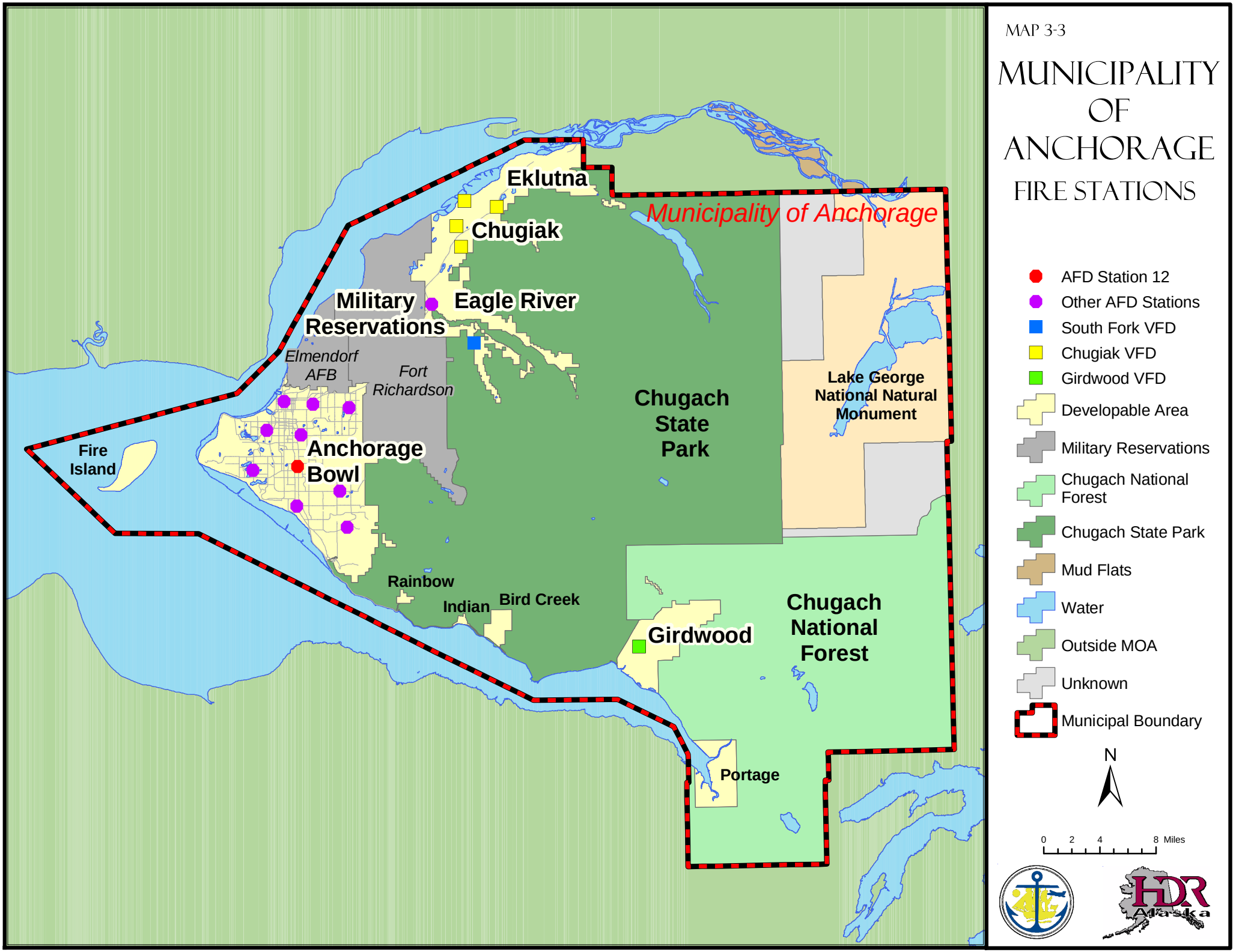
N

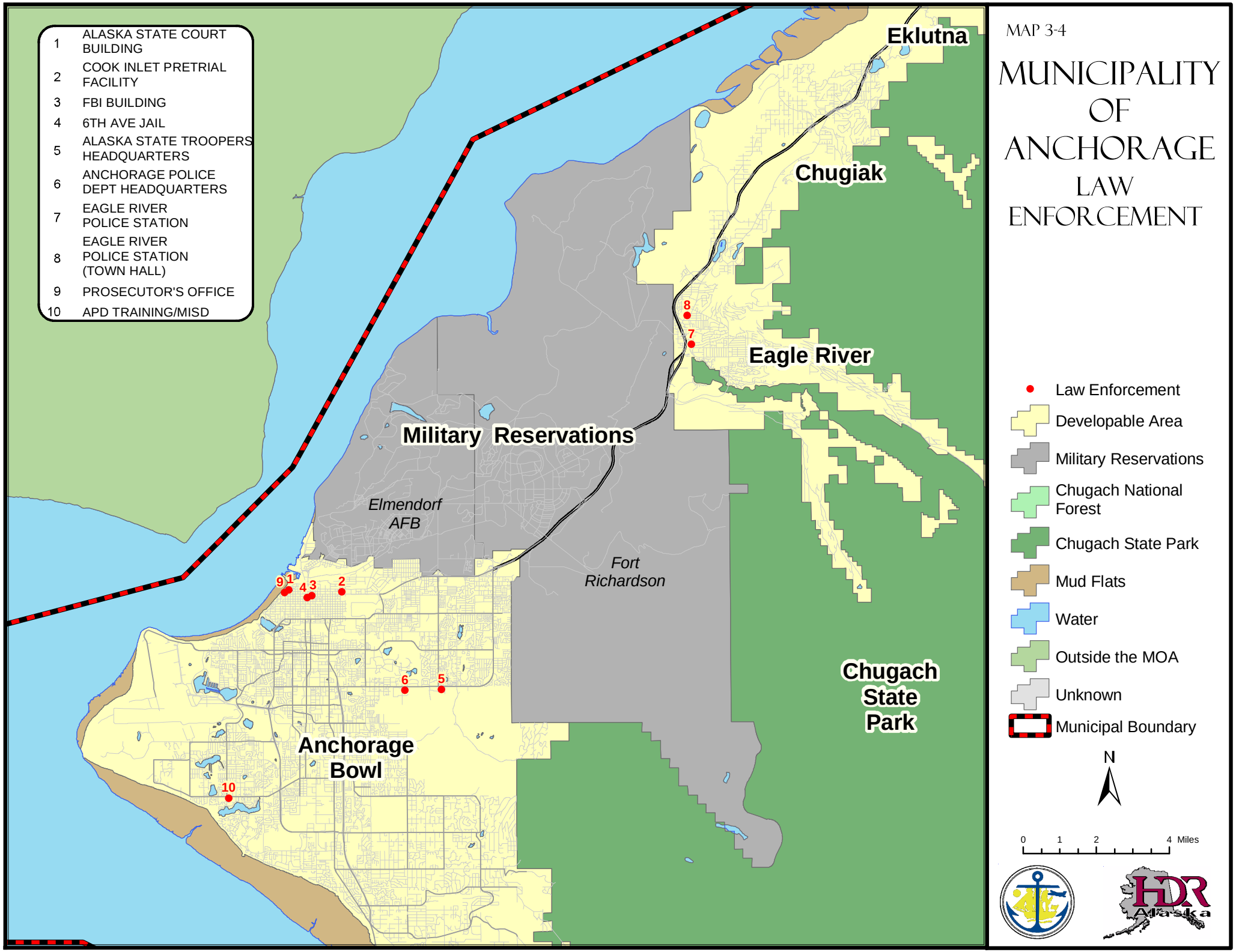
0 0.5 1 2 Miles

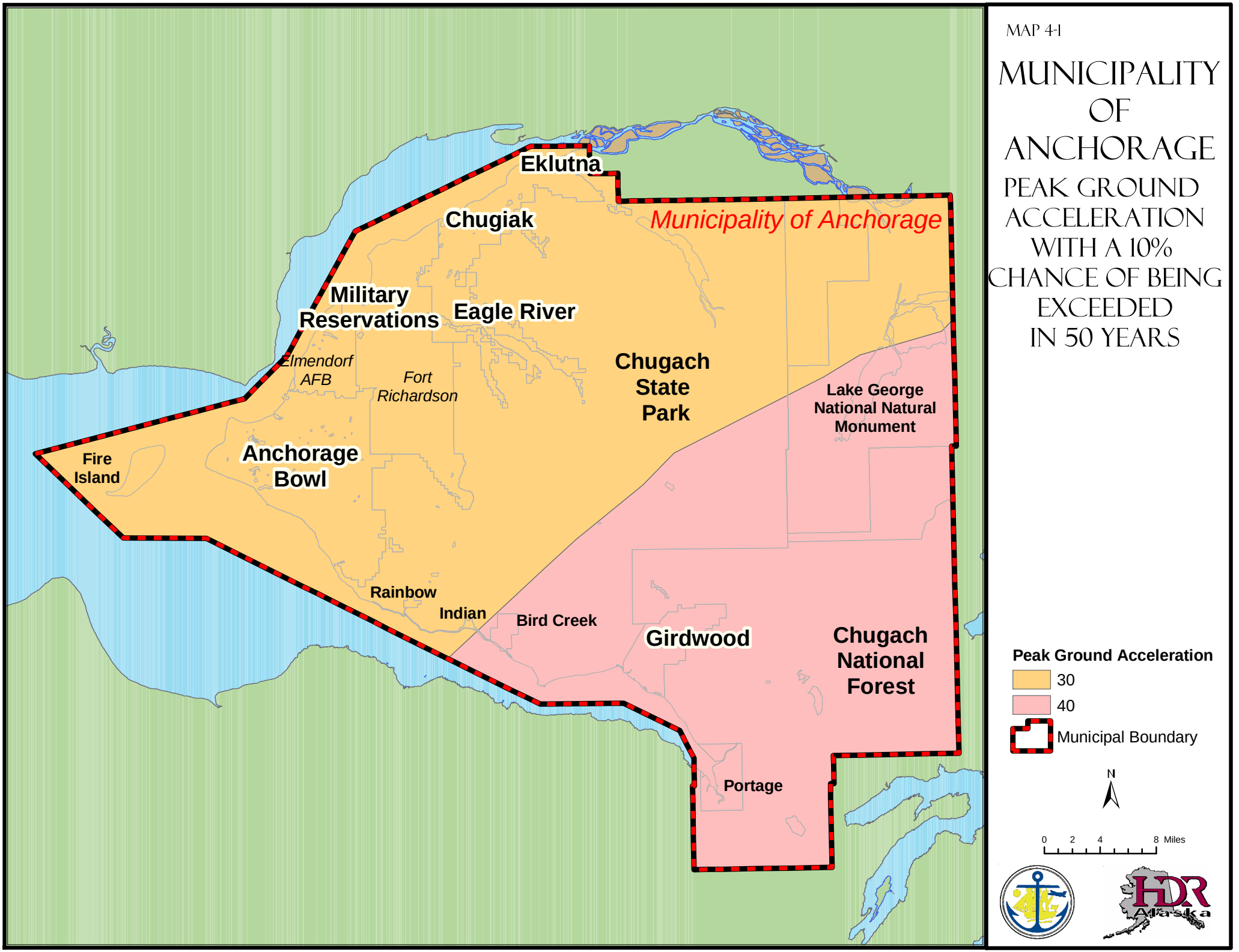
HDR Alaska

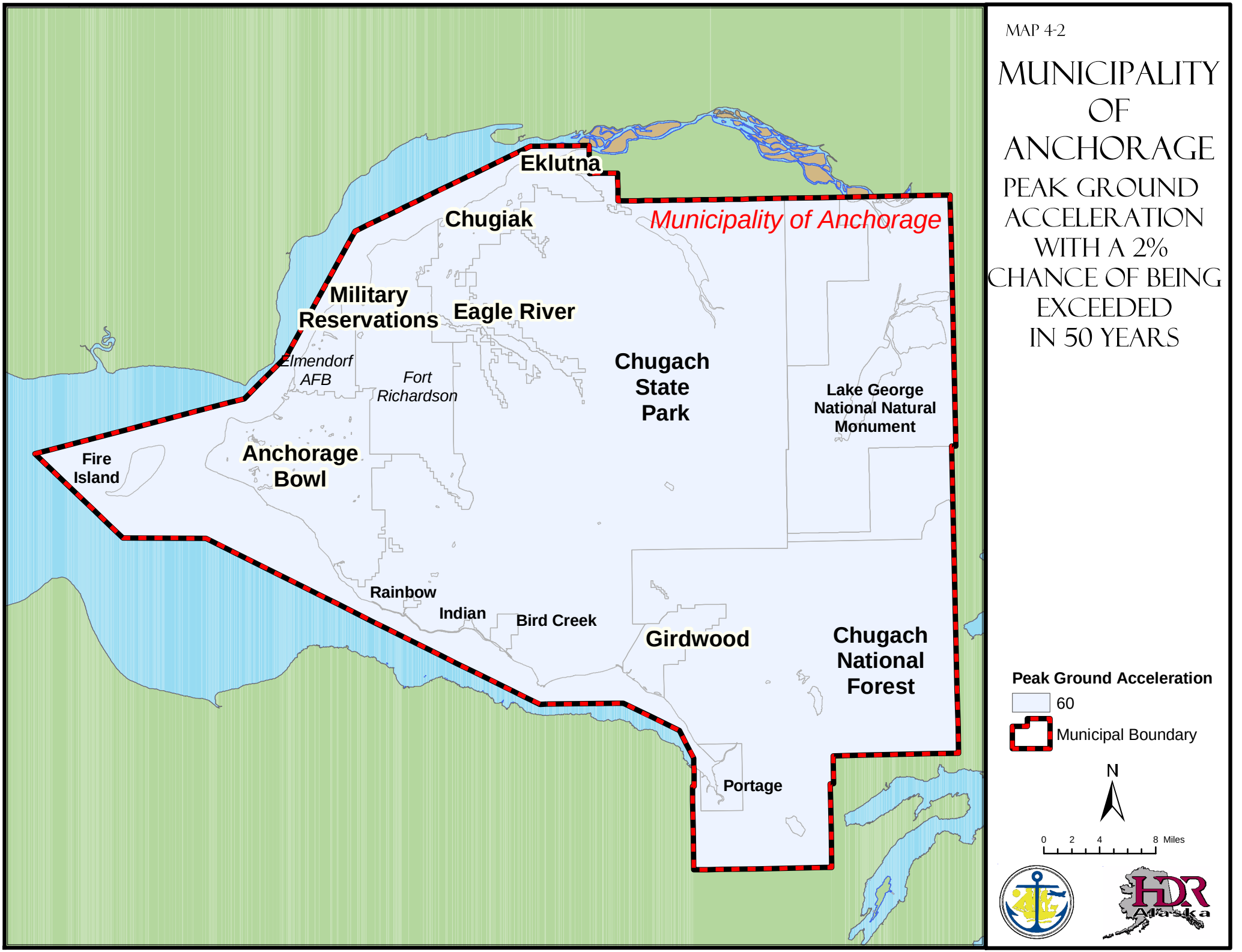

MAP 3-1
MUNICIPALITY OF ANCHORAGE
SCHOOLS
Chugiak
Eagle River
Fort Richardson
Elmendorf AFB
Anchorage Bowl
Girdwood
0 0.5 1 2 Miles
0 0.5 1 Miles
Elementary School
Middle School
High School
Developable Area
Military Reservations
Chugach State Park
Mud Flats
Water
Outside MOA
Municipal Boundary
N
HDR Alaska

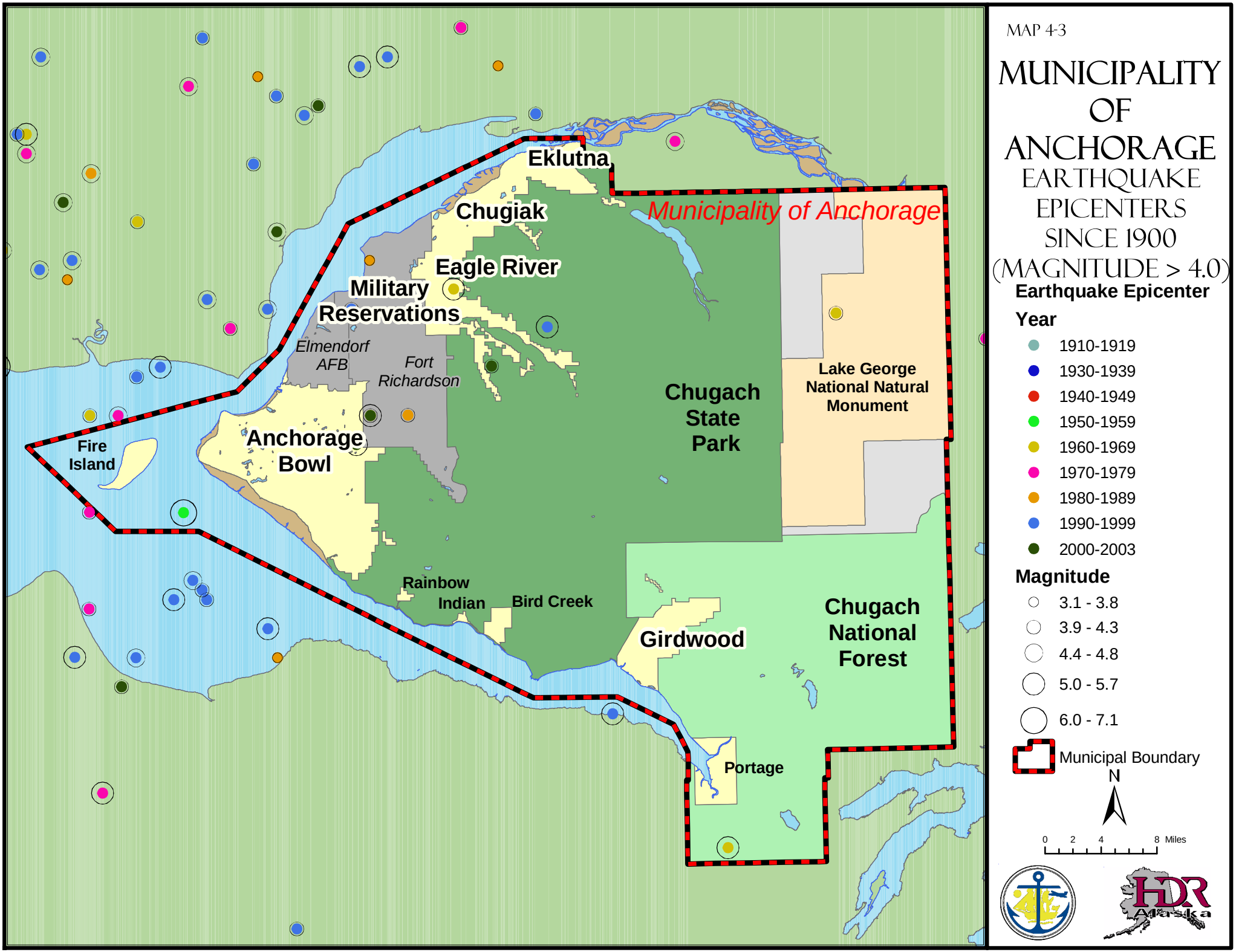

1 USAF ELMENDORF HOSPITAL
2 ANCHORAGE PIONEER HOME
3 VA CLINIC
4 COLUMBIA ALASKA REGIONAL HOSPITAL
5 COLUMBIA ALASKA REGIONAL HOSPITAL
6 CHARTER NORTH BEHAVIORAL HEALTH SYSTEM
7 PROVIDENCE HOSPITAL
8 ALASKA PSYCHIATRIC INSTITUTE
9 ALASKA NATIVE HOSPITAL
10 PROVIDENCE EXTENDED CARE FACILITY
Elmendorf AFB
Fort Richardson
Anchorage Bowl
Chugach State Park
NEW GLENN HWY
FIFTH AV
6TH AV
1ST
L ST
15TH AV
FIFTEENTH AV
BRAGAW ST
DEBARR RD
MULDOON RD
LAKE OTIS PKWY
NORTHERN LIGHTS BLVD
BENSON BLVD
MINNESOTA DR
ARCTIC BLVD
C ST
A ST
OLD SEWARD HWY
TUDOR RD
INTERNATIONAL AIRPORT RD
WEST POTTER DR
RASPBERRY RD
JEWEL LAKE RD
WEST DIMOND BLVD
NEW SEWARD HWY
ABBOTT RD
O'MALLEY RD
MAP 3-2
MUNICIPALITY OF ANCHORAGE
HOSPITALS
Hospital
Developable Area
Military Reservations
Chugach State Park
Mud Flats
Water
Outside MOA
Municipal Boundary
N
0 0.3 0.6 1.2 Miles
HDR Alaska

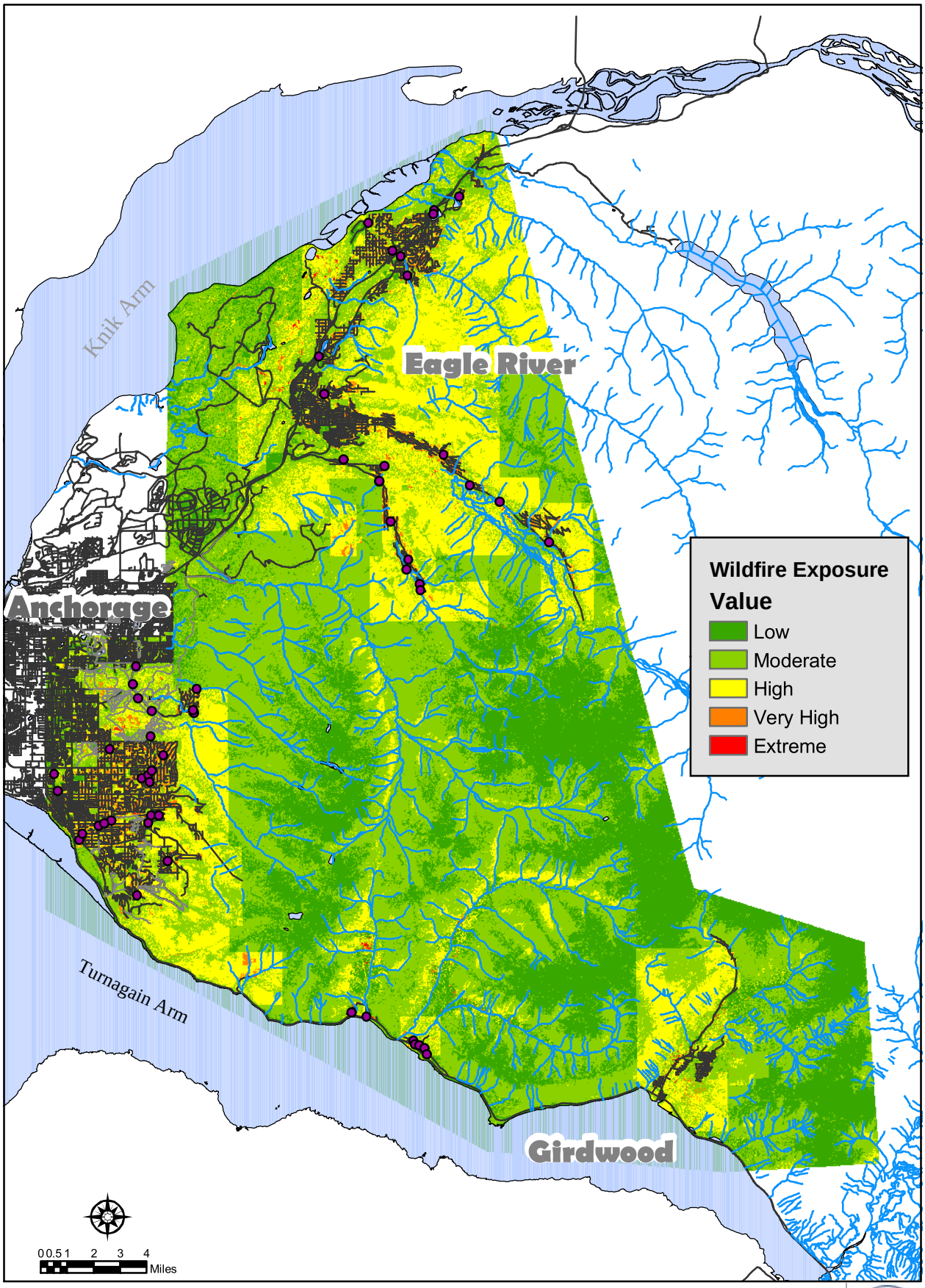

MAP 3-3
MUNICIPALITY OF ANCHORAGE
FIRE STATIONS
Municipality of Anchorage
Eklutna
Chugiak
Military Reservations
Eagle River
Elmendorf AFB
Fort Richardson
Anchorage Bowl
Fire Island
Chugach State Park
Lake George National Natural Monument
Rainbow
Indian
Bird Creek
Girdwood
Chugach National Forest
Portage
AFD Station 12
Other AFD Stations
South Fork VFD
Chugiak VFD
Girdwood VFD
Developable Area
Military Reservations
Chugach National Forest
Chugach State Park
Mud Flats
Water
Outside MOA
Unknown
Municipal Boundary
N
0 2 4 8 Miles
HDR Alaska


1 ALASKA STATE COURT BUILDING
2 COOK INLET PRETRIAL FACILITY
3 FBI BUILDING
4 6TH AVE JAIL
5 ALASKA STATE TROOPERS HEADQUARTERS
6 ANCHORAGE POLICE DEPT HEADQUARTERS
7 EAGLE RIVER POLICE STATION
8 EAGLE RIVER POLICE STATION (TOWN HALL)
9 PROSECUTOR'S OFFICE
10 APD TRAINING/MISD
Eklutna
Chugiak
Eagle River
Military Reservations
Elmendorf AFB
Fort Richardson
Chugach State Park
Anchorage Bowl
MAP 3-4
MUNICIPALITY OF ANCHORAGE
LAW ENFORCEMENT
Law Enforcement
Developable Area
Military Reservations
Chugach National Forest
Chugach State Park
Mud Flats
Water
Outside the MOA
Unknown
Municipal Boundary
N
0 1 2 4 Miles
HDR Alaska


MAP 4-1
MUNICIPALITY OF ANCHORAGE
PEAK GROUND ACCELERATION WITH A 10% CHANCE OF BEING EXCEEDED IN 50 YEARS
Eklutna
Chugiak
Municipality of Anchorage
Military Reservations
Eagle River
Elmendorf AFB
Fort Richardson
Chugach State Park
Lake George National Natural Monument
Fire Island
Anchorage Bowl
Rainbow
Indian
Bird Creek
Girdwood
Chugach National Forest
Portage
Peak Ground Acceleration
30
40
Municipal Boundary
N
0 2 4 8 Miles
HDR Alaska


MAP 4-2
MUNICIPALITY OF ANCHORAGE
PEAK GROUND ACCELERATION WITH A 2% CHANCE OF BEING EXCEEDED IN 50 YEARS
Eklutna
Chugiak
Municipality of Anchorage
Military Reservations
Eagle River
Elmendorf AFB
Fort Richardson
Chugach State Park
Lake George National Natural Monument
Fire Island
Anchorage Bowl
Rainbow
Indian
Bird Creek
Girdwood
Chugach National Forest
Portage
Peak Ground Acceleration
60
Municipal Boundary
N
0 2 4 8 Miles
HDR Alaska


MAP 4-3
MUNICIPALITY OF ANCHORAGE
EARTHQUAKE EPICENTERS SINCE 1900 (MAGNITUDE > 4.0)
Eklutna
Chugiak
Municipality of Anchorage
Eagle River
Military Reservations
Elmendorf AFB
Fort Richardson
Lake George National Natural Monument
Chugach State Park
Fire Island
Anchorage Bowl
Rainbow Indian
Bird Creek
Girdwood
Chugach National Forest
Portage
Earthquake Epicenter
Year
1910-1919
1930-1939
1940-1949
1950-1959
1960-1969
1970-1979
1980-1989
1990-1999
2000-2003
Magnitude
3.1 - 3.8
3.9 - 4.3
4.4 - 4.8
5.0 - 5.7
6.0 - 7.1
Municipal Boundary
N
0 2 4 8 Miles
HDR Alaska

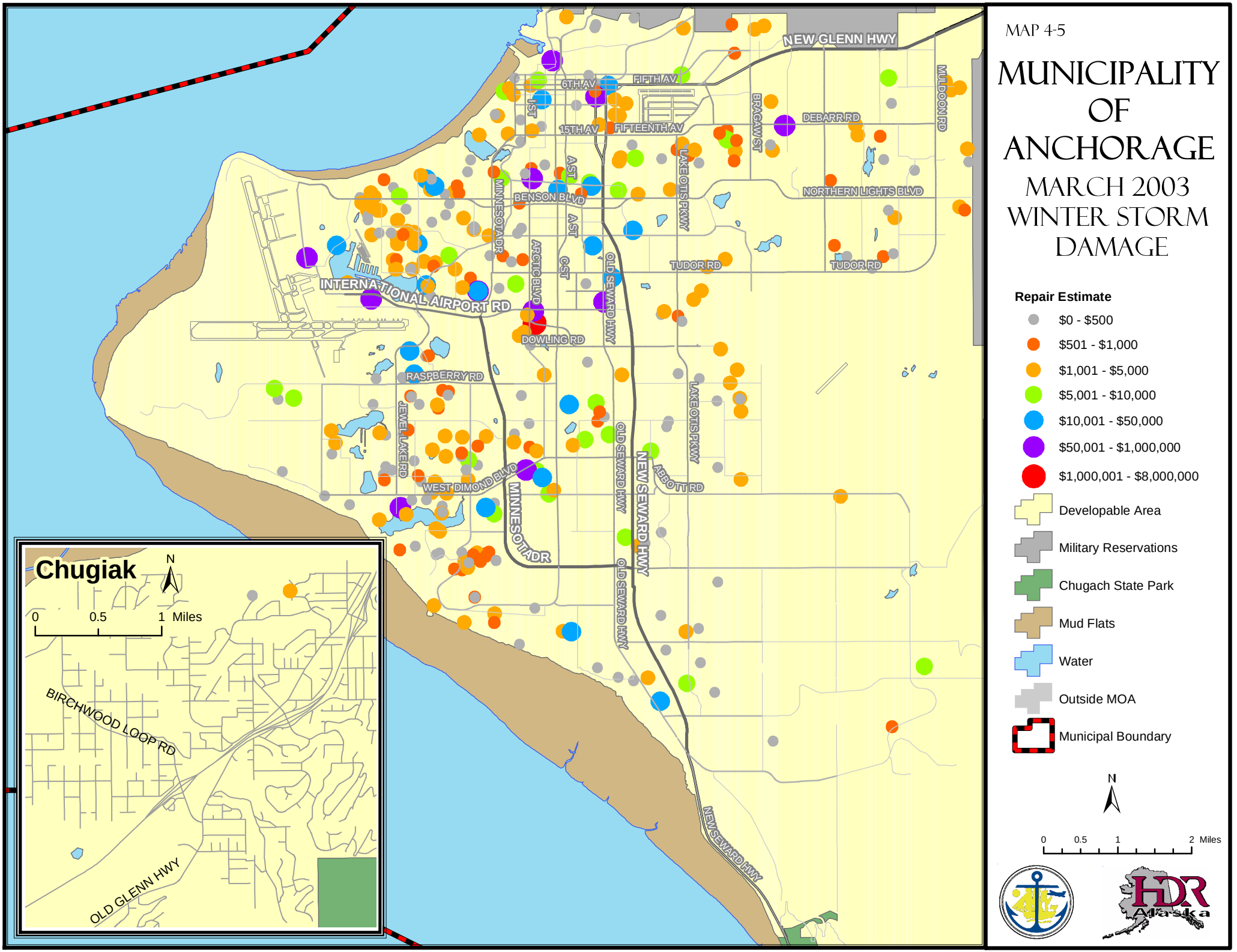


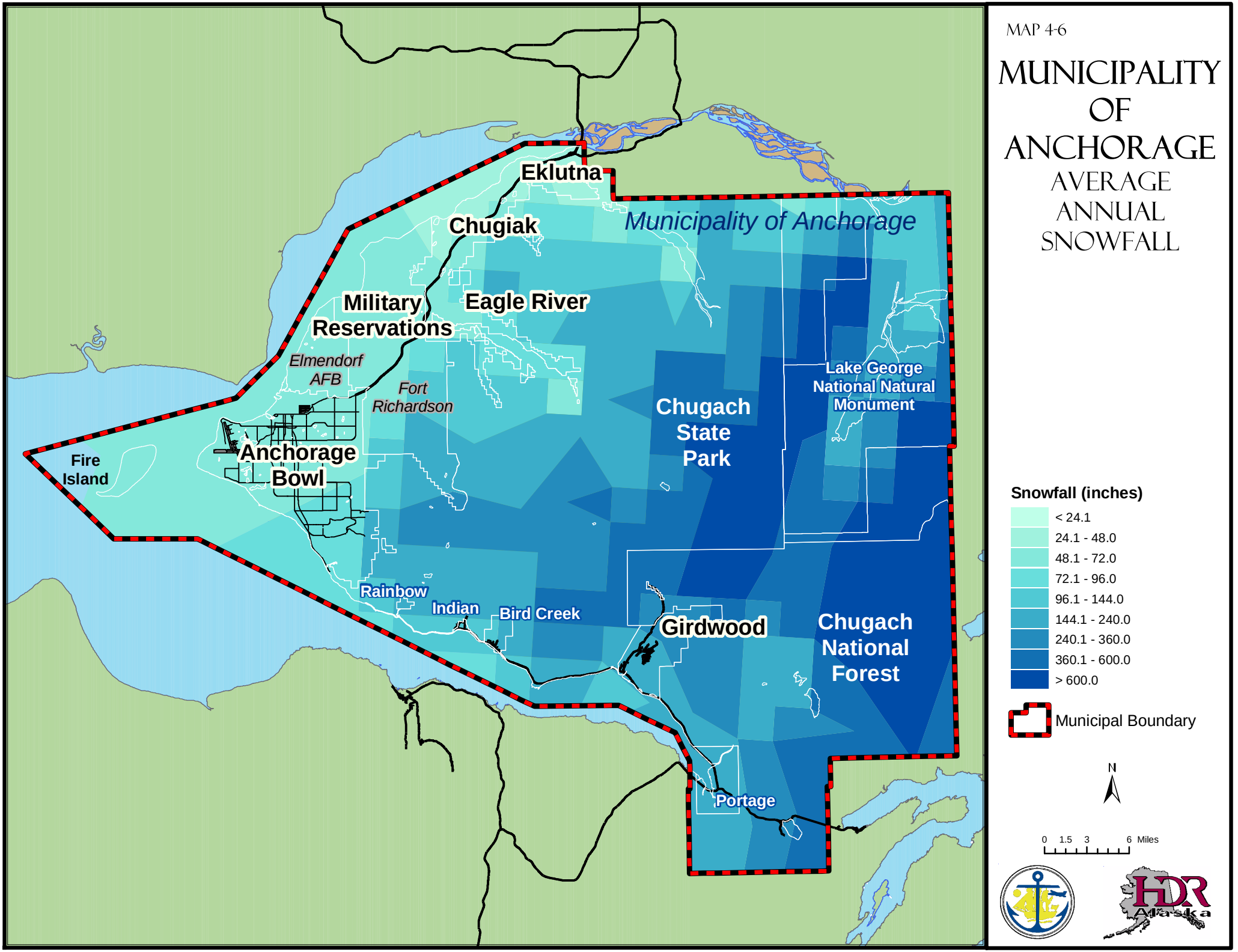

# Wildfire Exposure

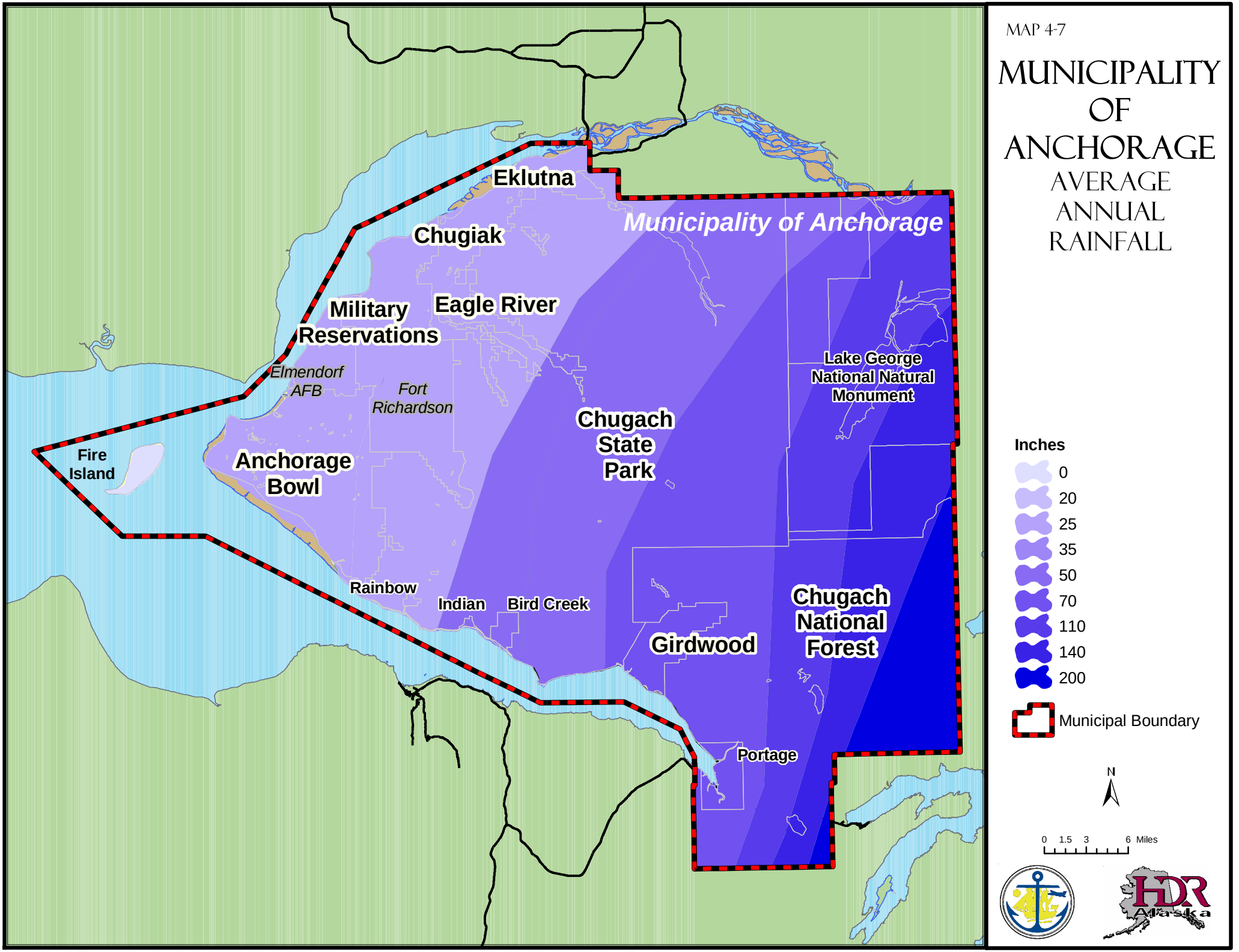
**Anchorage Fire Exposure Model**
**Anchorage Fire Mapping: Phase II**

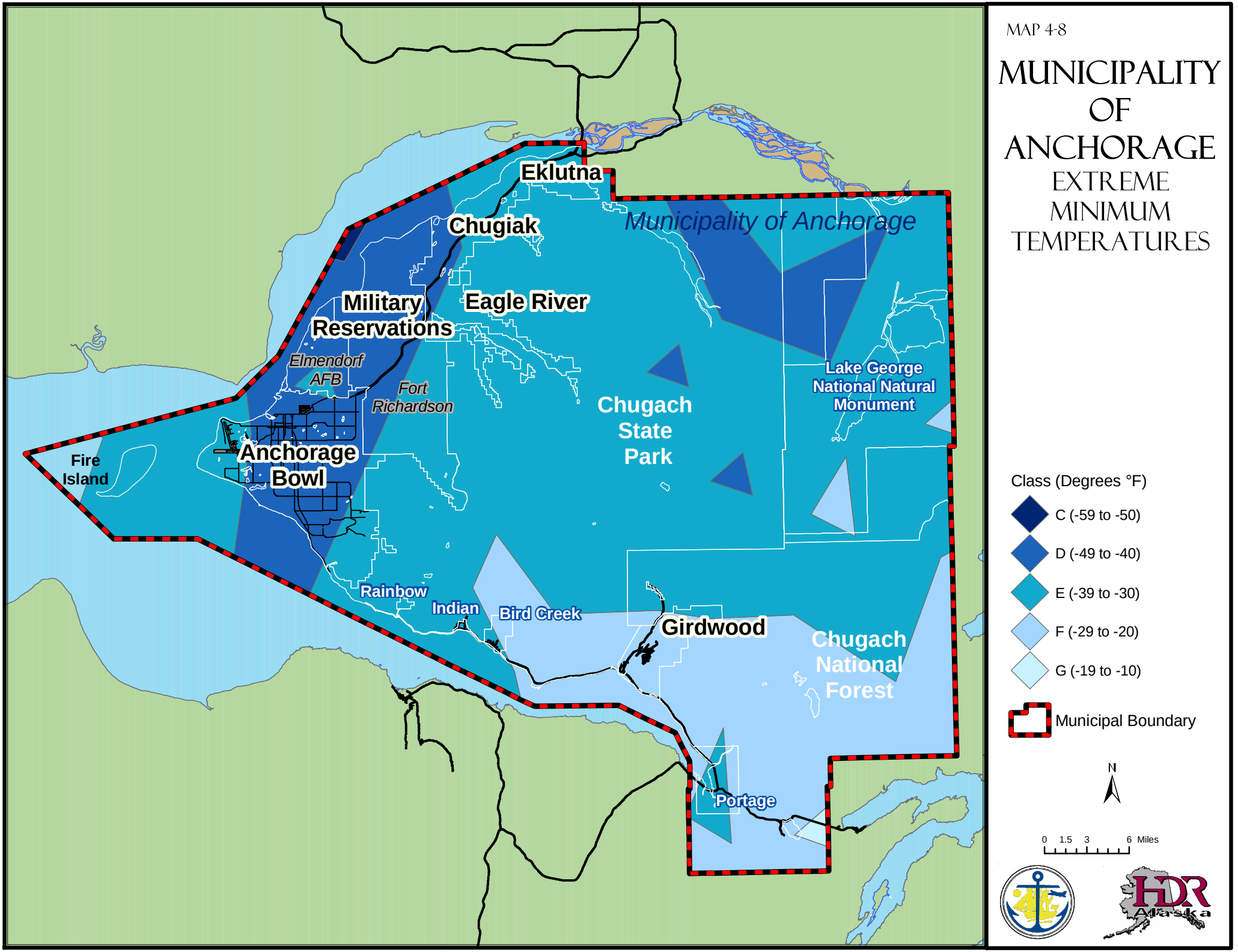
Geographic Resource Solutions

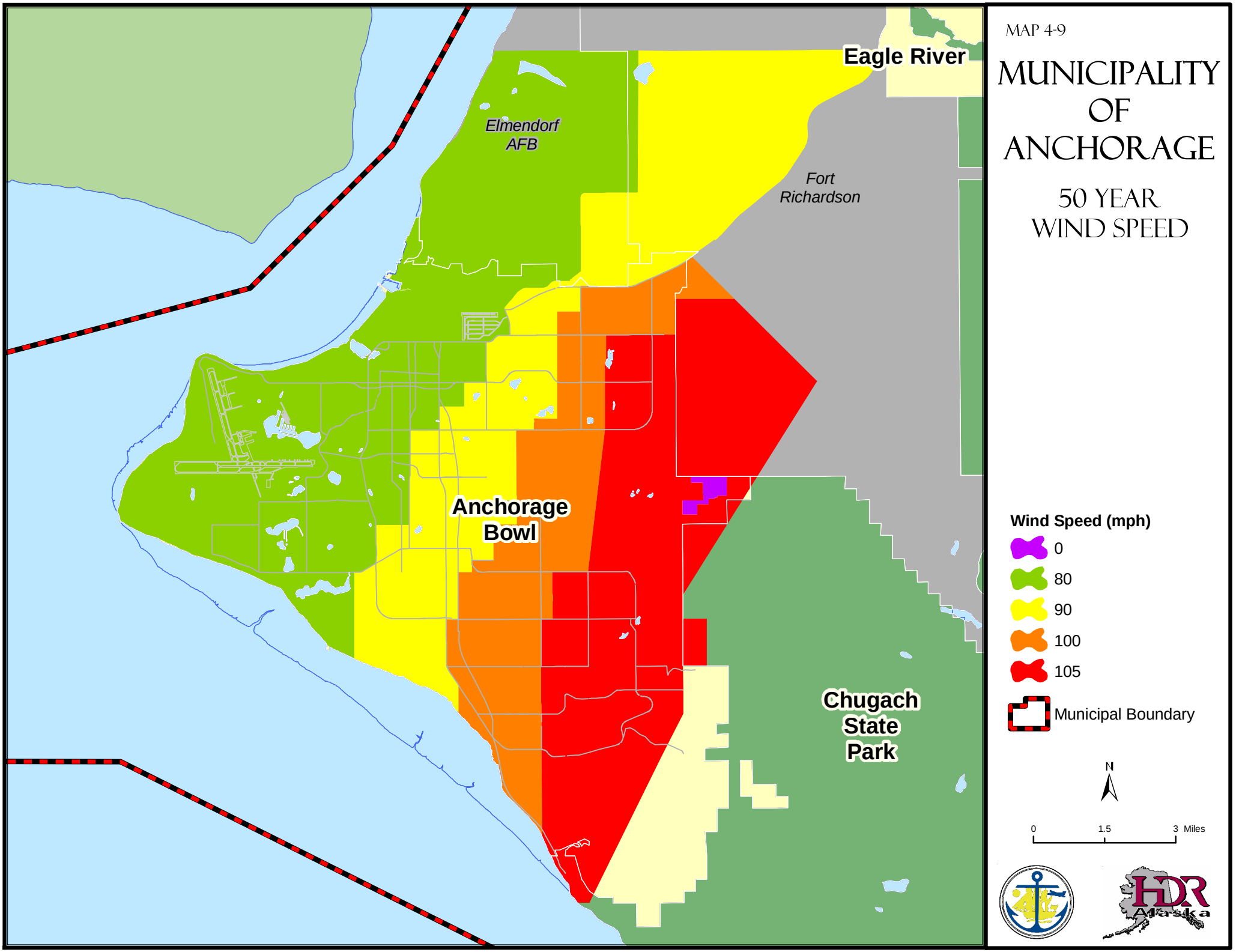
Municipality of Anchorage


MAP 4-5
MUNICIPALITY OF ANCHORAGE
MARCH 2003 WINTER STORM DAMAGE
Repair Estimate
$0 - $500
$501 - $1,000
$1,001 - $5,000
$5,001 - $10,000
$10,001 - $50,000
$50,001 - $1,000,000
$1,000,001 - $8,000,000
Developable Area
Military Reservations
Chugach State Park
Mud Flats
Water
Outside MOA
Municipal Boundary
N
0 0.5 1 2 Miles
NEW GLENN HWY
6TH AV
FIFTH AV
15TH AV
FIFTEENTH AV
1ST
BRAGAW ST
MULDOON RD
DEBARR RD
LAKE OTIS PKWY
AST
BENSON BLVD
NORTHERN LIGHTS BLVD
MINNESOTA DR
ARCTIC BLVD
OST
OLD SEWARD HWY
TUDOR RD
INTERNATIONAL AIRPORT RD
DOWLING RD
RASPBERRY RD
JEWEL LAKE RD
WEST DIMOND BLVD
NEW SEWARD HWY
ABBOTT RD
Chugiak
N
0 0.5 1 Miles
BIRCHWOOD LOOP RD
OLD GLENN HWY
HDR Alaska


MAP 4-6
MUNICIPALITY OF ANCHORAGE
AVERAGE ANNUAL SNOWFALL
Eklutna
Chugiak
Municipality of Anchorage
Military Reservations
Eagle River
Elmendorf AFB
Fort Richardson
Lake George National Natural Monument
Chugach State Park
Fire Island
Anchorage Bowl
Rainbow
Indian
Bird Creek
Girdwood
Chugach National Forest
Portage
Snowfall (inches)
< 24.1
24.1 - 48.0
48.1 - 72.0
72.1 - 96.0
96.1 - 144.0
144.1 - 240.0
240.1 - 360.0
360.1 - 600.0
> 600.0
Municipal Boundary
N
0 1.5 3 6 Miles
HDR Alaska


MAP 4-7
MUNICIPALITY OF ANCHORAGE
AVERAGE ANNUAL RAINFALL
Eklutna
Chugiak
Municipality of Anchorage
Military Reservations
Eagle River
Elmendorf AFB
Fort Richardson
Lake George National Natural Monument
Chugach State Park
Fire Island
Anchorage Bowl
Rainbow
Indian
Bird Creek
Girdwood
Chugach National Forest
Portage
Inches
0
20
25
35
50
70
110
140
200
Municipal Boundary
N
0 1.5 3 6 Miles
HDR Alaska


MAP 4-8
MUNICIPALITY OF ANCHORAGE
EXTREME MINIMUM TEMPERATURES
Eklutna
Chugiak
Municipality of Anchorage
Military Reservations
Eagle River
Elmendorf AFB
Fort Richardson
Anchorage Bowl
Fire Island
Chugach State Park
Lake George National Natural Monument
Rainbow
Indian
Bird Creek
Girdwood
Chugach National Forest
Portage
Class (Degrees °F)
C (-59 to -50)
D (-49 to -40)
E (-39 to -30)
F (-29 to -20)
G (-19 to -10)
Municipal Boundary
N
0 1.5 3 6 Miles
HDR Alaska




MAP 4-9

# MUNICIPALITY OF ANCHORAGE

## 50 YEAR WIND SPEED

**Wind Speed (mph)**

- 0
- 80
- 90
- 100
- 105
- Municipal Boundary

N

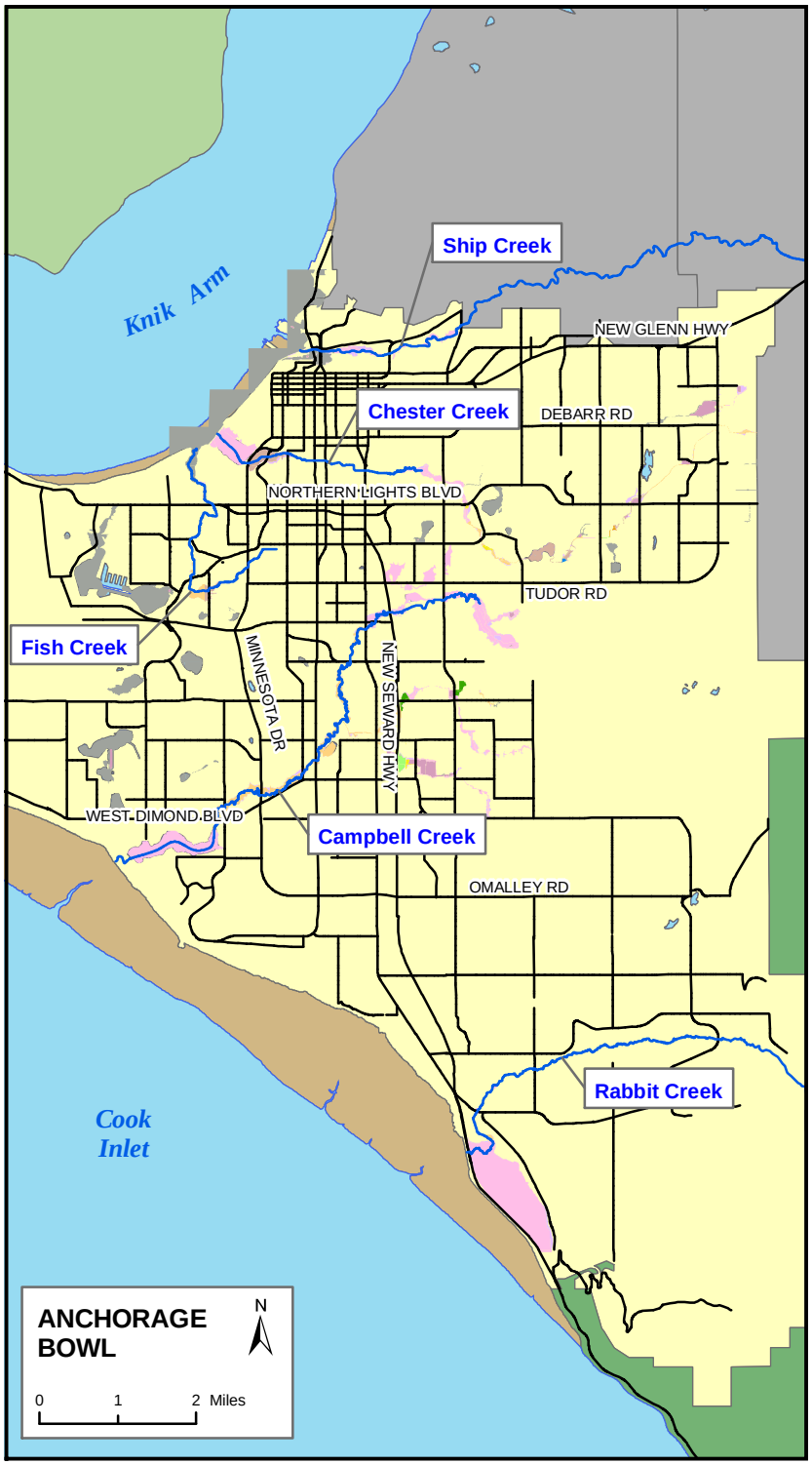
0 1.5 3 Miles

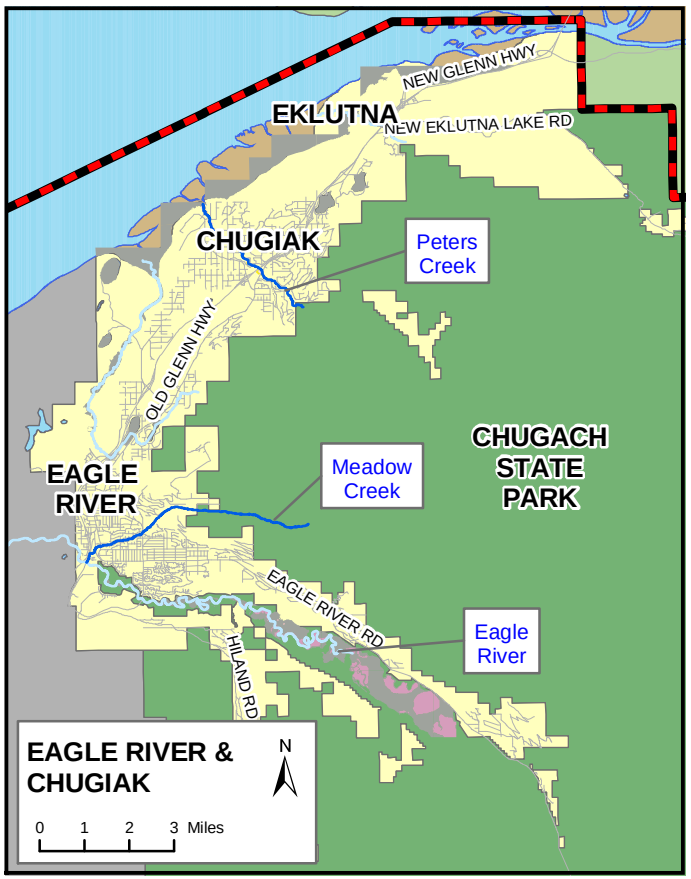
HDR Alaska

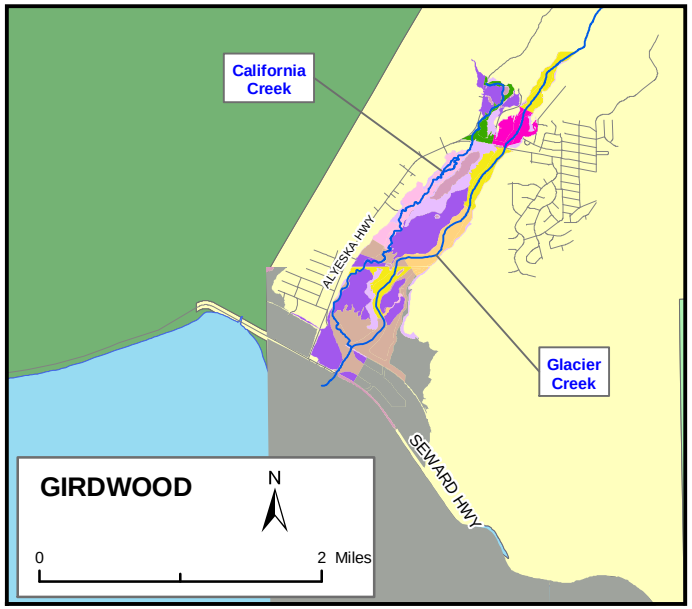
MAP 4-10

# MUNICIPALITY OF ANCHORAGE

## FLOOD INSURANCE ZONES




**Zone**

- A
- A1
- A2
- A3
- A4
- A5
- A6
- A7
- A8
- A11
- AH
- AO
- B
- C

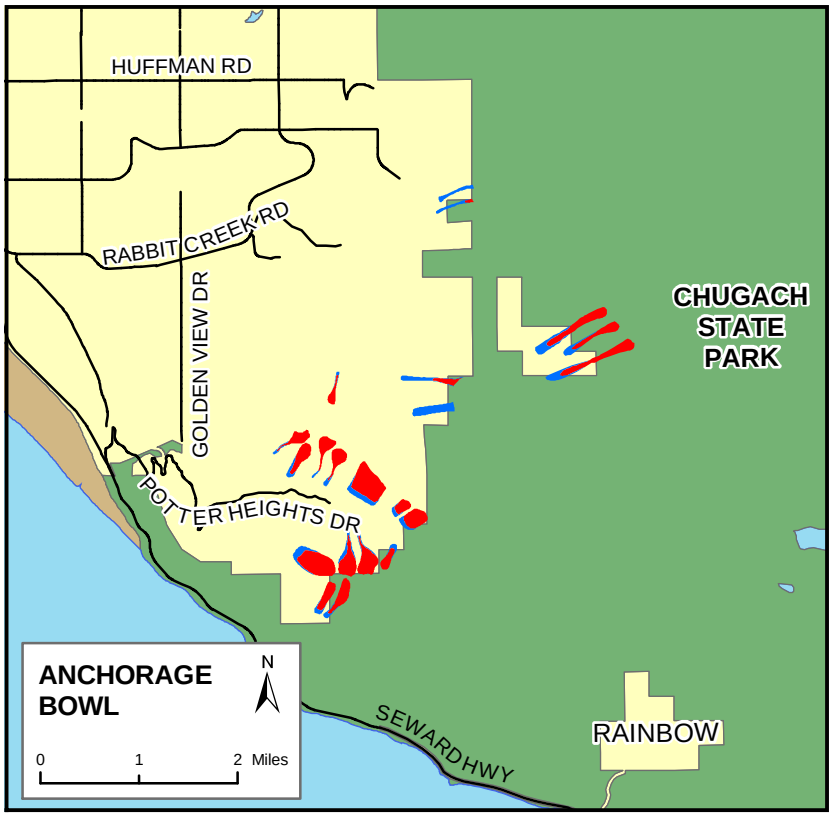
Municipal Boundary

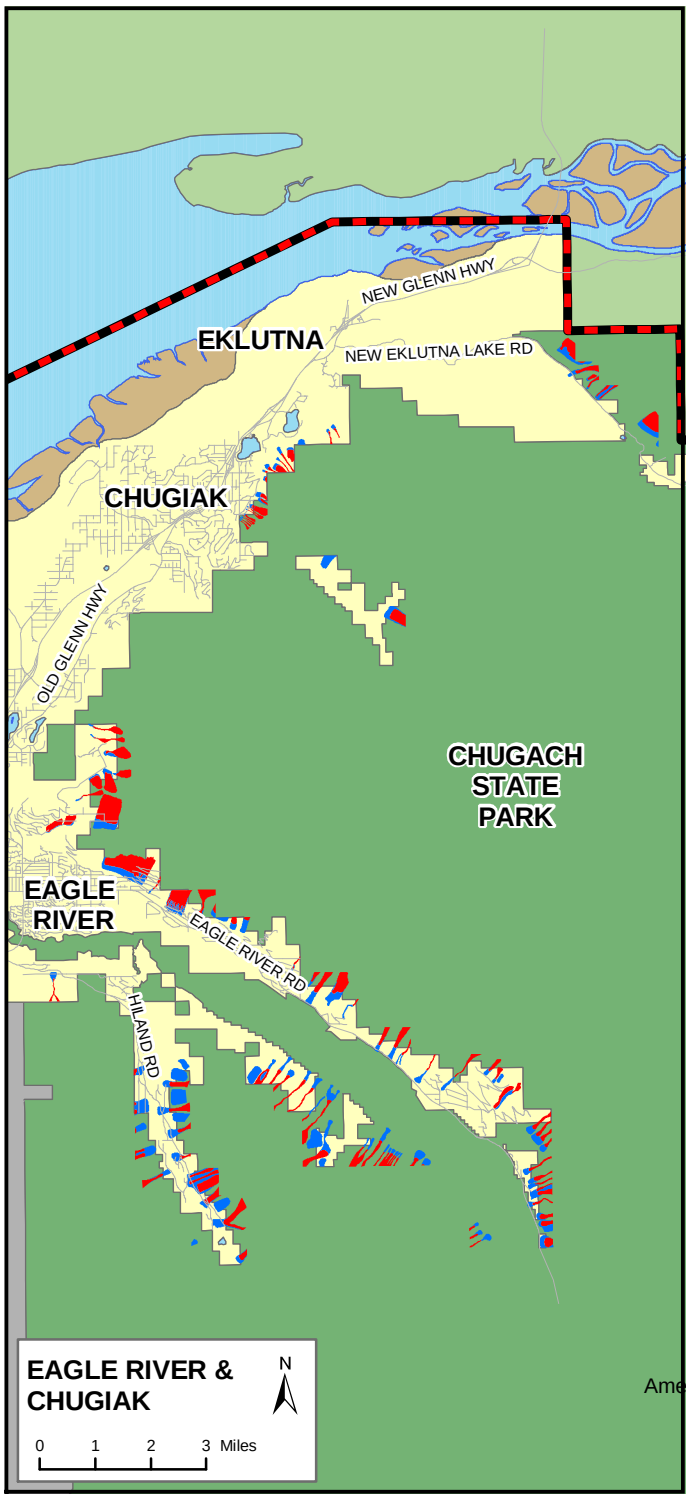
HDR Alaska

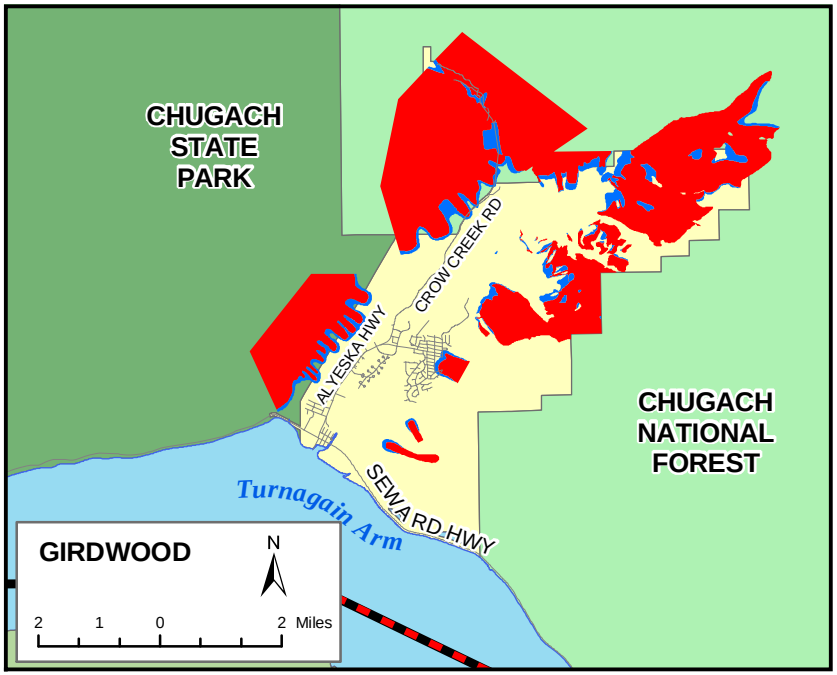
MAP 4-11

# MUNICIPALITY OF ANCHORAGE

## KNOWN AVALANCHE RISK AREAS



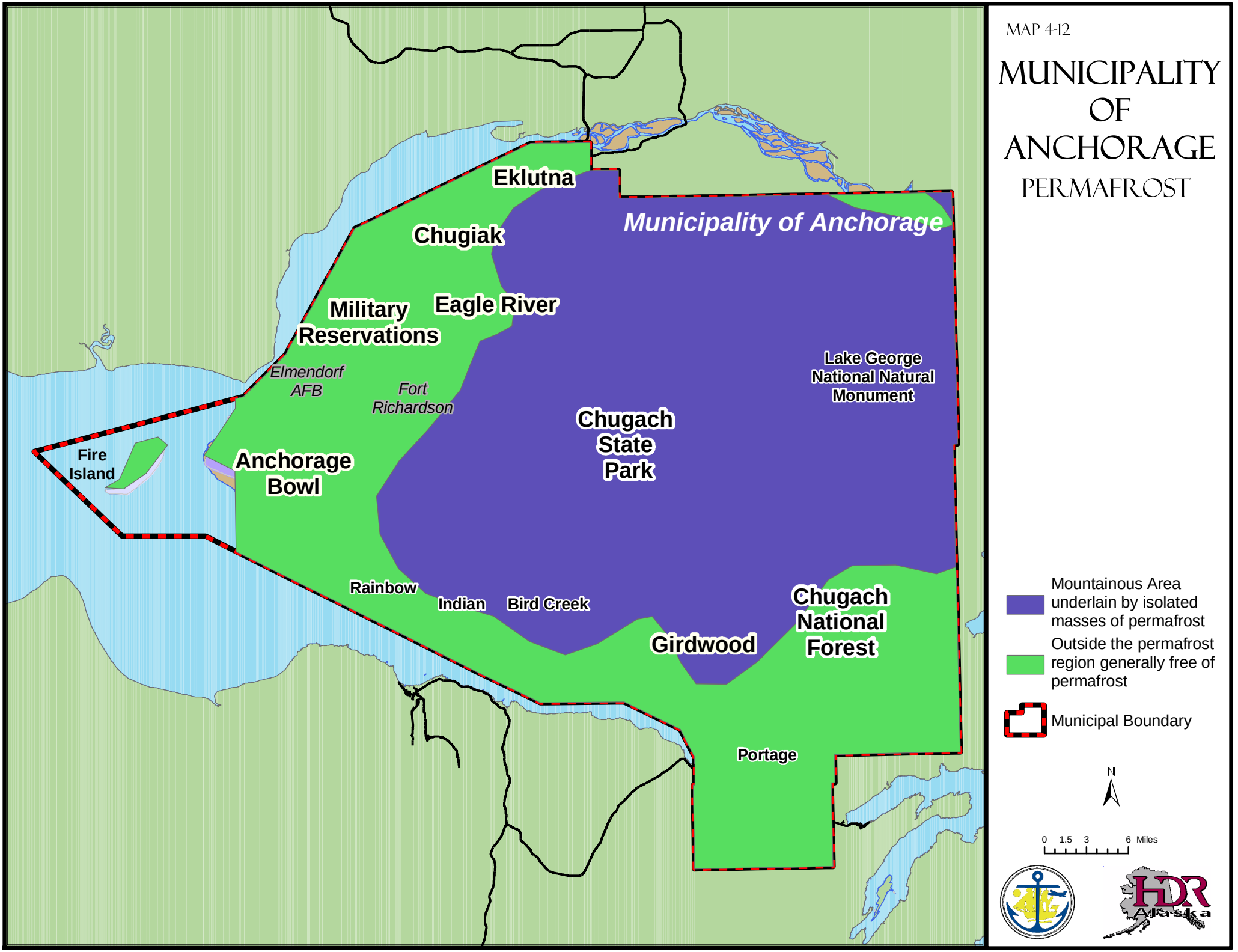



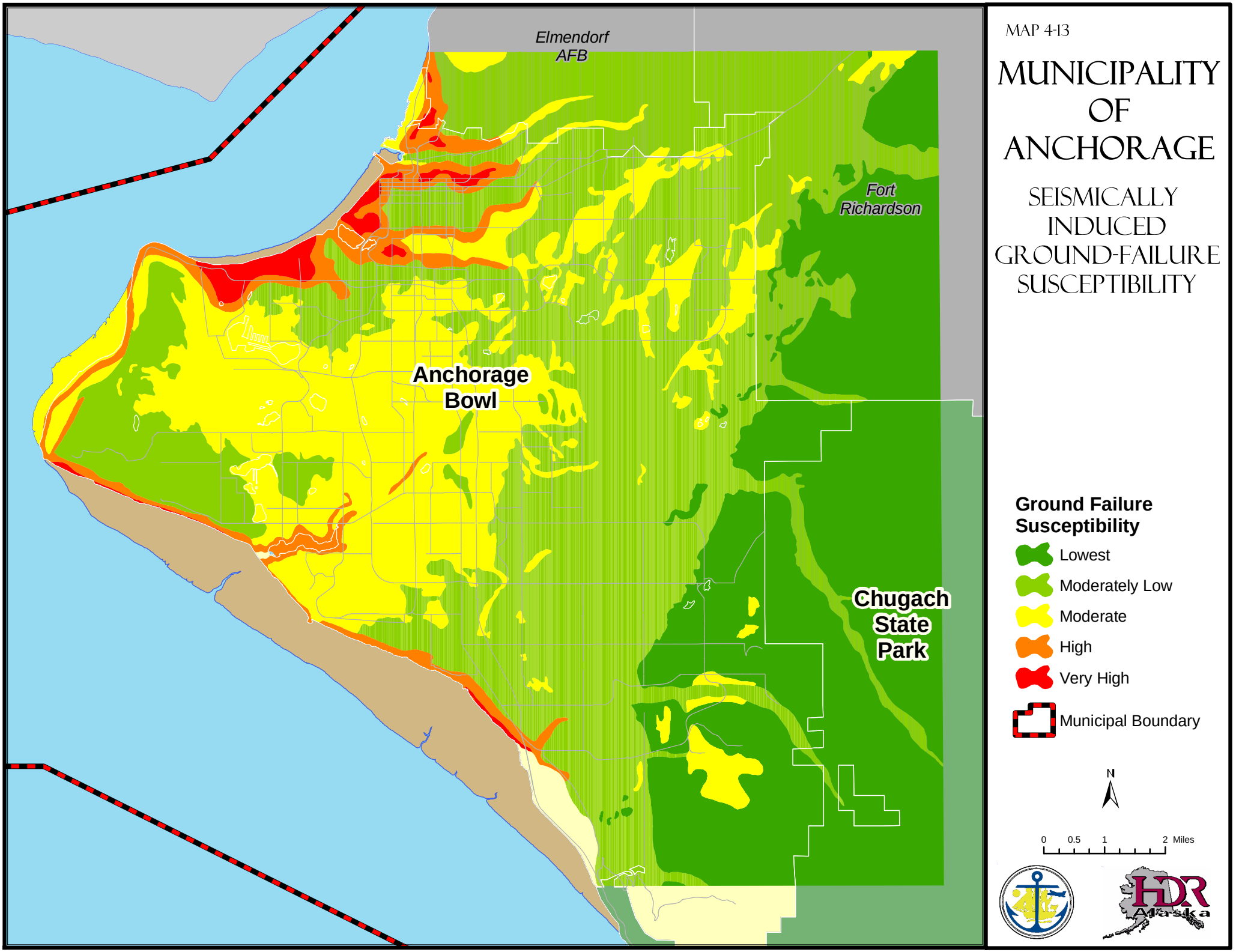

**Avalanche Areas**

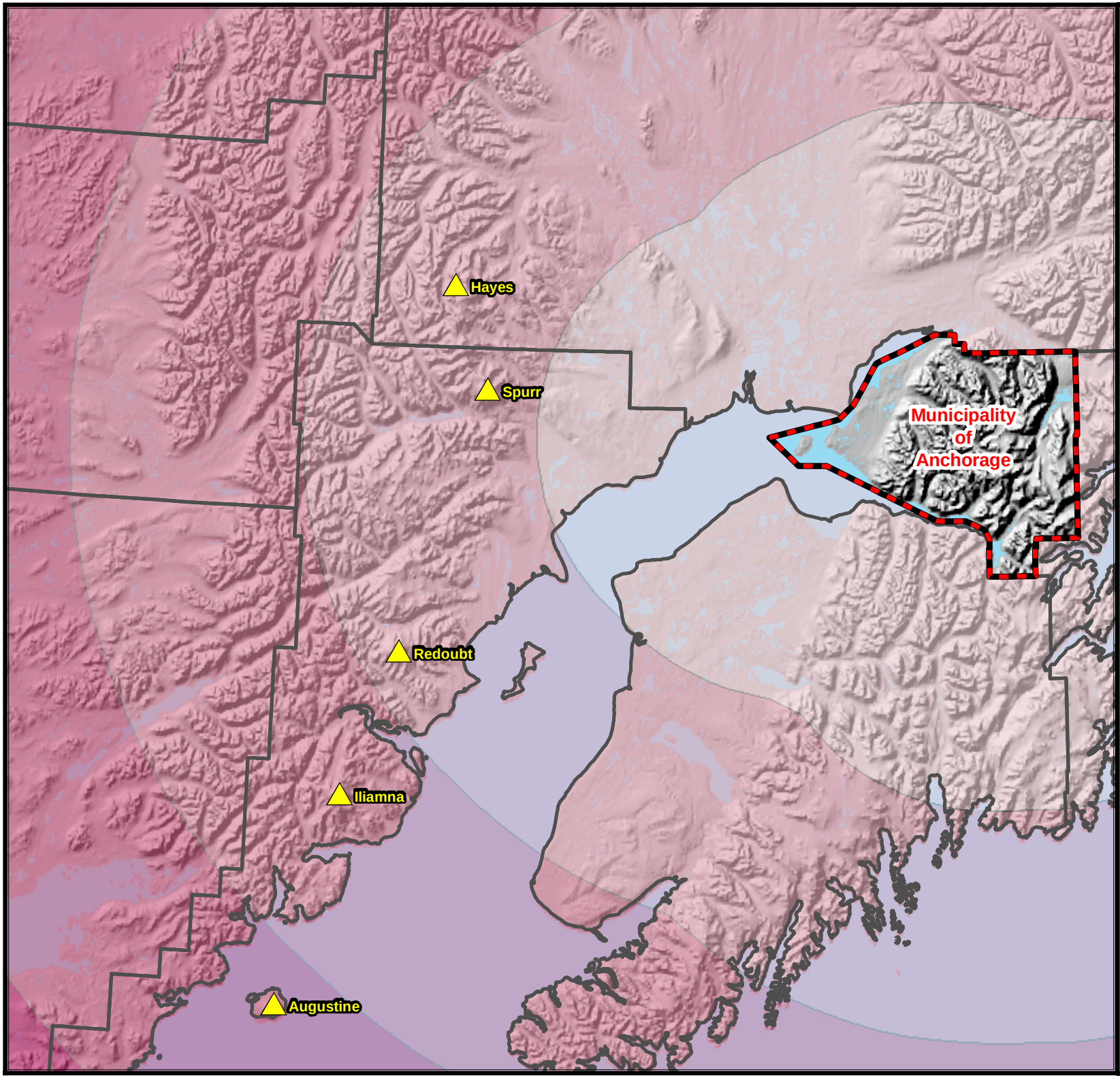
- Red (High)
- Blue (Moderate)

Municipal Boundary

HDR Alaska


MAP 4-12
MUNICIPALITY OF ANCHORAGE
PERMAFROST
Eklutna
Chugiak
Municipality of Anchorage
Military Reservations
Eagle River
Elmendorf AFB
Fort Richardson
Lake George National Natural Monument
Chugach State Park
Fire Island
Anchorage Bowl
Rainbow
Indian
Bird Creek
Girdwood
Chugach National Forest
Portage
Mountainous Area underlain by isolated masses of permafrost
Outside the permafrost region generally free of permafrost
Municipal Boundary
N
0 1.5 3 6 Miles
HDR Alaska


Elmendorf AFB
Fort Richardson
Anchorage Bowl
Chugach State Park
MAP 4-13
MUNICIPALITY OF ANCHORAGE
SEISMICALLY INDUCED GROUND-FAILURE SUSCEPTIBILITY
Ground Failure Susceptibility
Lowest
Moderately Low
Moderate
High
Very High
Municipal Boundary
N
0 0.5 1 2 Miles
HDR Alaska




MAP 4-14

# MUNICIPALITY OF ANCHORAGE

## VOLCANOES

Volcano

Boroughs

**Distance from MOA (miles)**

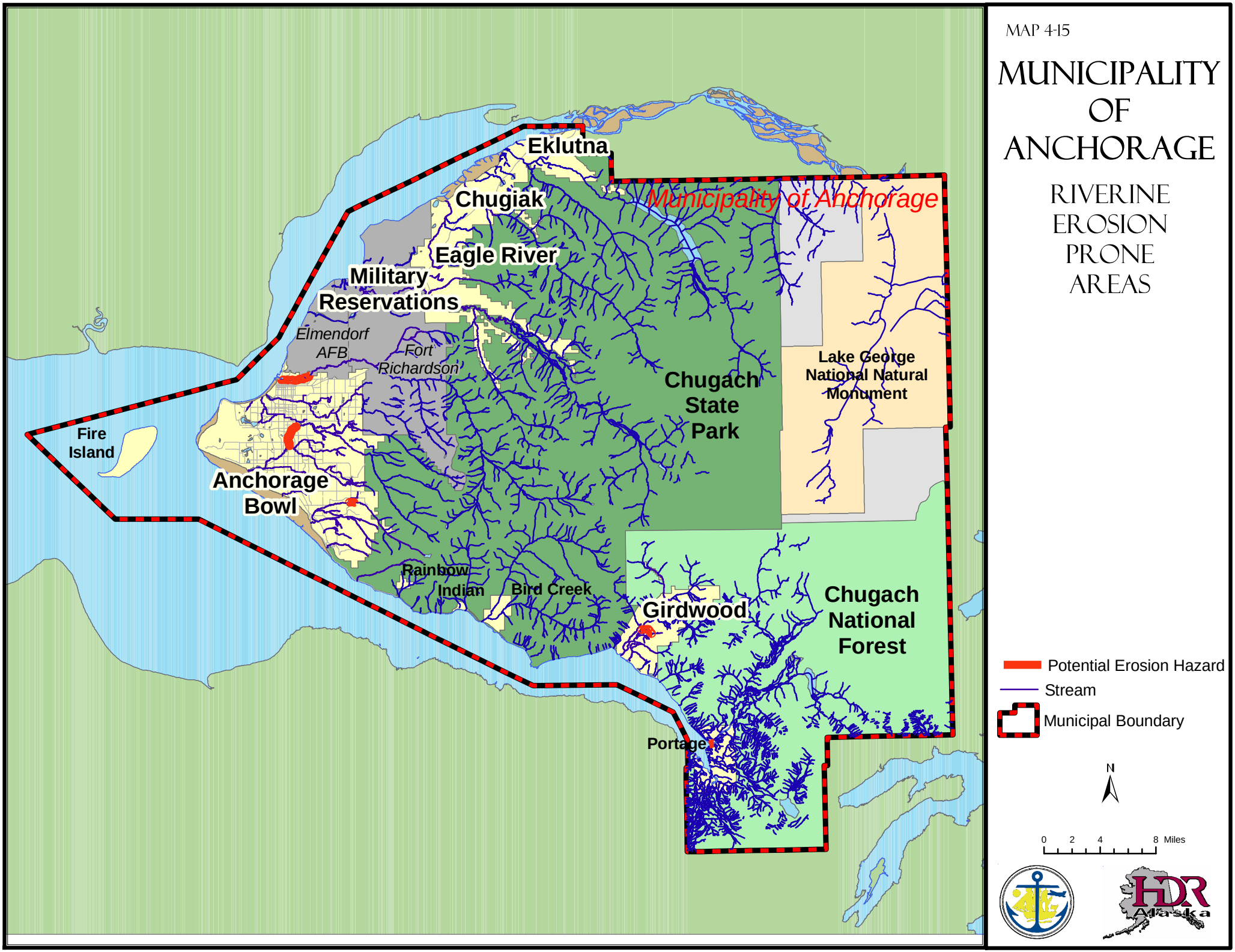
50
100
150
200
250

Municipal Boundary

N

0 5 10 20 Miles

HDR Alaska


MAP 4-15
MUNICIPALITY OF ANCHORAGE
RIVERINE EROSION PRONE AREAS
Eklutna
Chugiak
Municipality of Anchorage
Eagle River
Military Reservations
Elmendorf AFB
Fort Richardson
Fire Island
Anchorage Bowl
Chugach State Park
Lake George National Natural Monument
Rainbow
Indian
Bird Creek
Girdwood
Chugach National Forest
Portage
Potential Erosion Hazard
Stream
Municipal Boundary
N
0 2 4 8 Miles
HDR Alaska