

City and Borough of Wrangell,
Alaska
Joint Hazard Mitigation Plan

DRAFT

December 2025

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1 – Introduction

The City and Borough of Wrangell (CBW), herein referred to as Wrangell, with collaboration from the Wrangell Cooperative Association (WCA), who is the recognized tribal governmental entity, are both located within and have authority within the same geographic area. For purposes of this plan, the area includes the borough boundaries of the City and Borough of Wrangell. Additionally, the Central Council of the Tlingit and Haida Indian Tribes of Alaska (T&H) provides a wide range of services and programs to its citizens.

The 2025 Multi-Jurisdiction Hazard Mitigation Plan (MJHMP) is intended to serve as a guide for the collective Wrangell community, CBW, WCA, and T&H. This comprehensive plan assesses potential hazards, vulnerabilities, risks, and actively engages the diverse range of stakeholders and the public throughout the planning process. By doing so, the plan aids the city, borough, and tribal community to effectively prevent, protect against, respond to, and recover from disasters that could threaten the economic, social, and environmental well-being of the community. This plan incorporates historical disaster data, addresses the potential impacts of these hazards, and further outlines mitigation strategies that are tailored to the needs of the community. The hazards profiled in this plan are earthquake, flood and erosion, ground failure, tsunami and seiche, volcanic ash, severe weather, wildfire, high hazard dams and technological hazards. A further explanation of hazards is conducted in Chapter 4.

1.1 Hazard Mitigation

The Federal Emergency Management Agency (FEMA) developed the Disaster Mitigation Act of 2000 (DMA), which amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act). The DMA created a framework for state, local, tribal and territorial governments to become involved in disaster planning efforts to mitigate the effects disasters have in their communities. Through these planning efforts, communities can receive certain non-emergency grant funding to assist with the associated cost of hazard mitigation projects. Tribal governments who choose to participate with local governments in hazard mitigation planning may do so through a Local/Tribal Multi-Jurisdictional Plan. Collaborative local/tribal multi-jurisdictional plans may be accepted by FEMA “as long as the Indian Tribal government has participated in the process and has officially adopted the plan. Indian Tribal governments must address all the elements identified in this section to ensure eligibility as a recipient or as a subrecipient.” (FEMA, 2018)

Hazards can be natural or man-made events that pose risk to human life, property, or the environment. These risks can range from mild to severe. Therefore, any actions taken to reduce the long-term risk on human life or property from hazards is defined as hazard mitigation. The

process of a hazard mitigation plan is to identify and profile hazards within a geographical area. This process also analyses the people and facilities at risk, seeking to develop mitigation actions that will reduce or eliminate identified hazard risks. The primary tools in achieving FEMA's goal of reducing the effects of disasters are done through planning, policy changes, programs, projects and other activities that can be both short and long-term strategies. It is the responsibility of the local governments to ensure the protection of the community through community lifelines. These lifelines ensure the health, safety and welfare of citizens.

The overarching objectives of hazard mitigation planning is as follows:

- Ensure public safety by preventing loss of life and property.
- Minimize the negative impact on current and future development while considering climate change and other potential factors.
- Protect the community's economic, cultural and environmental resources.

1.2 Plan Overview

Section 1 Introduction states the concept of a hazard mitigation plan, outlines federal requirements and authorities, and introduces the Hazard Mitigation Assistance program, which provides a comprehensive list of various grant programs.

Section 2 Planning Process This section provides an overview of the planning process, identifies planning members and describes their involvement with the plan update process highlighting key steps, as well as providing a detailed description of how stakeholders and the public were involved. Table 2 in this plan provides an overview of previous plans that are incorporated into the 2025 MJHMP.

Section 3 Community Profile offers a detail of the City and Borough of Wrangell, encompassing its historical path as well as the demographic and economic characteristics that have influenced the region.

Section 4 Hazard Identification and Risk Assessment addresses the various hazards that can potentially affect Wrangell, including a stand-alone section focused on technological hazards. This includes updated maps for vulnerable populations and critical facilities within applicable hazard zones. A descriptive summary is provided for each hazard, ensuring a well-rounded understanding of the potential risks and challenges. Table 15 in this section outlines the critical facilities identified by the community.

Section 5 Mitigation Strategies outlines Wrangell's capabilities for hazard mitigation, along with the mitigation strategy, which provides the outline for reducing risks associated with hazards. The strategy comprises three main components: mitigation goals, potential mitigation actions and projects, and a mitigation action plan.

Section 6 Plan Maintenance and Adoption contains plan maintenance tools and copies of the plan adoption.

Section 7 References and Appendices contains the sources cited throughout the plan, and any appendix mentioned throughout the plan.

2 – Planning Process

To comply with the requirements of the DMA 2000, the CBW, WCA, and T&H have developed this MJHMP to evaluate risks associated with natural hazards and formulate a mitigation strategy to minimize these risks on Wrangell Island (Wrangell). This revised plan supersedes the 2020 hazard mitigation plan previously implemented for the community.

The planning process originated on September 3, 2024, with an in-person meeting between the Principal Consultant of Katmai Solutions and Wrangell Borough Manager Mason Villarma at his office. This meeting was structured to discuss the planning process, particularly since the 2020 MJHMP underwent a comprehensive overhaul of the 2009 legacy plan. The CBW expressed a desire for an updated plan and emphasized the importance of focusing on landslides, given the recent occurrence of a fatal landslide. The professional service agreement was signed by all parties on September 9, 2024.

During the initial meeting, the Principal Consultant discussed the prospective community planning team members who could assist the community in identifying available resources and capabilities for the 2025 MJHMP update. The planning team would provide support to Katmai Solutions by acting as a representative for the planning process, gathering information, and facilitating public participation opportunities.

2.1 Planning Team

Table 1 provides an overview of members who played a role in the 2025 MJHMP update. Several members of the planning team met at the City Hall on July 8, 2025, to discuss hazard mitigation action items, current project statuses and the various growing concerns of hazards within the community. This included discussing the need for an in-depth overview of landslide hazards within the planning area, and the need to include technological hazards into the updated MJHMP.

Table 1 Planning Team

Name	Department/Agency, Title	Contribution
Mason Villarma	Borough Manager	Planning team lead, data input and MJHMP Review
Patricia Gilbert	Mayor	Planning team member, data input and MJHMP Review
David Powell	Vice Mayor	Planning team member, data input and MJHMP Review

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Kate Thomas	Economic Development Director	Planning team member, data input and MJHMP Review
Tom Wetor	Public Works Director	Planning team member, data input and MJHMP Review
Amber Al-Haddad	Capital Projects Director	Planning team member, data input and MJHMP Review
Jordan Bunes	Fire Chief	Planning team member, data input and MJHMP Review
Gene Meek	Police Chief	Planning team member, data input and MJHMP Review
Steve Miller	Port & Harbor Director	Planning team member, data input and MJHMP Review
Victoria Houser	Forest Service District Ranger, US Forest Service District (USFS)	Planning team member, data input and MJHMP Review
Esther Reece (formerly), Albert Rinehart (present)	Tribal Administrator	Planning team member, Tribal data input and MJHMP Review
	Emergency Manager, Central Council of Tlingit and Haida Indian Tribes of Alaska	Planning team member, Tribal data input and MJHMP Review
Carly Allen	Hospital Administrator, Southeast Alaska Regional Health Consortium	Agency Planning Participant

2.2 Resources and Existing Plans

The planning process incorporated the existing natural hazard mitigation elements from these previous planning efforts. Table 2 lists the plans, studies, reports, and ordinances used in the development of the plan.

Table 2 Existing Plans and Reports

Plan/Report	Information Incorporated
Wrangell Community Survey, 2025	Community survey highlighting residents concern regarding landslides, NFIP program participation, overall perception of risk and desire for increased technological hazard response capabilities.

Wrangell Alaska Economic Conditions Report 2025	Contributed valuable data on infrastructure priorities, growth projections, and capital projects that align with mitigation efforts.
2020 Wrangell Multi-Jurisdiction Hazard Mitigation Plan	Information from the 2020 MJHMP provided foundation of previously identified natural hazards, risk assessments and mitigation action items.

2.3 Public Involvement

The CBW actively engaged the public in the plan update process through discussions held at the Borough Assembly and Tribal Council meetings, as well as distribution of paper surveys and plan drafts (Appendix A).

The WCA and the T&H of Alaska recognize all tribal members, Alaska Natives, community residents, and employees as public members of the community. This inclusive approach ensures that every individual within the community has the opportunity to attend and participate in tribal public meetings related to the development and implementation of the hazard mitigation plan. The first community outreach meeting took place on July 7, 2025, at the local City Hall. Public notices were posted in various locations through the community including offices, the post office, CBW social media pages, newspaper and other public bulletin boards to encourage attendance. The Katmai Solutions team provided a presentation on the Hazard Mitigation Plan overview and goals, electronic and paper surveys were provided to the community members to capture their feedback and concerns, WCA members were given paper copies of the survey to provide those who had limited access to electronic devices. The turnout for this event was minimal, however, there was vital information gathered during the open hall meeting. Furthermore, a community survey was hosted on the Wrangell Emergency Planning Website starting in late 2024, providing residents with ample opportunities to learn about the Hazard Mitigation Plan process and other emergency planning activities. On July 8th, 2025, a planning team meeting was held to review the 2020 mitigation actions, assess their current status, and identify new mitigation actions based on the results of the risk assessment.

3 – Community Profile



Figure 1 Geographic Planning Area

3.1 Location and Geography

Approximately 155 miles south of Alaska’s capital city of Juneau, the incorporated City and Borough of Wrangell spans a total area of around 3,462 square miles, comprising 2,541 square miles of land and 921 square miles of water. According to the US Census Bureau, Wrangell is the 26th largest borough in Alaska by total area. Nestled among the Alexander Archipelago of southeastern Alaska, Wrangell is bordered by Petersburg Borough to the north, Ketchikan Gateway Borough to the south, Prince of Wales-Hyder Census Area to the west and the Canadian border of British Columbia to the east and The City of Wrangell itself is on the northern end of the island.

The City and Borough of Wrangell’s water supply is sourced from the Upper and Lower Dam System, comprising two earth-filled dams and reservoirs. These dams and reservoirs are situated on Mill Creek, and most of the surface water in the watershed flows down steep rock slopes to

the southeast side of the reservoirs. The Upper Reservoir has a maximum storage capacity of 190-acre feet, while the Lower Reservoir can store a maximum of 102-acre feet.

3.2 History

Wrangell is one of the oldest continuously occupied communities in Alaska and is widely known as the place where four nations' flags have flown: Tlingit, Russian, British, and American, reflecting its long and complex history as a center of trade, governance, and cultural exchange.

The area lies within the ancestral homeland of the Stikine Tlingit (Lingít), whose people have lived in, stewarded, and traveled throughout the region for thousands of years. Long before foreign contact, Wrangell served as an important hub within extensive Indigenous trade networks connecting the coast to the Stikine River corridor and the interior. Tlingit governance, land use, and cultural practices shaped the landscape well prior to outside settlement.

In the early 19th century, Russian traders arrived in Southeast Alaska as part of the fur trade. In 1834, the Russian American Company constructed a fortified trading post, Redoubt Saint Dionysius, under the direction of Baron Ferdinand Petrovich Wrangel, for whom the community is named. The Russian flag was raised over the site, marking the first European power to formally occupy the area.

In 1840, control of the post transferred to the British-owned Hudson's Bay Company through a lease agreement with the Russian American Company. Renamed Fort Stikine, the British flag flew over Wrangell for more than two decades as the fort became a major center for trade and transportation along the Stikine River and into the interior.

Following the United States' purchase of Alaska from Russia in 1867, the American flag was raised in Wrangell, completing the sequence of four flags. The U.S. Army established Fort Wrangell in 1868, and the community soon became a key supply and transportation hub during regional gold rushes along the Stikine River and in interior British Columbia.

During the late 19th and early 20th centuries, Wrangell evolved into a permanent community supported by fishing, forestry, maritime trade, and government services. The city incorporated in 1903 and later unified as the City and Borough of Wrangell. Throughout its history, the community has adapted to economic change, geographic isolation, and environmental hazards, shaping land use patterns and infrastructure that continue to influence hazard exposure and resilience planning today.

3.3 Population and Demographics

According to the Wrangell Alaska Economic Conditions Report 2025, Wrangell continues to experience a long-term population decline with the community's total population decreasing from 2,369 to 2,030 residents in 2024. Between 2010 and 2024, Wrangell's population experienced a significant decline of 14 percent. The decline was particularly pronounced among

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children and several working age groups. The number of children in Wrangell decreased by a substantial 26 percent while residents in their twenties experienced a 15 percent decrease, and the population their thirties saw an 8 percent increase. This highlights the uneven trends across younger adult age groups. The steepest decline occurred among residents in their fifties, who decreased by nearly half. In 1990, children under the age of twenty comprised a significant portion of Wrangell’s population, accounting for one-third of the total. However, by 2024, their representation had declined to just 21 percent, further underscoring the long-term demographic shift in the community towards an aging older population. (Economic Conditions Report, 2025)

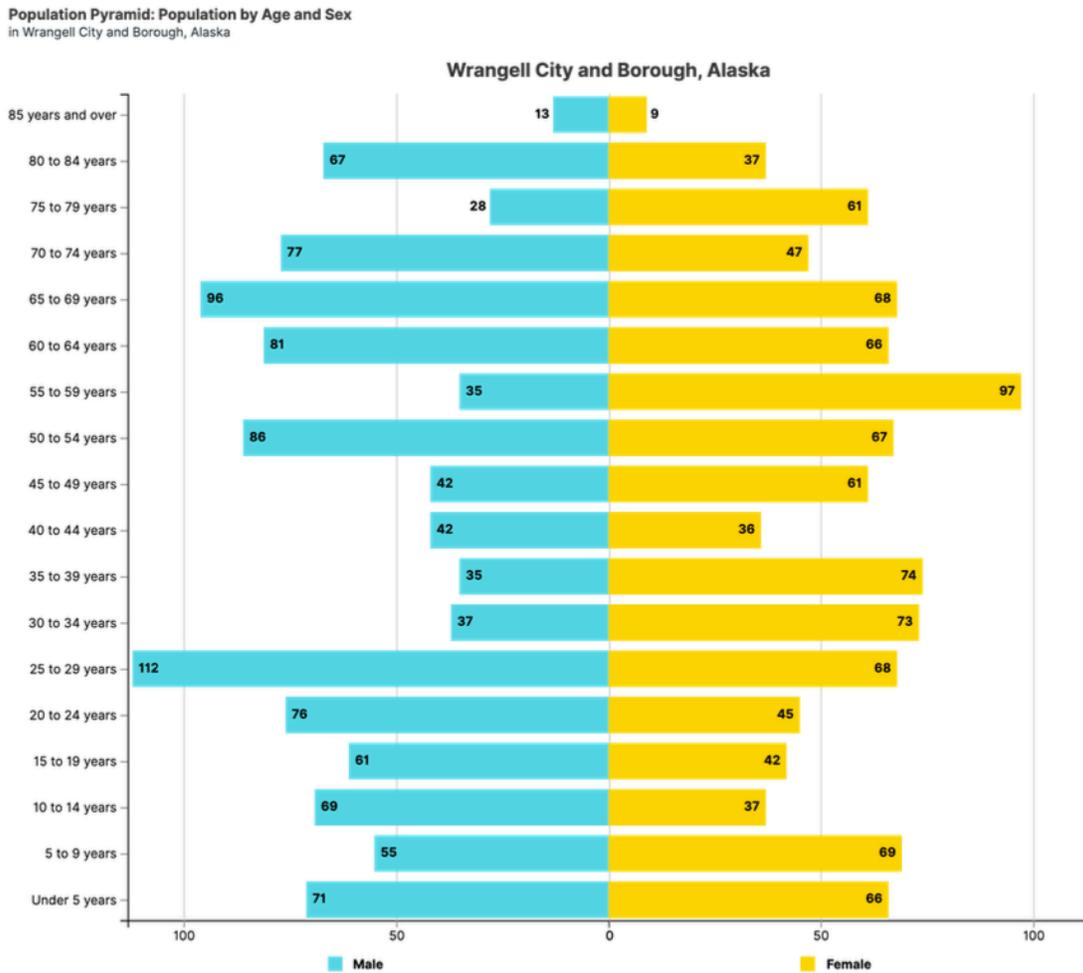


Figure 2 U.S. Census Bureau Population Pyramid

3.3.1 Housing

The planning team during the 2020 MJHMP noted that the U.S. Census estimates for median home values in Wrangell don’t accurately reflect the rebuild cost. This discrepancy is primarily

due to the additional costs associated with material purchasing, transportation (barge or airplane delivery), construction, and labor in rural Alaska.

In 2017, previous data indicated a median home value of \$183,300. The planning team then calculated a 40% markup on building costs for replacing a home in Wrangell. This resulted in an estimate of the average 1,200 square foot residential structure costing \$275,000. Using the same information and updated data from the U.S. Census, the planning team identified the estimated house values to be \$289,700, however, including the 40% markup on the median home value. Subsequently, the cost to replace the average 1,200 square foot single family home in Wrangell in 2025 is projected to be \$405,580. The 2025 Census data estimates that there are 1,300 housing units in Wrangell.

Table 3 Estimated Population and Residential Building Inventory

Population	Residential Buildings	
2025 Census Data	House Inventory Count	Total Value of Housing
2,030	1,300	US Census Estimate Value \$376,610,000 Adjusted for CBW: \$527,254,000

3.4 Economy

Wrangell’s economy has been coping with the forces of long-term structural decline and decades of population loss. The reduction in working age residents, coupled with the contraction of the time and seafood processing industries, has left the region vulnerable to labor availability issues and the need for industry diversification. Despite a modest economic improvement in 2024, Wrangell remains heavily dependent on sectors susceptible to resource fluctuations and global market fluctuations. The local economy has undergone a significant shift over the past decade. Health care has emerged as the largest sector. This growth can be largely attributed to SEARHC’s expansion of the Wrangell Medical Center and its associated services.

Between 2019 and 2024, the Port of Wrangell’s seafood value declined by 50 percent, and total landed pounds fell by 44 percent. These declines are primarily attributed to weak salmon returns, global oversupply, and depressed prices. However, despite these challenges, the seafood industry remains essential, notably, Dungeness crab now accounts for nearly half (47%) of the community’s total ex-vessel value, highlighting the increasing dependence on a single species. At the same time, Wrangell is experiencing its most robust tourism resurgence in two decades. The visitor industry has created over a hundred jobs in 2024, and total wages have increased by 46 percent between 2019 and 2024. Cruise visitation is projected to surge significantly, with over 45,000 passengers anticipated in 2025 and nearly 80,000 in 2026, marking a historic expansion for the sector. However, this rapid growth also underscores existing limitations, such as

constrained excursion capacity, workforce shortages, and the need for additional tourism infrastructure. (Economic Conditions Report, 2025)

3.4.1 Land Use

The Wrangell Alaska Economic Conditions Report 2025 describes Wrangell's land base in terms of federal, state, municipal, and private ownership. The City and Borough of Wrangell encompass 2,582 square miles of land and 883 square miles of water. Federal ownership dominates the landscape: 97 percent of Wrangell's land base is federally managed. An additional 2.5 percent is managed by the State of Alaska, while the City and Borough control only 0.08 percent of the land base. Private landholders account for just 0.17 percent. The extremely limited availability of municipally and privately owned land continues to restrict Wrangell's ability to support new residential, commercial, and industrial development. This shortage of developable land affects housing growth limits private-sector expansion, as well as limiting site options for new community facilities and infrastructure. Despite these constraints, the community has undertaken several targeted land-use initiatives aimed at supporting economic and population needs. These include efforts to stimulate new housing construction, expansion of waterfront infrastructure through a second cruise doc and continued work to relocate industrial waterfront activities from downtown to the Six Mile area. The community is also investing in harbor renovations, road improvements, and maintenance of essential public infrastructure, including the new water treatment plant. Collectively, these efforts reflect Wrangell's attempt to balance limited land availability with the demands of a changing economy and an evolving tourism sector. (Economic Conditions Report, 2025)

3.4.2 Development Trends

Wrangell continually seeks to maintain and upgrade their aging infrastructure. Historically, the CBW lacked clearly defined hazard zones and sufficient data to guide planning. In response, the community is now actively mapping known hazard areas and collecting critical data to improve future development and resilience. The landslide of 2023 further increased the attention on disaster response and preparedness for the community.

Beginning in 1978 FEMA conducted a Flood Insurance Study for Wrangell, the study consisted of the coastal areas among Zimovia Strait, shoreline along Eastern Passage, and the riverine areas of Cemetery Creek, Rainbow Falls Creek and Mill Creek (all approximate), this study was published in 1981, subsequently, the National Flood Insurance Program suspended the NFIP eligibility in Wrangell effective June 15, 1982. (Federal Register, 1982)

3.5 Climate

Wrangell is a temperate rainforest characterized by an annual rainfall of approximately 80 inches. During the summer months, spanning from May to August, temperatures generally range in the 60s Fahrenheit, while weather conditions are drier compared to other seasons. In contrast, the autumn season is typically characterized by wet and windy conditions. Winter months bring intermittent snowfall and precipitation, with temperatures typically fluctuating between the 20s and 30s Fahrenheit. The spring season introduces milder temperatures, ranging from the 30s to the 40s Fahrenheit. (Center, 2025)

4 – Hazard Identification and Risk Assessment

For the 2025 MJHMP, the planning lead collaborated with the local planning team to assess the identified hazards in the Wrangell area based on the State of Alaska’s Hazard Mitigation Plan (State HMP). The team evaluated and screened potential hazards, considering various factors such as prior knowledge or perception of their threat, the relative risk posed by each hazard, and the availability of known or expected information. Each profiled hazard is assigned an impact rating (i.e., magnitude or severity) based on its individual characteristics.

Table 4 Hazard Magnitude/Severity Criteria

Magnitude/Severity	Criteria
4 – Catastrophic	<ul style="list-style-type: none"> • Multiple deaths. • Complete shutdown of facilities for 30 or more days. • More than 50 percent (%) of property is severely damaged.
3 – Critical	<ul style="list-style-type: none"> • Injuries and/or illnesses result in permanent disability. • Complete shutdown of critical facilities for at least two weeks. • More than 25% of property is severely damaged.
2 – Limited	<ul style="list-style-type: none"> • Injuries and/or illnesses do not result in permanent disability. • Complete shutdown of critical facilities for more than one week. • More than 10% of property is severely damaged
1 – Negligible	<ul style="list-style-type: none"> • Injuries and/or illnesses are treatable with first aid. • Minor quality of life lost. • Shutdown of critical facilities and services for 24 hours or less. • Less than 10% of property is severely damaged

Recurrence probability is also defined based on specific criteria within each hazard profile, or utilizing the criteria identified in Table 5.

Table 5 Hazard Recurrence Probability Criteria

Probability	Criteria
4 – Highly Likely	<ul style="list-style-type: none"> • Event is probable within the calendar year. • Event has up to 1 in 1 year chance of occurring (1/1=100 percent [%]). • History of events is greater than 33% likely per year.
3 – Likely	<ul style="list-style-type: none"> • Event is probable within the next three years. • Event has up to 1 in 3 years chance of occurring (1/3=33%). • History of events is greater than 20% but less than or equal to 33% likely per year.
2 – Possible	<ul style="list-style-type: none"> • Event is probable within the next five years. • Event has up to 1 in 5 years chance of occurring (1/5=20%). • History of events is greater than 10% but less than or equal to 20% likely per year.
1 – Unlikely	<ul style="list-style-type: none"> • Event is possible within the next ten years. • Event has up to 1 in 10 years chance of occurring (1/10=10%). • History of events is less than or equal to 10% likely per year.

4.1 Natural Hazards

The planning team elected to maintain previously identified natural hazards as the seven hazards that continue to pose the greatest threat to Wrangell. Earthquake, flood and erosion, ground failure (landslide), tsunami and seiche, volcanic ash, weather, and wildland fire. These hazards are comprehensively profiled in this plan.

Examinations of these hazards include several factors:

- Hazard Description
- Location
- History
- Extent
- Impact
- Probability

4.1.1 Earthquake

4.1.1.1 Description

The outer most layer of the earth is referred to as the lithosphere, across this layer of earth are irregular shaped masses of solid rock that are generally composed of continental (land) and oceanic areas. These slabs cover the earth in major and minor sections referred to as tectonic plates. There are seven major tectonic plates and eight minor plates across earth's lithosphere. These plates move slowly over time in different formations, referred to as transformative, divergent and convergent.

Transformative plates are when two plates, regardless of being oceanic or continental, slide past each other in a horizontal manner. These plate boundaries can create earthquakes should they become stuck as they move.

Convergent boundaries are when two tectonic plates collide with one other. In the case of two plates converging in a continental section, there are often mountain formations in these areas. When an oceanic plate collides with a continental plate, the oceanic plate can be forced underneath, creating volcanic regions and more frequent earthquake activity.

Divergent plates move apart from each other; magma rises upwards and creates new crust. This is often seen at mid-ocean ridges where new oceanic crust is form.

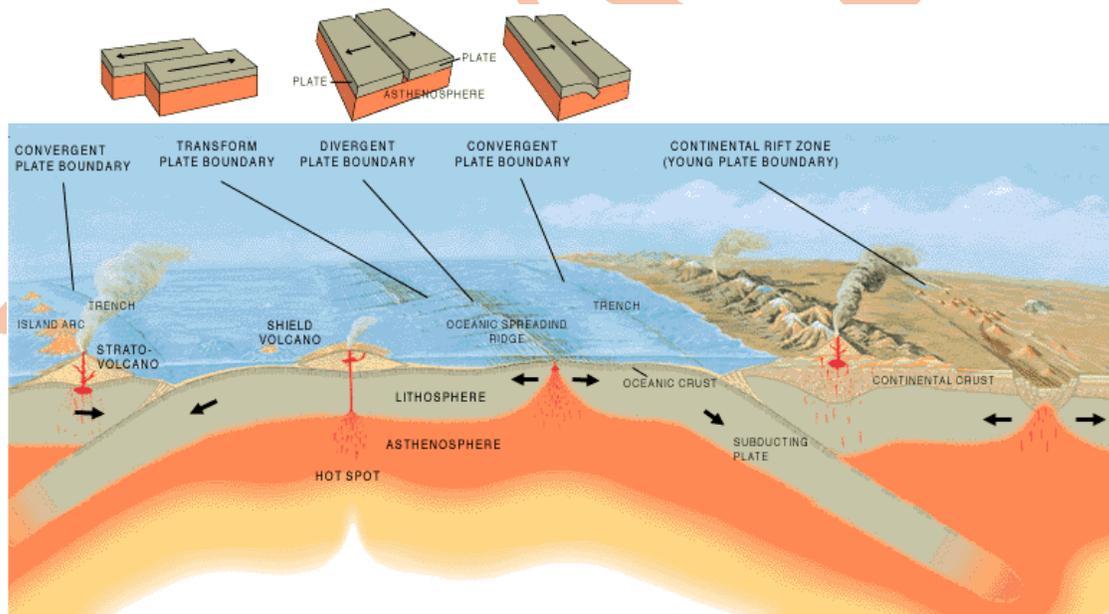


Figure 3 USGS Plate Boundaries

An earthquake occurs when there is a sudden slip in the tectonic plate formations. This is due to the plate boundaries becoming stuck at the edge of a boundary, when one boundary gives way the energy from that is released, resulting in an earthquake of varying severity. Earthquakes can be felt far beyond where the energy was released, referred to as the epicenter, and earthquakes

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usually occur without warning. They can last for seconds or even minutes with smaller earthquakes known as aftershocks often occurring after larger earthquakes. The effects of earthquakes can be diverse, with ground shaking, or the vibration and shaking of the ground during an earthquake, being the most prevalent. Ground shaking and tremors from severe earthquakes can cause the collapse of buildings and bridges, disrupt gas, electric, and communication lines (including telephone, cable, and internet), and occasionally trigger landslides, tsunamis, flash floods, and wildfires. Buildings with foundations resting on unstable soil, as well as trailers or homes not securely attached to their foundations, are at risk during earthquakes. These structures can be dislodged from their foundations, leading to potential fatalities, injuries, and substantial property damage.

The magnitude of an earthquake is measured by data recorded on an instrument called a seismograph, which quantifies the energy released at the epicenter. Magnitude refers to the size of an earthquake, and it is a single value. However, the shaking caused by an earthquake can have varying values depending on factors such as distance, the type of surface material, and other circumstances.

CIIM Intensity	People's Reaction	Furnishings	Built Environment	Natural Environment
I	Not felt			Changes in level and clarity of well water are occasionally associated with great earthquakes at distances beyond which the earthquakes felt by people.
II	Felt by a few.	Delicately suspended objects may swing.		
III	Felt by several; vibration like passing of truck.	Hanging objects may swing appreciably.		
IV	Felt by many; sensation like heavy body striking building.	Dishes rattle.	Walls creak; window rattle.	
V	Felt by nearly all; frightens a few.	Pictures swing out of place; small objects move; a few objects fall from shelves within the community.	A few instances of cracked plaster and cracked windows within the community.	Trees and bushes shaken noticeably.
VI	Frightens many; people move unsteadily.	Many objects fall from shelves.	A few instances of fallen plaster, broken windows, and damaged chimneys within the community.	Some fall of tree limbs and tops, isolated rockfalls and landslides, and isolated liquefaction.
VII	Frightens most; some lose balance.	Heavy furniture overturned.	Damage negligible in buildings of good design and construction, but considerable in some poorly built or badly designed structures; weak chimneys broken at roof line, fall of unbraced parapets.	Tree damage, rockfalls, landslides, and liquefaction are more severe and widespread with increasing intensity.
VIII	Many find it difficult to stand.	Very heavy furniture moves conspicuously.	Damage slight in buildings designed to be earthquake resistant, but severe in some poorly built structures. Widespread fall of chimneys and monuments.	
IX	Some forcibly thrown to the ground.		Damage considerable in some buildings designed to be earthquake resistant; buildings shift off foundations if not bolted to them.	
X			Most ordinary masonry structures collapse; damage moderate to severe in many buildings designed to be earthquake resistant.	

Figure 4 Modified Mercalli Intensity

The intensity of an earthquake evaluates the strength of shaking generated at a particular location and its effects on human populations, man-made structures, and the natural environment. Intensities are expressed in Roman numerals, such as VI, X, and so on. Historically, these

intensities were subjective measures derived from human observations and reports of felt shaking and damage. Figure 4 demonstrates the Modified Mercalli Intensity Scale, Table 6 provides a comparison of magnitude vs intensity scale.

Table 6 Magnitude vs Modified Mercalli Scale

Earthquake Magnitude	Modified Mercalli Intensity
1.0 – 3.0	I
3.0 – 3.9	II – III
4.0 – 4.9	IV – V
5.0 – 5.9	VI – VII
6.0 – 6.9	VII – IX
7.0 and higher	VII and higher

4.1.1.2 Location

Because Wrangell is situated near the Pacific-North American plate in a transformative plate boundary with the Queen Charlotte-Fairweather plate, the entirety of the planning area falls within the hazard risk zone for an earthquake. To the south and southwest region of Wrangell lies the volcanic belt of Stikine which has subduction activities from the Pacific Plate beneath the North American Plate. Both seismic active regions pose as potential risks to Wrangell.

4.1.1.3 Extent

Based on historical earthquake events and the identified criteria, the magnitude and severity of earthquake impacts in the Wrangell area are classified as “Limited.” These impacts may result in potential injuries and/or illnesses that do not lead to permanent disability. Critical facilities may experience shutdowns for more than two weeks. Furthermore, over 10% of property is severely damaged, with limited long-term consequences affecting transportation, infrastructure, and the economy.

4.1.1.4 History

Current data for the Wrangell area is provided by the USGS earthquake database, utilizing a radius of approximately 100 miles, the planning team identified data starting in 1956 and ending present day in 2025. There were over one thousand recorded incidents ranging from Magnitude

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2.5 to 7.6 within this larger radius. Following the legacy 2020 plan, the historical data in Table 7 showcases the recorded earthquakes within the radius. Records indicate that the majority of earthquakes occur along the Queen Charlotte-Fairweather plate, while the earthquakes that are within relative vicinity (under 40 miles) of Wrangell occur in the Stikine volcanic area, though these earthquakes tend to be lower magnitude than those at the transformative plate boundary.



Figure 5 Earthquake Epicenters Southeast Alaska

Table 7 Southeast Alaska Earthquake History

Date and Time	Latitude	Longitude	Depth	Magnitude	Location
7/4/25	58.347	-133.453	0	2.6	56 km E of Juneau, Alaska
5/19/25	56.548	-136.141	16.7	2.5	74 km SW of Sitka, Alaska
5/5/25	55.503	-135.024	10	2.5	86 km SSW of Port Alexander, Alaska
4/4/25	58.337	-136.929	10.5	3.2	37 km WNW of Elfin Cove, Alaska
2/7/25	56.786	-136.1	27.1	2.6	55 km WSW of Sitka, Alaska
1/15/25	55.437	-134.828	24.4	4.4	91 km S of Port Alexander, Alaska
10/25/24	55.514	-135.151	19	2.8	87 km SSW of Port Alexander, Alaska
10/19/24	55.544	-135.241	2.6	3.3	86 km SSW of Port Alexander, Alaska

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Date and Time	Latitude	Longitude	Depth	Magnitude	Location
10/1/24	55.049	-134.538	5	2.9	100 km WSW of Craig, Alaska
9/21/24	54.315	-134.009	14.956	3.7	125 km SW of Hydaburg, Alaska
9/11/24	58.157	-136.799	11.5	2.8	27 km W of Elfin Cove, Alaska
9/4/24	53.413	-133.308	10	4	202 km S of Hydaburg, Alaska
8/20/24	58.264	-132.456	4.287	3	103 km NNE of Hobart Bay, Alaska
7/16/24	57.291	-136.206	4.1	2.7	59 km WNW of Sitka, Alaska
7/9/24	57.154	-131.927	4.66	2.5	73 km ENE of Petersburg, Alaska
6/9/24	55.026	-134.741	20.4	2.8	113 km WSW of Craig, Alaska
5/27/24	57.529	-136.994	14.5	2.9	66 km SW of Pelican, Alaska
5/13/24	57.559	-136.67	2.4	2.5	51 km SSW of Pelican, Alaska
4/6/24	53.909	-134.849	11.9	3.2	194 km SW of Hydaburg, Alaska
3/27/24	56.574	-135.069	5.5	2.9	44 km NW of Port Alexander, Alaska
3/10/24	56.402	-135.594	19.8	2.6	61 km WNW of Port Alexander, Alaska
2/24/24	55.487	-135.155	23.5	2.7	90 km SSW of Port Alexander, Alaska
2/10/24	57.53	-136.899	15.1	2.8	62 km SW of Pelican, Alaska
2/3/24	58.277	-136.937	11.7	3.1	36 km WNW of Elfin Cove, Alaska
1/17/24	56.402	-135.624	15.2	3.6	62 km WNW of Port Alexander, Alaska
1/13/24	56.418	-135.572	9.6	2.8	60 km WNW of Port Alexander, Alaska
1/12/24	56.438	-135.714	11.1	5.9	69 km WNW of Port Alexander, Alaska
1/3/24	52.517	-132.644	10	4.1	252 km SW of Prince Rupert, Canada
12/29/23	53.929	-132.442	10	3.7	144 km S of Hydaburg, Alaska
12/28/23	55.428	-134.793	7.3	2.9	91 km SW of Edna Bay, Alaska
12/20/23	54.807	-134.592	10.7	3	118 km SW of Craig, Alaska
11/24/23	55.464	-134.997	8.1	2.5	90 km SSW of Port Alexander, Alaska
10/26/23	55.169	-135.54	11.9	2.9	132 km SSW of Port Alexander, Alaska
9/23/23	55.375	-135.431	4.5	3.3	109 km SSW of Port Alexander, Alaska
8/15/23	52.649	-132.01	10.172	4.4	216 km SSW of Prince Rupert, Canada
8/6/23	54.491	-136.569	3.9	2.6	230 km SSW of Port Alexander, Alaska

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Date and Time	Latitude	Longitude	Depth	Magnitude	Location
7/12/23	55.022	-134.545	11.7	2.5	102 km WSW of Craig, Alaska
7/1/23	53.621	-133.201	10	4.3	178 km S of Hydaburg, Alaska
6/12/23	55.897	-135.783	25.4	2.5	81 km WSW of Port Alexander, Alaska
5/19/23	55.357	-134.945	19.9	2.5	101 km S of Port Alexander, Alaska
5/13/23	56.181	-134.948	7.4	3.8	20 km WSW of Port Alexander, Alaska
5/8/23	52.327	-132.058	10	4.2	249 km SSW of Prince Rupert, Canada
4/4/23	56.871	-132.4	6.6	2.8	34 km E of Petersburg, Alaska
3/13/23	52.808	-132.157	10	4.2	207 km SW of Prince Rupert, Canada
3/4/23	58.179	-136.9	13.1	2.7	32 km W of Elfin Cove, Alaska
1/28/23	54.572	-134.136	20.3	2.8	109 km SW of Hydaburg, Alaska
1/28/23	54.536	-134.142	20.7	2.9	Haida Gwaii Region, Canada
1/13/23	56.656	-135.993	15.7	3	59 km SW of Sitka, Alaska
1/13/23	56.746	-136.006	9.2	3.2	53 km SW of Sitka, Alaska
1/13/23	56.665	-135.944	15.9	3.2	57 km SW of Sitka, Alaska
12/24/22	53.859	-131.587	10	3.8	97 km WSW of Prince Rupert, Canada
12/24/22	53.821	-131.735	10	4.5	107 km WSW of Prince Rupert, Canada
12/10/22	55.011	-134.639	13.4	2.7	108 km WSW of Craig, Alaska
11/7/22	56.734	-131.231	5	2.9	Southeastern Alaska
10/21/22	53.856	-131.61	14.5	2.8	98 km WSW of Prince Rupert, Canada
10/21/22	53.869	-131.631	7.579	3.9	99 km WSW of Prince Rupert, Canada
10/10/22	54.926	-130.68	13.3	3.8	61 km ESE of Metlakatla, Alaska
10/10/22	54.922	-130.683	11.3	2.9	61 km ESE of Metlakatla, Alaska
8/16/22	58.144	-136.725	5.1	2.8	23 km WSW of Elfin Cove, Alaska
8/15/22	58.137	-136.794	13.3	3.2	Southeastern Alaska
8/15/22	58.16	-136.734	13.7	2.8	23 km W of Elfin Cove, Alaska
6/13/22	57.21	-136.277	11.1	3.4	59 km WNW of Sitka, Alaska
6/8/22	55.24	-134.769	24.4	2.7	105 km SW of Edna Bay, Alaska
6/5/22	58.224	-137.035	14.1	2.6	40 km W of Elfin Cove, Alaska
5/9/22	53.74	-131.847	10	4.1	Hecate Strait region, Canada
4/11/22	57.043	-135.702	6.6	2.7	22 km W of Sitka, Alaska
2/13/22	54.385	-134.096	14.49	3.2	122 km SW of Hydaburg, Alaska
1/14/22	57.469	-136.462	13.9	4.5	56 km SSW of Pelican, Alaska

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Date and Time	Latitude	Longitude	Depth	Magnitude	Location
12/6/21	58.146	-132.926	4.21	2.7	79 km NNE of Hobart Bay, Alaska
11/8/21	55.045	-134.557	11.9	2.5	101 km WSW of Craig, Alaska
10/21/21	55.448	-131.32	9.6	2.5	22 km NE of Saxman, Alaska
9/28/21	58.347	-133.53	5	2.7	52 km E of Juneau, Alaska
9/28/21	58.301	-133.558	5	3.3	50 km E of Juneau, Alaska
9/28/21	58.126	-133.772	3.6	2.7	Southeastern Alaska
9/9/21	55.099	-134.571	23.1	2.6	99 km WSW of Craig, Alaska
9/3/21	56.373	-130.777	24.6	2.8	69 km NW of Hyder, Alaska
8/28/21	55.122	-136.224	10	2.9	160 km SW of Port Alexander, Alaska
8/13/21	55.054	-134.493	4.2	2.6	97 km WSW of Craig, Alaska
7/15/21	55.058	-134.46	17.3	2.5	95 km WSW of Craig, Alaska
6/12/21	55.533	-135.141	10	2.6	85 km SSW of Port Alexander, Alaska
5/23/21	56.81	-131.886	7.14	2.5	48 km NE of Wrangell, Alaska
5/18/21	57.869	-132.693	5	3.2	59 km NE of Hobart Bay, Alaska
5/18/21	57.846	-132.595	5	2.9	61 km NE of Hobart Bay, Alaska
4/11/21	55.373	-134.982	1.7	2.6	99 km SSW of Port Alexander, Alaska
2/20/21	58.112	-136.685	0.5	2.6	22 km WSW of Elfin Cove, Alaska
12/31/20	55.44	-135.21	5.6	2.6	off the coast of Southeastern Alaska
11/23/20	56.699	-135.97	18.5	4.2	55 km SW of Sitka, Alaska
11/18/20	53.004	-132.786	10	4.1	218 km SW of Prince Rupert, Canada
8/30/20	57.1	-135.733	4.7	2.5	24 km WNW of Sitka, Alaska
8/22/20	56.265	-130.656	1.8	2.8	55 km NW of Hyder, Alaska
8/17/20	57.462	-130.854	8.47	2.6	144 km NE of Wrangell, Alaska
8/6/20	57.575	-137.126	9.6	2.6	68 km SW of Pelican, Alaska
3/23/20	55.454	-135.084	14.7	3.8	92 km SSW of Port Alexander, Alaska
3/22/20	57.766	-132.962	3.2	3.1	40 km NE of Hobart Bay, Alaska
2/23/20	57.878	-132.593	5	3	64 km NE of Hobart Bay, Alaska
1/22/20	55.548	-135.065	0.8	2.7	82 km SSW of Port Alexander, Alaska
1/21/20	52.77	-132.31	10	4	216 km SW of Prince Rupert, Canada
1/2/20	57.102	-135.759	5.3	3	26 km WNW of Sitka, Alaska
12/24/19	53.067	-132.754	10	4.1	212 km SW of Prince Rupert, Canada

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Date and Time	Latitude	Longitude	Depth	Magnitude	Location
12/10/19	55.111	-133.11	5.4	3.4	20 km WSW of Hydaburg, Alaska
11/18/19	57.714	-137.077	12	2.6	57 km WSW of Pelican, Alaska
11/9/19	52.748	-132.317	15.48	4.6	218 km SW of Prince Rupert, Canada
9/30/19	57.188	-136.421	5	2.6	67 km WNW of Sitka, Alaska
9/30/19	57.222	-136.454	4.1	2.8	70 km WNW of Sitka, Alaska
9/15/19	57.381	-132.583	2.5	3	47 km ESE of Hobart Bay, Alaska
9/4/19	56.301	-134.479	10.2	2.5	11 km ENE of Port Alexander, Alaska
8/16/19	55.049	-134.422	12.7	2.8	93 km WSW of Craig, Alaska
8/16/19	55.338	-134.446	7.2	2.9	Southeastern Alaska
7/4/19	52.892	-132.703	5.6	3.7	223 km SW of Prince Rupert, Canada
7/4/19	55.448	-135.121	0.4	4.3	94 km SSW of Port Alexander, Alaska
7/3/19	55.222	-134.815	27.8	3.8	108 km SW of Edna Bay, Alaska
4/28/19	55.259	-135.023	17.4	3.6	112 km SSW of Port Alexander, Alaska
4/12/19	55.985	-130.364	8.1	3	22 km WNW of Hyder, Alaska
3/9/19	55.276	-134.909	28.2	4.8	Southeastern Alaska
2/5/19	55.528	-135.462	0.2	2.6	95 km SSW of Port Alexander, Alaska
12/23/18	52.984	-132.604	10	4.2	211 km SW of Prince Rupert, Canada
11/27/18	55.48	-135.057	19	2.7	89 km SSW of Port Alexander, Alaska
10/2/18	55.545	-135.101	21	2.7	83 km SSW of Port Alexander, Alaska
9/3/18	56.105	-135.371	28.3	3.4	47 km WSW of Port Alexander, Alaska
7/30/18	55.622	-135.476	22.7	2.9	87 km SW of Port Alexander, Alaska
6/15/18	53.62	-134.302	10	4.2	200 km SSW of Hydaburg, Alaska
6/2/18	53.899	-133.855	10	4.2	160 km SSW of Hydaburg, Alaska
4/16/18	55.872	-135.533	10	3.2	69 km SW of Port Alexander, Alaska
3/22/18	57.387	-136.88	4.3	2.5	74 km SSW of Pelican, Alaska
1/13/18	55.294	-135.051	5.7	2.5	109 km SSW of Port Alexander, Alaska

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Date and Time	Latitude	Longitude	Depth	Magnitude	Location
1/2/18	55.528	-135.112	6.8	2.6	85 km SSW of Port Alexander, Alaska
12/25/17	55.533	-135.057	25.5	4	83 km SSW of Port Alexander, Alaska
12/12/17	54.45	-134.225	20.1	3.6	123 km SW of Hydaburg, Alaska
12/3/17	57.154	-136.38	5.1	2.9	64 km W of Sitka, Alaska
11/1/17	55.565	-135.013	10	2.6	79 km SSW of Port Alexander, Alaska
10/26/17	55.191	-134.828	9.8	3.6	111 km WSW of Craig, Alaska
10/7/17	55.583	-134.98	13.3	2.8	77 km SSW of Port Alexander, Alaska
8/22/17	54.514	-134.2	52	3.1	117 km SW of Hydaburg, Alaska
8/10/17	54.529	-134.223	14.3	4.4	117 km SW of Hydaburg, Alaska
6/27/17	55.818	-135.606	24.8	2.5	76 km SW of Port Alexander, Alaska
6/18/17	57.661	-136.476	4.8	2.9	36 km SSW of Pelican, Alaska
6/15/17	57.168	-136.405	0.7	3.1	66 km W of Sitka, Alaska
5/22/17	57.709	-132.558	5	2.7	Southeastern Alaska
4/28/17	58.196	-136.888	10.6	2.8	32 km W of Elfin Cove, Alaska
3/29/17	52.899	-132.41	10	4.1	209 km SW of Prince Rupert, Canada
3/25/17	55.379	-134.942	8.5	3.2	98 km S of Port Alexander, Alaska
3/24/17	57.733	-132.435	1	2.5	62 km ENE of Hobart Bay, Alaska
3/14/17	54.552	-133.994	8.34	2.7	104 km SW of Hydaburg, Alaska
3/9/17	55.299	-134.862	10	2.8	104 km SW of Edna Bay, Alaska
3/2/17	55.454	-134.859	26.7	2.9	89 km S of Port Alexander, Alaska
2/10/17	55.017	-134.687	10	2.9	110 km WSW of Craig, Alaska
1/26/17	57.692	-132.328	10	2.8	66 km ENE of Hobart Bay, Alaska
1/26/17	57.719	-132.417	1	3.1	62 km ENE of Hobart Bay, Alaska
1/18/17	58.231	-136.837	1	2.8	29 km W of Elfin Cove, Alaska
1/17/17	58.182	-136.868	9.7	2.5	30 km W of Elfin Cove, Alaska
1/17/17	58.173	-136.8	13	3.2	26 km W of Elfin Cove, Alaska
1/17/17	58.177	-136.783	12	3	25 km W of Elfin Cove, Alaska
1/16/17	58.189	-136.74	15.5	2.7	23 km W of Elfin Cove, Alaska
1/16/17	58.148	-136.854	13.1	4.5	30 km W of Elfin Cove, Alaska
1/16/17	58.237	-136.777	9.3	2.8	25 km W of Elfin Cove, Alaska
1/16/17	58.175	-136.83	10.6	4.1	28 km W of Elfin Cove, Alaska
11/14/16	57.859	-133.073	1	2.5	46 km NNE of Hobart Bay, Alaska
10/26/16	57.437	-132.936	1	2.5	25 km E of Hobart Bay, Alaska

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Date and Time	Latitude	Longitude	Depth	Magnitude	Location
10/7/16	55.535	-135.521	27.4	2.7	96 km SW of Port Alexander, Alaska
9/5/16	57.856	-133.045	0.2	2.5	Southeastern Alaska
7/5/16	56.664	-135.916	14	3.6	56 km SW of Sitka, Alaska
6/10/16	57.701	-132.448	5	2.9	60 km ENE of Hobart Bay, Alaska
6/8/16	55.42	-135.042	10	2.9	95 km SSW of Port Alexander, Alaska
5/12/16	56.054	-130.232	4.4	2.8	20 km NW of Hyder, Alaska
5/9/16	52.651	-132.098	10	4.2	219 km SSW of Prince Rupert, Canada
4/18/16	55.503	-135.048	17.2	2.9	86 km SSW of Port Alexander, Alaska
3/9/16	57.131	-136.247	20.3	2.8	56 km W of Sitka, Alaska
2/13/16	55.548	-135.459	29.8	2.9	93 km SSW of Port Alexander, Alaska
2/2/16	58.33	-137.032	8.1	2.5	43 km WNW of Elfin Cove, Alaska
1/25/16	54.796	-134.14	21.34	2.7	95 km WSW of Hydaburg, Alaska
1/7/16	58.249	-136.877	10.9	3	31 km W of Elfin Cove, Alaska
12/26/15	55.448	-135.169	8	2.6	95 km SSW of Port Alexander, Alaska
12/18/15	54.876	-134.449	20	2.9	106 km SW of Craig, Alaska
11/18/15	57.236	-132.908	1	2.8	37 km SE of Hobart Bay, Alaska
11/16/15	55.035	-134.628	4.5	2.6	106 km WSW of Craig, Alaska
10/22/15	55.503	-135.304	10	3.3	92 km SSW of Port Alexander, Alaska
10/20/15	55.439	-135.084	21.9	2.5	94 km SSW of Port Alexander, Alaska
9/2/15	55.534	-135.412	28	2.8	93 km SSW of Port Alexander, Alaska
8/24/15	55.498	-134.918	15	3	85 km SSW of Port Alexander, Alaska
8/18/15	55.414	-135.111	14.52	2.7	97 km SSW of Port Alexander, Alaska
8/8/15	55.495	-135.47	19.7	2.7	98 km SSW of Port Alexander, Alaska
7/9/15	57.873	-133.058	1	2.7	48 km NNE of Hobart Bay, Alaska
6/8/15	55.544	-135.009	10	3	81 km SSW of Port Alexander, Alaska
5/30/15	58.338	-137.013	5	2.6	42 km WNW of Elfin Cove, Alaska
3/14/15	57.479	-132.525	1	2.8	Southeastern Alaska

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Date and Time	Latitude	Longitude	Depth	Magnitude	Location
2/18/15	58.337	-137.032	3.4	4.5	43 km WNW of Elfin Cove, Alaska
1/25/15	52.562	-131.967	17.56	4.5	223 km SSW of Prince Rupert, Canada
1/12/15	54.978	-134.454	20	3	99 km SW of Craig, Alaska

4.1.1.5 Impact

Significant ground movement, potentially resulting in infrastructure damage, could occur due to the magnitude or intensity of an earthquake. The community’s water supply is dependent on two aging earthen dams situated behind surface reservoirs. Minor tremors have been experienced during previous seismic events. A high-magnitude earthquake could cause severe repercussions for future populations, residences, critical facilities, and infrastructure. Due to the location of Wrangell, infrastructure is at risk of disruption by a large-scale earthquake, this apart of a larger risk to underwater infrastructure such as the Alaska United fiber optic cable, which was previously damaged in a 2013 earthquake, and the Southeast Alaska Power Agency (SEAPA) electric line connecting Wrangell and Petersburg which experienced failure from a different incident. Wrangell falls within the moderate perceived shaking range and the moderate range for perceived damages. The overall risk for a large catastrophic earthquake is lower, but not impossible, therefore, depending on the size and severity of an earthquake in Wrangell, the impact can range from “Limited” to “Catastrophic”.

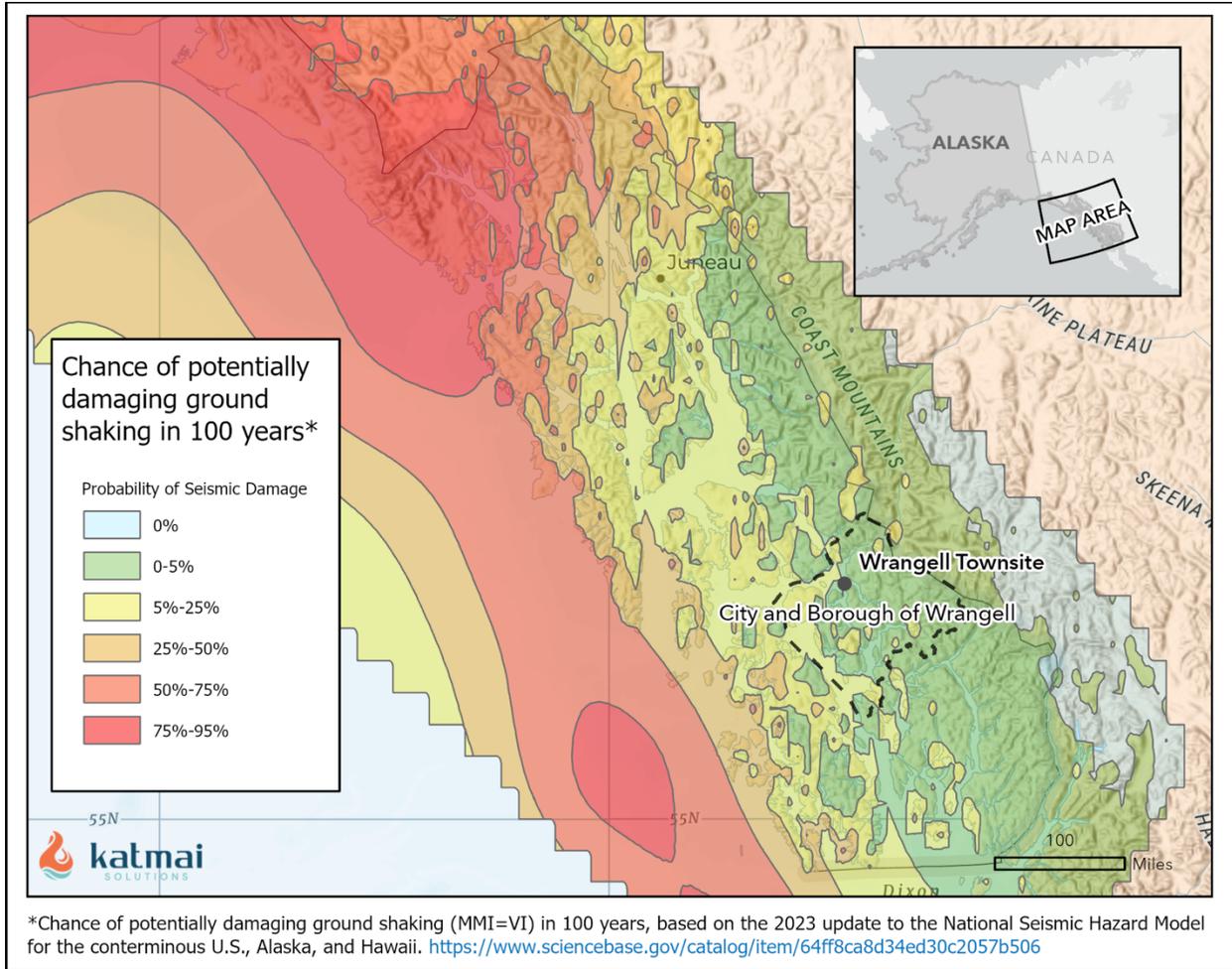


Figure 6 Ground Shaking Seismic Hazard Model

4.1.1.6 Probability

Based on USGS Earthquake Rates and Probabilities source model within the next 10 years there is a high probability that an earthquake could occur within a 15-mile radius (24km) of Wrangell. The region is at moderate to high risk for significant seismic activity. While Wrangell has not been near the epicenter of a major earthquake, the regional seismic area of Queen Charlotte-Fairweather Fault zone contributes to this elevated risk. (Earthquake, 2025)

Figure 7 below demonstrates the probability analysis from USGS source models with National Seismic Hazard Models (NHSM) Alaska 2023 data. Wrangell is nearly certain within the next 10 years to have seismic activity occur, an earthquake within the small-to-moderate range (M4-M6) therefore, it is imperative to be treated as a routine or expected event. Additionally, stronger earthquakes (M6-6.9) remain likely and although they are less likely, major earthquakes (M7+) still pose as a potential risk within the aforementioned forecasted time span. Overall, Wrangell has a low probability of experiencing an earthquake of magnitude 5.0 or greater. Although it is considered “Unlikely,” there is a possibility that an event could occur within the next 10 years, with a 10 percent chance of happening, as mentioned previously, the size and severity will differ.

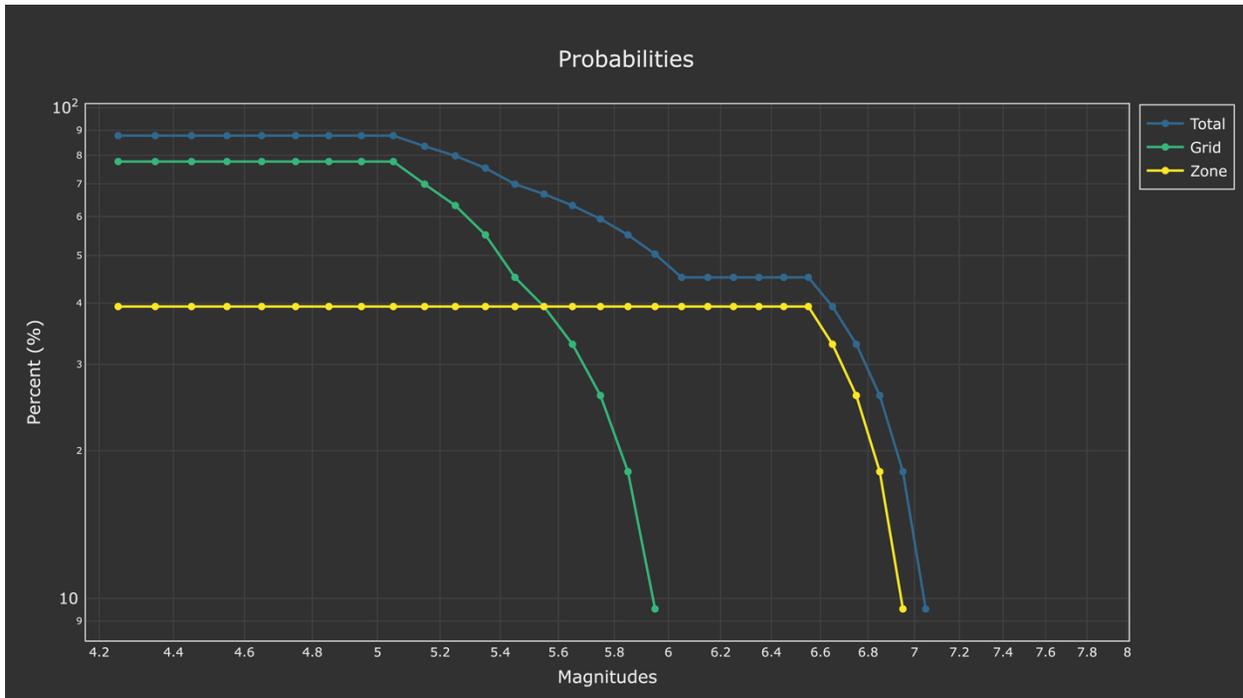


Figure 7 USGS Earthquake Rates and Probabilities

4.1.2 Flood and Erosion

4.1.2.1 Description

Flooding occurs when water accumulates in areas where it typically does not, or when excess water from streams, rivers, lakes, reservoirs, glaciers, or coastal bodies overflows onto adjacent floodplains. Floodplains are lowlands near water bodies that are susceptible to recurring floods. While floods are natural occurrences, they become hazardous when they cause human suffering and economic losses.

Flood events affect communities with high water levels or fast-moving waters, but they also impact sediment transport. This can result in infrastructure damage and restrict access to barges and other river vessels. In such instances, dredging may be the sole viable option to preserve the infrastructure’s viability and longevity. The severity of flooding is determined by the volume and distribution of precipitation within a specific area, the rate at which it infiltrates the ground, and the dynamics of the boundary, including its shape, size, and slope. These factors are considered when assessing flood risks. The primary concerns of flooding types in Wrangell are rainfall-runoff, rapid snowmelt, coastal and dam/levee failure inundation.

Rainfall-runoff Flooding is a common type of flooding; these floods result from high rainfall amounts and accompanying high surface runoff rates. Rainfall intensity, duration, and

distribution, and pre-existing soil moisture conditions and the geomorphic characteristics of the watershed all contribute to a flood's severity.

Snowmelt Flooding occurs when the major source of water involved in a flood is melting snow. Unlike rainfall, which can reach the soil almost immediately, snowpack can store water for extended period until temperatures rise above freezing and the snow melts. This frozen storage can delay the arrival of water to the soil for days, weeks or even months. Once the snow begins to melt, the water behaves much as it would if it had come from rain instead of snow by either running off, infiltrating into the soil, or both. However, snowmelt typically happens before soil thaw and can therefore be considered largely as surface runoff that results in rapid rise in river discharge.

Coastal Flooding occurs when water overflows or covers normally dry coastal areas due to high or rising tides. This occurrence typically arises from storm surge and high winds that coincide with high tides. Storm surge is primarily caused by the rising sea levels resulting from low atmospheric pressure.

Dam/Levee Failure can result from overtopping, seepage, internal erosion, inadequate foundation conditions, or structural deficiencies. These factors can cause substantial flooding by rapidly releasing an immense volume of water, potentially leading to catastrophic damage and loss of life, especially in areas within the inundation zone of the dam/levee failure. This topic will be covered further under Technological Hazards, High Hazard Dams.

Erosion is a geological process that involves the wearing away and transportation of earthen materials by natural forces such as wind or water. Weathering, a similar process, breaks down or dissolves rock but does not involve movement. Erosion is the opposite of deposition, the geological process in which earthen materials are deposited or built up on a landform. Erosion is typically carried out by liquid water, wind, or ice (from glacier movement and melt). The process of water-induced erosion is categorized into different types.

- *Splash Erosion*: The impact of falling raindrops.
- *Sheet Erosion*: Caused by runoff.
- *Rill Erosion*: The process by which runoff creates a stream.
- *Gully Erosion*: The stage in which soil particles are transported through large channels.
- *Coastal erosion* is the process by which local sea level rise, powerful wave action, and coastal flooding degrade or moving rocks, soils, and sand along the coast. All coastlines are susceptible to erosion caused by storms and other natural occurrences; however, the combination of storm surge during high tide with additional effects from strong waves results in the most damaging conditions.

4.1.2.2 Location

Wrangell has an overall low risk to flooding in the interior land areas, though some minor flooding can occur due to rainfall and snowmelt. Wrangell does not participate in the National Flood Insurance Program (NFIP), resources for flooding information is limited to local reports,

regional watershed assessments and USGS surveys. The Southeast Alaska Watershed Coalition (SAWC) conducted a watershed assessment in 2019.

“The purpose of the Wrangell Area Watersheds Assessment was to compile a dataset and report outlining key aquatic resources within the City and Borough of Wrangell, including an assessment of the current habitat condition of key aquatic resources, identification of sites that could benefit from restoration treatment, and outlining watershed management challenges and opportunities.”

This assessment identified areas of small floodplains throughout the interior portion of Wrangell. Stormwater control measures (SCM) were also identified and assessed in the town center to study potential flooding in Evergreen Ave, Town Center, and Heritage Harbor areas. No flooding was indicated in the assessment; however, localized flooding remains a potential. Although Wrangell is a coastal community, the relative risk for coastal flooding is low. Southeast Alaska is experiencing rapid land surface uplift due to the receding of glaciers. (Coalition, 2019)

4.1.2.3 Extent

Flooding in Wrangell is primarily attributed to rainfall-runoff, snowmelt, and coastal flooding, all of which are closely associated with natural erosion processes. These flood events predominantly impact low-lying developed areas, stream-adjacent strips, and coastal regions. In areas with steep slopes and unstable soil, erosion risks are heightened, particularly during prolonged or intense rainfall events. Pat Creek, Mill Creek, and urban low points along Zimovia Highway and Heritage Harbor exhibit the highest potential for rapid rainfall-runoff. While coastal flooding is historically uncommon, waterfront areas can still be affected during extreme tidal events, wind-driven storm surges, and prolonged swell. Although protective structures, such as the harbor breakwater, exist in the borough to mitigate risk, localized flooding and shoreline erosion can still occur during powerful storms. Erosion, both river and coastal, creates a compounding hazard associated with flooding in Wrangell. Additionally, sloped areas near streams or coastlines are susceptible to landslide-related erosion, particularly during heavy rainfall and following snowmelt. The overall magnitude and severity of flooding and erosion in Wrangell is “Negligible” where injuries and illnesses can be treated with first aid. However, minor loss of quality of life could occur. Critical facilities and services may be temporarily shut down for less than 24 hours. Additionally, less than 10% of property is severely damaged.

4.1.2.4 History

Wrangell has an overall low risk of flooding, with very limited historical data documenting significant events. The most notable coastal impact on record was from a storm on October 26, 1976, when high tides and waves caused minor waterfront damage, eroding soil and exposing structures. Inland flooding in Wrangell is generally localized and shorter in duration, typically resulting from periods of heavy rainfall. Although major flood events are not recorded, areas

such as Pat Creek, Mill Creek, and low-lying areas along Zimovia Highway and Heritage Harbor are susceptible to rapid runoff from heavy rainfall. Wrangell's coast flooding has a low risk due to land uplift and previous mitigation efforts that provide protective harbor structures to reduce coastal erosion. Because of the topography of Wrangell, localized inland flooding and ground failure from oversaturated slopes pose a risk to the planning area.

Wrangell no longer participates in the National Flood Insurance Program (NFIP), any reports or studies regarding flood or inundation zones are from 1976-1982. Additionally, the WCA does not participate in the NFIP program either, any information utilized to plan for flooding incidents are from the previous flood insurance study published.

4.1.2.5 Impact

Though Wrangell's flood risk is relatively low the effect of flooding inflicts widespread physical damage, ranging from minor debris fields to significant damage caused by extreme water flow, carrying debris, worsening the situation. Erosion further intensifies flood related damages and can occur both as a slow process or in sudden events. Flood and erosion disasters have a profound impact on infrastructure, the environment, and human lives. The extent of damages varies depending on the specifics of the flood, such as its type, severity, and duration. Flooding disasters have impacts far beyond initial damages, human health effects such as contaminated water supplies from sewage overflows or chemical spills. The flooding and erosion impact in Wrangell may not be felt through traditional flooding behaviors but may be felt through ground failure hazards that are exasperated by heavy rainfall and erosion.

4.1.2.6 Probability

FEMA's National Risk Index database has Wrangell's probability of significant riverine and coastal flooding as very low; it should be noted that this is predominantly based on aging and limited data. Inland flooding from rainfall or snowmelt has a slightly higher likelihood, particularly in stream adjacent areas, low lying terrain, and location with insufficient drainage. While historical data shows that large scale flood events are rare in Wrangell, climate variability and changing patterns of precipitation may change future flooding and erosion risks. The overall probability of significant flooding for Wrangell is low, the 100-year flood recurrence probability for a significant event is minimal, however, there is still a possibility that a significant event could occur within the next 10 years ($1/10=10$ percent). This is calculated based up on the data occurrence of previous events, since the event history is less than or equal to 10 percent likely per year the overall probability for Wrangell is "Unlikely"

4.1.3 Ground Failure (Landslides)

4.1.3.1 Description

There are several types of ground failure that occur across the globe, furthermore, the USGS divides landslide up into five categories known as falls, topple, slides, spreads, and flows, and within those basic types there are sub-types of landslides. While not all landslide types are applicable to the planning area, the ones with the greatest likelihood of occurring within Wrangell are introduced into this plan.

Landslides, a serious geologic hazard prevalent in almost every state in the US. The term “landslide” is a general term used to describe the downhill movement of soil, rock, and organic materials due to gravity. It also refers to the resulting landform. Some landslides progress slowly, causing gradual damage, while others move at an alarming speed, destroying property and taking lives abruptly. Gravity serves as the primary driving force behind landslide movement. Significant ground vibrations, slope failure due to excessive downward movement, gravity, and groundwater table changes often triggered by heavy rains saturating the soil are the primary sources of ground failure.

The basic components of a typical landslide, as depicted in figure 8 below, illustrate the most commonly used terms to describe its distinctive features. All illustrations utilized in this section were provided from USGS (Highland, 2008)

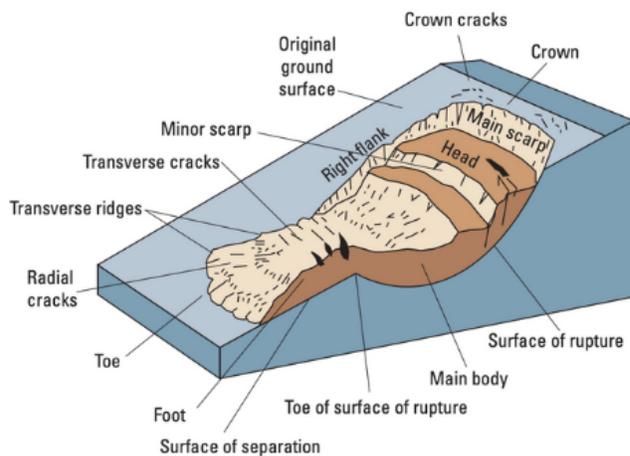


Figure 8 USGS Landslide Terminology

Falls

A fall begins when soil or rock, or both, detach from a steep slope and fall onto a surface. The falling material descends mainly through a falling, bouncing, or rolling motion.

Rockfall

Falls are abrupt, downward movements of rock or earth from steep slopes or cliffs. The falling material usually strikes the lower slope at angles less than the angle of fall, causing bouncing. It

may break on impact, roll on steeper slopes, or continue until the terrain flattens. This typically occurs on steep or vertical slopes, and in coastal area, along rocky banks of rivers and streams.



Figure 9 USGS Rockfall Slide

Topple

A topple is a type of landslide characterized by the sudden and downward movement of rocks or substantial masses of earthen materials. Instead of sliding or falling straight down, the materials rotate forward like it is tipping over. This typically occurs when the bottom of a slope is worn away by water, ice accumulation in cracks, vibration, undercutting, differential weathering, excavation, or stream erosion. Topples can happen slowly over time or suddenly, and they often occur on steep slopes or cliffs.

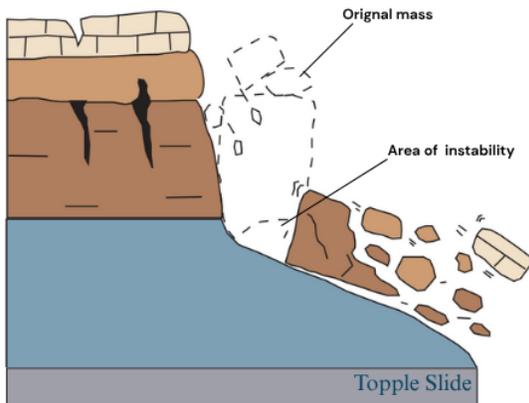


Figure 10 USGS Topple Slide

Slides

Slides occur when a substantial mass of rock, soil, or debris descends a slope along a clear, flat, or curved surface. The material generally remains together as it moves. Slides frequently occur when slopes become too steep or saturated with water, especially after heavy rainfall periods, causing the ground to weaken.

Translational Landslide

One of the most common landslides worldwide, the translational slide moves along a flat or slightly inclined surface, typically sliding downward in materials ranging from loose, unconsolidated soils to a mixture of extensive slabs of rock. These slides can potentially travel extended distances. Intense rainfall, snowmelt, flooding, rising groundwater, and other human related distances are the primary triggers of translation landslides.

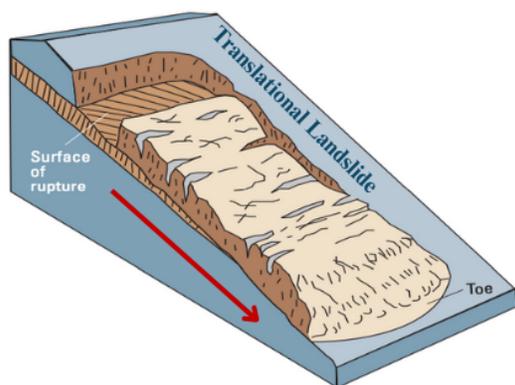


Figure 11 USGS Translational Landslide

Flows

Flows are categorized as loose materials like soil, rocks, or mud that move downhill like a thick liquid. They can occur suddenly or move slowly over time. The surfaces where the flow changes direction is short-lived, close together, and usually not retained. Typically, there's a transition from slides to flows, depending on the water content, mobility, and the nature of the movement.

Debris Flows

Debris flows are a form of rapid mass movement where loose soil, rock, and sometimes organic matter combine with water to form a slurry that flows downhill. These flows can be deadly because they may occur without any warning. Debris flows can be intensified when they occur on slopes that have been stripped of vegetation due to wildfires or forest logging. The movement of debris is generally shallow, resulting in a long and narrow runout. In particularly steep terrain, the runout can extend for long sections. The debris and mud typically stop at the base of the slopes, forming fan-like, triangular deposits known as debris fans.

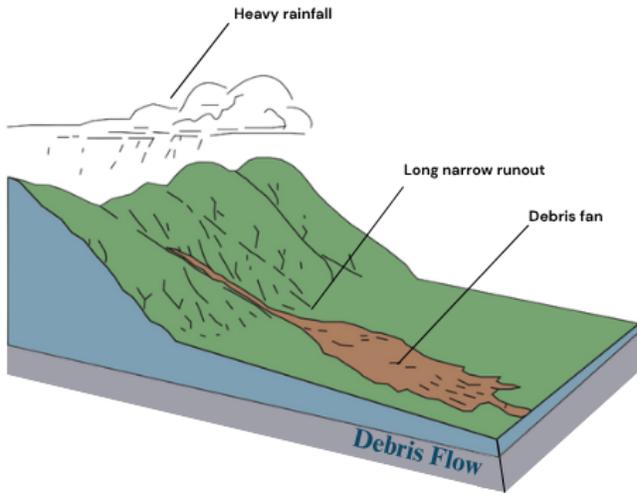


Figure 12 USGS Debris Flow Landslide

Earthflow

Earthflows occur on gentle to moderate slopes, typically in fine-grained soils like clay or silt, or even in bedrock containing clay material. Earthflows are susceptible in marine clay regions such as the St. Lawrence Lowlands of North America, coastal Alaska, and British Columbia. These flows are usually slower than debris flows, but they can transform into rapid earthflows or even debris flows under certain triggering events. These changes can cause a loss of shear strength in the landmass material, leading to sudden liquefaction and rapid flow.

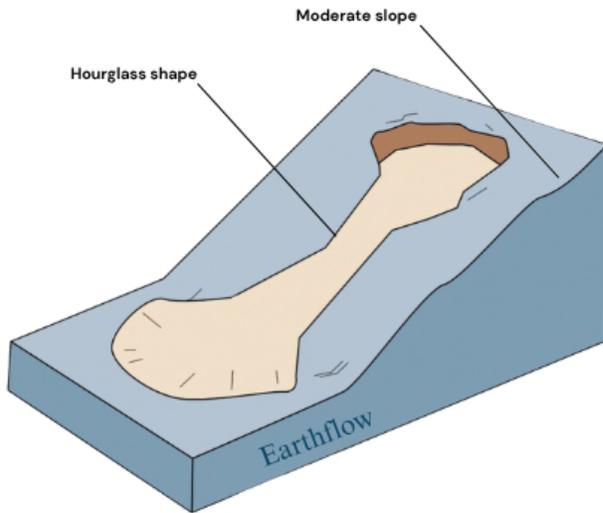


Figure 13 USGS Earthflow Landslide

Slow Earthflow (Creep)

The informal terminology for a slow earthflow is Creep. This is the slowest type of earthflow; it happens gradually over time as the ground very slowly moves downhill. Movement is hard to notice at first because the internal shear stress is sufficient to cause some deformation but not strong enough to cause rapid failure.

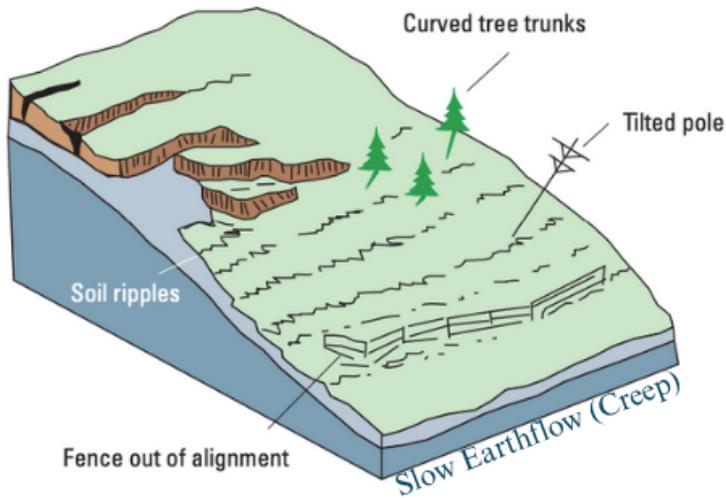


Figure 14 USGS Slow Earthflow Landslide

4.1.3.2 Location

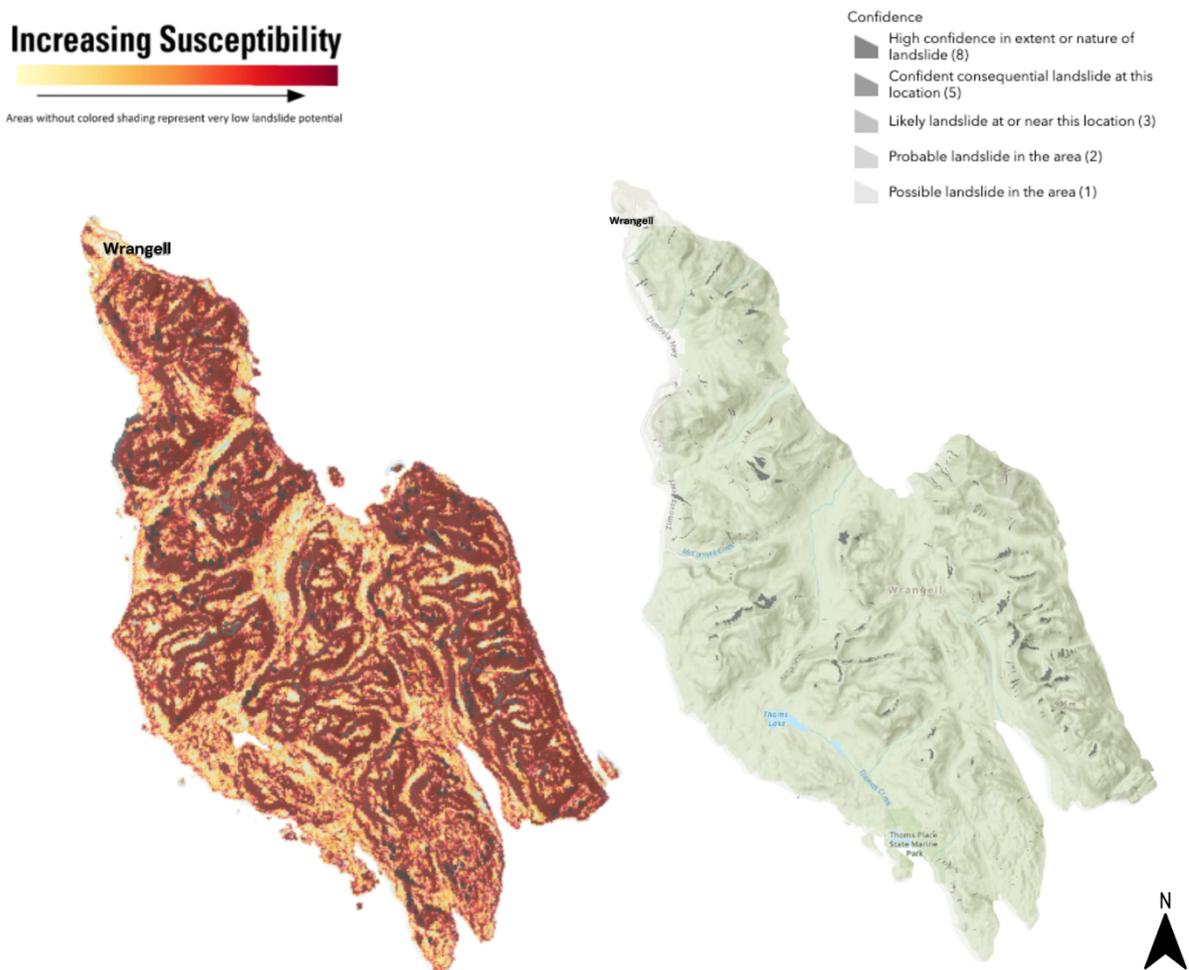


Figure 15 USGS Landslide Inventory and Susceptibility

As indicated on the mapping images above, the left image indicates where Wrangell has increased susceptibility of ground failure such as landslides in areas where the slope increases, particularly in areas where the slope is greater than 33%. The image on the right indicates areas in which landslides have previously occurred or have high probability to have occurred in the past. Further information regarding these documented areas can be located through the USGS Landslide Inventory and Susceptibility mapping tool. (U.S. Landslide Inventory Web Application, 2025)

4.1.3.3 Extent

Based on the historical record of ground failure incidents within the planning area, the potential impacts can range from minor environmental damage to severe incidents that result in property damage and loss of life. The nature and frequency of landslides in the borough pose a significant

risk, as they can occur rapidly with minimal warning. This hazard has demonstrated catastrophic consequences for the community, demonstrated by the 2023 landslide, which stranded residents on the outskirts of the populace area, requiring boat transportation to access the city center, in addition, communication lines were severed, further isolating these residents. The severity of a ground failure incident in Wrangell largely depends on the location of where the incident occurs, following a worst-case scenario the extent is “Critical” where injuries and/or illnesses result in permanent disability. Complete shutdown of critical facilities for at least two weeks and the potential for more than 25% of property is severely damaged.

4.1.3.4 History

Wrangell has a documented history of rain triggered landslides, with the recent incidents being the most significant in years.

Table 8 Landslide History

Date	Location	Impact
November 20, 2023	Mile 11 of Zimovia Highway	Large debris flows occurred near mile 11–11.2 of Zimovia Highway; the slide destroyed homes, buried the highway, and resulted in multiple fatalities and displaced residents. The Alaska Division of Geological & Geophysical Surveys (DGGS) produced a Preliminary Interpretive Report and subsequent lidar analyses documenting the November 2023 landslides and post landslide elevation changes. The mapping identified multiple landslide scars and elevation changes tied to that precipitation event.
November 5, 2016	Unknown	A small landslide was reported to The Department of Transportation (DOT), but no information about the location or damage was provided.
September 21, 2009	Mile 8 of the Zimovia highway	No injuries or significant damage were reported. The debris from the landslide was inside of a ditch, DOT had been informed about the incident.
October 4, 2006	Mile 8 of Zimovia Highway	A minor landslide occurred causing a car accident. The landslide carried fallen Alders, but fortunately, no injuries were reported. However, the vehicle sustained damage. The area, known as the Bluffs, had undergone logging during this period, and the fallen debris was believed to be a result of these logging activities.
December 14, 2003	Mile 7.5 of the Zimovia Highway	A combination of weather events including heavy rain, freezing and thawing temperatures caused a landslide of the embankment along Zimovia Highway. While the highways

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		pavement was not directly affected, Department of Transportation blocked off one lane of the road to prevent nighttime accidents and installed Jersey barriers as a mitigation factor for future incidents.
October 19, 2003	Forest Development Road 50054	US Forest Service announced a road closure due to a landslide. The landslide blocked the “Lost Joe Road”, also known as Forest Development Road 50054. The blocked road was on the south side of the Pat’s Creek Valley, past the junction of the Middle Road.
April 6, 2000	Mile 6 of the Zimovia Highway	Newspaper article states that roads were closed due to a landslide that occurred around 7PM near the Bluffs. The Police department notified State Department of Transportation who arrived on scene to clear a fallen tree only to discover that large boulders were underneath the debris and required extrication from Zimovia Highway, crews work on scene to clear remaining debris until nearly 8:30PM
January 1989	Upper Reservoir	Dirt and sand appearing in local pipes for the past month. Crews on March 2, 1989, discovered the increased turbidity apparently resulted from a landslide in the upper reservoir sometime in late January.” Further newspaper reports indicate that the landslide covered 12 acres and was up to 15 feet deep in some places. However, due to snow and ice in January accurate visual estimates were difficult.
October 12, 1982	Mile 1.5 of the Zimovia Highway	15 families were evacuated after mud and debris cascaded down the mountainside. No reports of damages to buildings or injuries. The “mudslide” was not as extensive as the slide that occurring in 1979. This occurred during a rain event, with rain coming in the days following the incident, sparking the limit of traffic through the area.
October 1979	Mile 1.4 of the Zimovia Highway	A hillside gave way, covering more than 20 acres with mud, trees and debris.

While large catastrophic slides are uncommon historically, Wrangell’s steep, forested slopes, high rainfall environment, and areas of known instability make rain-triggered landslides a locally documented hazard. All of the documented landslides recording in this section can be found through the Wrangell Sentential Newspaper.

According to U.S. Forest Service researchers, *Landslides have been happening throughout Southeast Alaska for thousands of years. Between 1998 and 2010, the U.S. Forest Service*

mapped landslides within the Tongass National Forest. Researchers found 252 landslides – or debris flows – just on Wrangell Island alone. (Czarnecki, 2024)

4.1.3.5 Impact

As development extends beyond the urban center into less developed areas characterized by inadequate infrastructure, the likelihood of landslides directly impacting human lives rises, particularly during the autumn and winter seasons when precipitation is more frequent, however, these events can occur at any time in the year. Landslides could pose a threat to bridges, roads, or the Zimovia Highway within the borough. Road obstructions resulting from landslides would exacerbate isolation challenges for residents residing in sparsely developed areas. Property owners situated on steep slopes may encounter damage to their dwellings or structures. Landslides moving vegetation such as shrubs and trees could disrupt utility lines, further isolating residents in rural regions. However, mass movements can occur anywhere within the borough affected by historical landslides or characterized by steep slopes.

4.1.3.6 Probability

Although current probability rates are less than 10%, making an incident such as this “unlikely”, there is plausible reason to believe an increase in probability to “possible” as based on Table 5 (equal to 10% but less than 20%) regional observations indicating an increase in the frequency and intensity of heavy precipitation events, historical events, steep slopes with a potential for instability. A reasonable estimate suggests an increased likelihood of ground failure or landslide incidents. Specifically, there is a substantial probability of at least one damaging, rain-induced landslide impacting inhabited or infrastructure areas in the proximity to the Zimovia Highway or other Wrangell residential areas.

4.1.4 Tsunami and Seiche

4.1.4.1 Description

Tsunami

A tsunami is a series of powerful ocean waves generated by significant disturbances such as underwater earthquakes, landslides, volcanic eruptions, or meteorite impacts. Tsunamis radiate outward in all directions from their source and can move around islands and into bays, sounds and up rivers. These waves possess the capability to traverse entire ocean basins, reaching speeds of up to 500 miles per hour, though these speeds depend on ocean depth, the deeper the water the faster the wave travels. However, in deep waters tsunami waves may go unnoticed. As they approach shallow coastal waters, their height can increase substantially. Wave heights can span from a few inches to over 100 feet, and they frequently consist of multiple waves occurring within a short time frame, ranging from minutes to hours. These tsunami waves can result in

catastrophic flooding, powerful currents, and widespread coastal devastation. While tsunamis are infrequent, they pose a serious threat to life and property whenever they occur.

Tsunamis are typically triggered by earthquakes because the earth's surface moves quickly, displacing the water above. However, not all earthquakes generate tsunamis, certain conditions must be met for an earthquake generated tsunami, such as size, vertical movement and proximity to the ocean floor,

Landslide generated tsunamis have the potential to be larger than seismic tsunamis near the source and may impact coastlines within minutes with minimal warning. However, they typically lose energy quickly and rarely affect distant coastlines. The energy of a tsunami generated by a landslide depends on the amount of landslide material that displaces the water, its speed, and the depth it reaches. There are two ways a tsunami can be generated by a landslide: a subaerial tsunami occurs when a landslide enters the water from above and displaces it, while a submarine landslide occurs when water is displaced ahead and behind an underwater landslide.

Seiche

Seiches are standing waves that oscillate in enclosed or partially enclosed bodies of water, such as lakes, bays, coastal inlets, and fjords. They are typically triggered by strong winds, severe storm fronts, atmospheric pressure changes, tsunamis, or seismic activity. While seiches are smaller than tsunamis, they can still cause localized flooding, erosion, and damage to waterfront infrastructure. Seiches are typically caused by strong winds and rapid changes in atmospheric pressure, which push the water from one end of the body of water to the other, similar to sloshing water in a confined container. When the wind or seismic motion stops, the water rebounds to the other side of the enclosed area, creating an oscillating motion that can last for hours or even days.

4.1.4.2 Location

Wrangell Island is situated along Zimovia Strait in Southeast Alaska. While it lies at some distance from deep-ocean subduction zones like the Aleutian Trench, its coastal position makes it potentially vulnerable to tsunamis generated by local underwater landslides, as well as tsunamis originating from large earthquakes elsewhere in Alaska.

In 1995 USGS in cooperation with the Federal Aviation Administration conducted an environment hydrogeologic report on the conditions of Wrangell. This report summarizes the overall low risk that Wrangell faces for storm surge or tsunami flooding occurrence. The 1968 Thanksgiving Day storm that was considered to be the largest storm in that time produced no unusual flooding in Wrangell (Overview of Environmental and Hydrogeologic Conditions at Wrangell, Alaska, 1995)

4.1.4.3 Extent

Current tsunami inundation maps do not explicitly include Wrangell among the coastal communities modeled for maximum inundation depth and flowing extent. Wrangell is considered to be low risk for tsunami inundation, however because Wrangell has coastal

infrastructure and low-lying areas along the Zimovia Strait, there are zones that could experience localized flooding from significant tsunami wave run up. There is currently limited tsunami impact data available. Based on this limited data, the magnitude and severity of tsunami impacts to the Wrangell area are considered “Limited” where the potential of a complete shutdown of critical facilities for more than a week or damage to more than 10% of property are considered.

4.1.4.4 History

Wrangell has minimal recorded history on tsunamis. However, the Wrangell Sentinel has few reports of tsunami warnings in the area. (Wrangell Newspaper Archive)

January 23, 2018, Wrangell residents were alerted to a tsunami warning just after midnight, following reports of an 8.2 magnitude earthquake occurring 175 miles offshore from Kodiak city. No damages were reported and within a few hours the tsunami warnings had been withdrawn.

January 5, 2013, a 7.5 magnitude earthquake located 100 kilometers west of Craig and approximately 6 miles under the earth’s surface. A tsunami warning was initially lodged for almost all of Southeast, including Wrangell. It was later cancelled within hours of the initial quake. No substantial elevation in the tide level at Wrangell or Petersburg were reported.

October 6, 1994, Wrangell, Alaska, received a tsunami warning due to an earthquake off the coast of Japan. Reports indicated that tide levels were less than a foot in some areas of Alaska, but there was no increase in Wrangell. Few residents expressed concern, and the school, situated at a high elevation, remained unaffected. However, a mill, closer to the coastline, temporarily shut down.

North of Wrangell on August 10, 2025, a landslide triggered a 100-foot tsunami. In an initial estimate, the landslide was possibly larger than 100 million cubic meters, this triggered a 100-foot run up near Sawyer Island. This landslide activity demonstrates that the devastating effects of a landslide triggered tsunami are possible within the Southeast Alaska area, thus including Wrangell.

The table below provides a list from the West Coast/Alaska Tsunami Warning Center. These tsunamis were generated across southeast Alaska and the Aleutian Islands. The earthquake or landslide generated tsunamis were those observed or measured tsunami waves throughout the southern region of Alaska.

Table 9 Southeast Alaska Tsunami History (National Geophysical Data Center, 2025)

Date	Earthquake Magnitude	Location Name	Latitude	Longitude	Maximum Water Height (m)
7/10/1958	7.8	Se. Alaska, Ak	58.37	-136.665	524.6
12/21/1962	6.5	Fox Islands, Aleutian Islands, Ak	52.47	-168.54	
3/28/1964	9.2	Prince William Sound, Ak	60.908	-147.339	51.8
7/2/1965	6.5	Fox Islands, Aleutian Islands, Ak	53.03	-167.55	0.08
10/1/1967		Grewingk, Ak	59.621	-151.106	60
3/11/1970	6	Andreanof Islands, Ak	57.5	-153.9	0.03
7/30/1972	7.6	Se. Alaska, Ak	56.82	-135.685	0.1
2/28/1979	7.5	Se. Alaska, Ak	60.691	-141.671	0.15
5/7/1986	8	Andreanof Islands, Ak	51.52	-174.776	0.9
5/17/1986	6.4	Andreanof Islands, Ak	52.327	-174.504	
11/17/1987	7.2	Gulf Of Alaska, Ak	58.586	-143.27	0.06
11/30/1987	7.9	Gulf Of Alaska, Ak	58.679	-142.786	0.43
3/6/1988	7.8	Gulf Of Alaska, Ak	57.262	-142.747	0.19
9/4/1989	7.1	Semidi Islands, Ak	55.543	-156.835	0.1
2/21/1991	6.7	Bering Sea, Ak	58.427	-175.45	0.15
11/4/1994		Skagway, Ak	59.5	-135.3	9
6/10/1996	7.9	Andreanof Islands, Ak	51.564	-177.632	0.51
8/8/2008		Kasatochi Volcano, Aleutian Is, Ak	52.18	-175.5	0.19
6/24/2011	7.3	Atka, Aleutian Islands, Ak	52.05	-171.836	0.1
9/2/2011	6.8	Fox Islands, Aleutian Islands, Ak	52.171	-171.708	0.06
1/5/2013	7.5	Se. Alaska, Ak	55.393	-134.652	1.5
7/25/2014	6	Palma Bay, Ak	58.335	-136.971	0.08
7/27/2015	6.9	Fox Islands, Aleutian Islands, Ak	52.376	-169.446	0.08
10/18/2015		Icy Bay, Ak	60.08	-141.3	193
5/1/2017	6.2	Skagway, Ak	59.821	-136.711	0.06
1/23/2018	7.9	Kodiak Island, Ak	56.004	-149.166	0.25
7/22/2020	7.8	Shumagin Islands, Ak	55.03	-158.522	0.24
10/19/2020	7.6	Shumagin Islands, Ak	54.608	-159.655	0.76
7/29/2021	8.2	Kodiak Island, Ak	55.325	-157.841	0.42
5/8/2022		Resurrection Bay, Ak	60.092	-149.444	0.06
7/16/2023	7.2	Sand Point, Ak	54.46	-160.76	0.15
8/7/2024		Pedersen Lagoon, Ak	59.904	-149.825	17
7/16/2025	7.3	Sand Point, Ak	54.549	-160.472	0.1
8/10/2025		Tracy Arm, Ak	57.84	-133.06	30

4.1.4.5 Impact

The most significant impacts would be concentrated along the community's coastal front. This area houses essential infrastructure, including the harbor, boat launch facilities, and coastal transportation routes. Moderate tsunami waves could potentially generate powerful currents capable of damaging dock, displacing boats and even sinking them. A severe tsunami would likely inundate the low-lying areas near the harbor and waterfront businesses. These impacts range from structural property damage, disruption to maritime industry and potential loss of life if immediate evacuation measures are not achieved.

4.1.4.6 Probability

Wrangell has a history of minor tsunami impacts, but there's no fully documented tsunami impact data. According to the criteria outlined in Table 5, a distant source tsunami is "Unlikely," where the event is possible within the next ten years, has a chance of occurring up to once every ten years, which is approximately 10%. The likelihood of such events occurring in history is less than or equal to 10% per year, but the recurrence interval remains unknown. The occurrence of an impact event is influenced by various factors, and the limited data in the area hinders the determination of the probability of recurrence.

4.1.5 Volcano

4.1.5.1 Description

A volcano is a rupture in the Earth's crust where magma, ash and gases escape to the surface. Volcanic eruptions can range from slow lava flows to violent explosions that eject ash high into the atmosphere. Volcanoes come in different shapes and sizes, depending on how they erupt, what kind of material they release, and how long they've been active. There are three main types of volcanoes, and several sub-type volcanoes. The three main volcano types are cinder cones, stratovolcanoes also referred to as composite volcanoes, and shield volcanoes.

Cinder Cone Volcano

Cinder cones are the most common type of volcano worldwide. Cinder cones are steep, conical hills typically characterized by a crater at their summit. Often surrounded by dark lava flows that come up from their base. Most cinder cones are only a few hundred feet tall and rarely go over 600 to 900 feet. Each cinder cone creates its own structure, made around a central vent. They usually have an asymmetrical shape. Most cinder cone eruptions are mild to moderate explosions, due to their relatively fluid magma, which contains a significant amount of dissolved gas.

Composite Volcanoes (Stratovolcano)

Classic composite volcanoes are characterized by their conical shape with a dished summit that descends steeply. These mountains typically have snowcapped peaks. Composite cones are large volcanoes, typically spanning thousands of feet in height, composed predominantly of lava flows, pyroclastic deposits, mudflows (lahars), and lava domes. These volcanoes exhibit

sustained activity over extended periods, ranging from tens to hundreds of thousands of years, and erupt periodically. Composite volcanoes are among the most intricate volcanic formations, known for their frequent eruptions, the generation of lavas with diverse compositions, and the occurrence of various eruption types. While they may possess multiple vents, the majority of composite cones have a primary vent situated at their summit.

Shield Volcano

Shield volcanoes, the largest on Earth, differ from composite volcanoes in their formation. While composite volcanoes rise to towering heights with conical peaks, shield volcanoes are broad giants. Their slopes are nearly flat on the Earth's surface, giving them a convex shape that becomes flatter near their summits. The gentle slopes of shield volcanoes are a result of their low viscosities, which generate thin, extensive lava flows. These extensive lava flows contribute to the substantial size of these volcanoes compared to their height. This type of volcano is common among the Hawaiian Islands, and in the Wrangell-St. Elias National Park in Alaska.

Alaska has the highest number of active volcanoes in the United States, most of which are located along the Aleutian Volcanic Arc. Due to the number of active volcanoes within Alaskan and the North Pacific, communities are at a higher risk from the active effects of a volcanic eruption. Because Alaska is reliant on-air travel, routes across an active volcanic pose the biggest concern for aviation safety. This includes widespread disruption due to volcanic hazards such as ash fall, volcanic gases, earthquakes, lahars, and pyroclastic flow. The long-term economic impacts are from infrastructure damage, tourism loss, and displacement of residents. Eruption types play a significant role in determining the physical impacts and hazards associated with an event. The hazards from a volcanic eruption often include:

- Acid Rain from volcanic gases are formed when sulfur dioxide and other gases and particles from volcanic eruptions react with oxygen, moisture, and sunlight in the atmosphere. These can damage crops, corrode infrastructure, acidify water sources, and cause respiratory irritation for people and animals.
- Lahars, composed of volcanic ash, rock, and water, are fast-moving slurries that cascade down valleys. Primarily formed by shield and stratovolcanoes, lahars are generated when loose, unconsolidated, and wet debris mobilizes. Eruptions can directly trigger lahars by rapidly melting snow and ice on volcanoes. The intense rainfall that accompanies eruptions further contributes to lahar formation, as rainwater can easily erode loose volcanic rock and soil on hillsides and in river valleys. These lahars can occur during or even after an eruption, burying communities beneath tens of feet of mud and debris.
- Lava flows are streams of molten rock expelled from a volcano during an eruption. Their speed varies depending on the slope and type of lava, ranging from a slow creep to several miles per hour. Although they rarely cause fatalities due to their movement, most lava flows move slowly enough for people to move out of their way. Flows typically don't travel far from the source vent. However, lava flows can destroy anything in their path, including homes, roads, crops, agricultural land, and forests, by burning, burying, or crushing.

- Pyroclastic flows are dense mixtures of hot, dry rock fragments and gases. These are fast-moving, ground-hugging clouds of hot gas, ash, and volcanic rock fragments. According to the USGS and NPS, pyroclastic flows can reach temperatures up to 1,500 degrees Fahrenheit and travel at speeds exceeding 200 miles per hour. Most pyroclastic flows consist of a ground flow composed of coarse fragments and an ash cloud that can be carried by the wind. They obliterate everything in their path, killing within seconds due to extreme heat and suffocation.
- Tephra, encompassing all solid material ejected from a volcano, ranges from fine ash to large boulders. Ashfall can blanket vast areas, causing roofs to collapse, contaminating water supplies, damaging machinery, and posing respiratory issues for both humans and animals. While large fragments typically fall back near the erupting vent, smaller fragment particles (ash) can be carried hundreds of miles by the wind, this ash causes respiratory problems, damages engines, and contaminates water supplies. Depending on the amount of ash that has fallen in an area, the weight of it can collapse roofs and the particles clog air filters, disrupting transportation and power systems such as generators.
- Volcanic gases, primarily water vapor, carbon dioxide, ammonia, sulfur, chlorine, fluorine, along with other substances, are primarily dispersed by the wind. The distance at which these gases can pose significant risks to humans, animals, and property can vary significantly depending on several factors. These gases contain acids, ammonia, and other substances. Inhaling excessive amounts of these gases can result in illness, respiratory distress, or even poisoning. Even small concentrations can harm crops, corrode metal, and cause acid rain. Moreover, heavier gases such as carbon dioxide can accumulate in confined spaces, leading to suffocation.

4.1.5.2 Location

The legacy 2020 MJHMP describes the closest active volcano as being 400 miles away, but no further information was provided. The Alaska Volcano Observatory (AVO) reported in 2022 that Mount Edgecumbe volcano is now considered to be historically active. This is in part by research that began in 2018 which led to the discovery that *significant ground deformation that has been measured, the upward deformation began abruptly in August 2018 and continued at a rate of 3.4 inches annually, for a total of 10.6 inches through early 2022.* (Volcanoes of North America: United States and Canada: New York, Cambridge University Press) However, Mount Edgecumbe currently poses no threat of eruption. Since the reclassification of Mount Edgecumbe to an active volcano there are now instruments in place to monitor the activity of the volcano. Therefore, the closest active volcano to Wrangell is approximately 135 miles northwest of the island. Moreover, there are several uninstrumented volcanic areas around Wrangell, these are considered inactive or dormant currently. The table below identifies potential volcanic hazards within relative proximity of Wrangell.

Table 10 Volcanic Hazards

Name	Distance (miles)	Latitude	Longitude	Type	Last Eruption
Addington Volcanic Field	99	55°26'24.00"N	134°10'12.00"W	Submarine volcanic field	Pleistocene
Behm Canal Rudyerd Bay	96	55°18'8.17"N	131° 0'11.59"W	Cluster Volcanic Field	Unknown - Evidence Uncertain
Duncan Canal	29	56°29'59.94"N	133° 6'0.06"W	Cluster Volcanic Field	Unknown - Evidence Credible
Mount Edgcumbe	135	57° 3'14.67"N	135°45'6.52"W	Cluster Volcanic Field	2080 BCE
Iskut-Unuk River Cones	77	56°31'10.56"N	130°19'51.60"W	Cluster Pyroclastic cone(s)	1800 CE
Tlevak Strait-Suemez Island	90	55°14'59.30"N	133°18'0.10"W	Cluster Volcanic Field	Unknown - Evidence Credible

4.1.5.3 Extent

Volcanic ashfall rarely poses a direct threat to human life, except in cases where extremely thick ashfall can cause structural damage to buildings or indirectly lead to casualties. Short term effects include irritation of the eyes and upper airways, as well as exacerbation of preexisting respiratory conditions like asthma. Affected communities may experience heightened distress, especially when eruptions disrupt day-to-day social and economic activities. Historically, Wrangell has experienced limited to no volcanic activity impacts. Therefore, based on the criteria outlined in Table 4 the impacts of a volcanic ashfall event in Wrangell would be considered “Negligible” where injuries and illnesses can be treated with first aid. However, minor loss of quality of life may occur. Critical facilities and services may be temporarily shut down for less than 24 hours. Additionally, less than 10% of property is severely damaged. The community should continue to further plan for an ashfall incident that may come from outside the surrounding areas, such as a catastrophic eruption from the Aleutian Island volcanoes or from distant Russian volcanoes.

4.1.5.4 History

There are no current records indicating volcanic activity within the Wrangell planning area; however, Alaska’s volcanoes have very diverse eruption histories spanning thousands of years. The Alaska Volcano Observatory (AVO) and The Smithsonian Institution's Global Volcanism

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Program (GVP) provide extensive reports on the history of volcanoes across Alaska. The table below provides history on volcanic eruptions based on the Volcanic Eruption Index (VEI) from moderate (VEI 2) to very large (VEI 6) within the last 1000 years. Figure 16 provides further explanation of the VEI scale with comparisons.

Table 11 Volcanic History State of Alaska (Smithsonian Institution National Museum of Natural History, 2025)

Volcano Name	Country	Last Eruption	Volcanic Landform	VEI
<u>Churchill</u>	United States	847 CE	Composite	6
<u>Novarupta</u>	United States	1912 CE	Caldera	6
<u>Kasatochi</u>	United States	2008 CE	Composite	4
<u>Okmok</u>	United States	2008 CE	Shield	4
<u>Spurr</u>	United States	1992 CE	Composite	4
<u>Aniakchak</u>	United States	1931 CE	Caldera	4
<u>Edziza</u>	Canada	950 CE	Composite	3
<u>Shishaldin</u>	United States	2023 CE	Composite	3
<u>Cleveland</u>	United States	2020 CE	Composite	3
<u>Bogoslof</u>	United States	2017 CE	Composite	3
<u>Redoubt</u>	United States	2009 CE	Composite	3
<u>Augustine</u>	United States	2006 CE	Composite	3
<u>Westdahl</u>	United States	1992 CE	Composite	3
<u>Ukinrek Maars</u>	United States	1977 CE	Minor (Basaltic)	3
<u>Trident</u>	United States	1974 CE	Composite	3
<u>Yunaska</u>	United States	1937 CE	Shield	3
<u>Katmai</u>	United States	1912 CE	Composite	3
<u>Iliamna</u>	United States	1876 CE	Composite	3
<u>Ugashik-Peulik</u>	United States	1814 CE	Composite	3
<u>Great Sitkin</u>	United States	2025 CE	Composite	2
<u>Semisopochnoi</u>	United States	2023 CE	Composite	2
<u>Pavlof</u>	United States	2022 CE	Composite	2
<u>Fourpeaked</u>	United States	2006 CE	Composite	2
<u>Seguam</u>	United States	1993 CE	Composite	2
<u>Kiska</u>	United States	1990 CE	Composite	2
<u>Vsevidof</u>	United States	1878 CE	Composite	2
<u>Fisher</u>	United States	1830 CE	Composite	2

The Volcanic Explosivity Index is a relative measure of the explosiveness of volcanic eruptions.

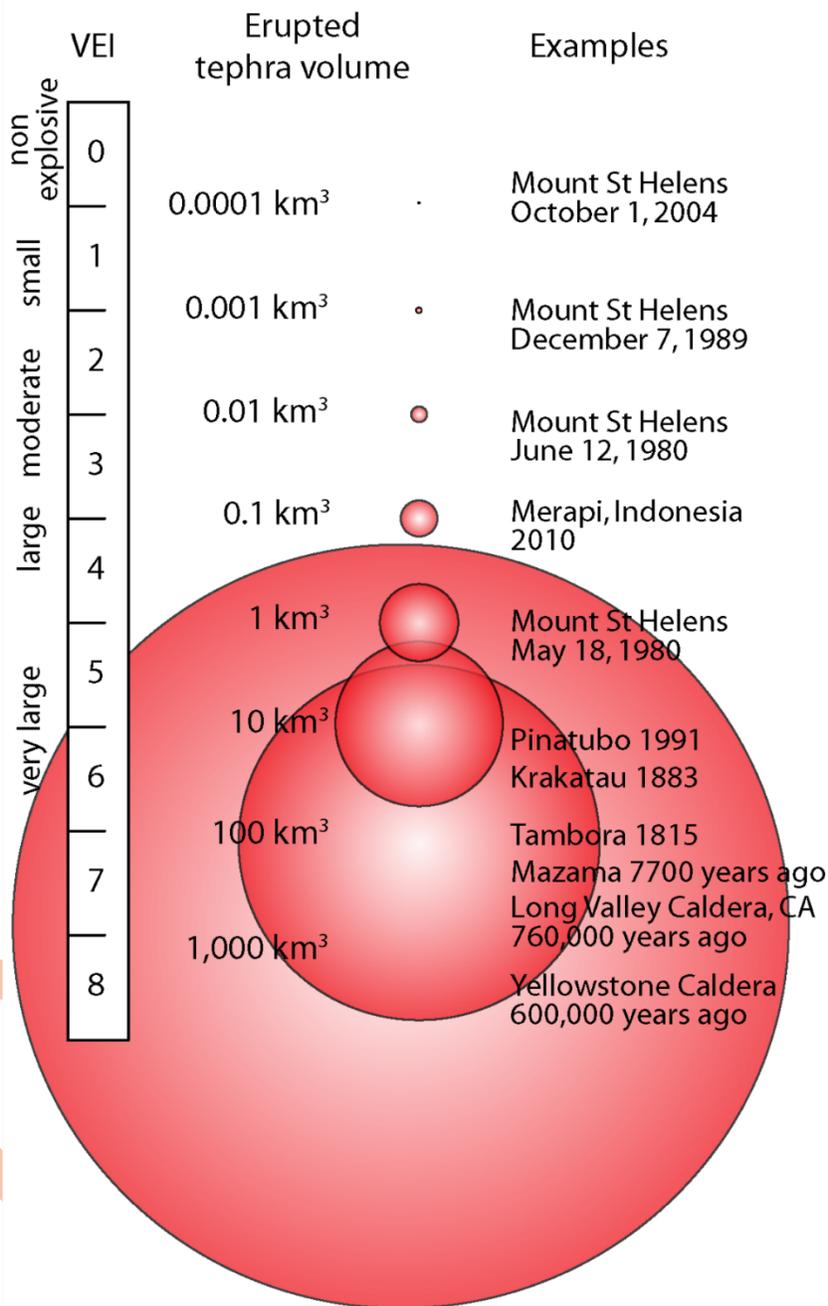


Figure 16 Volcanic Explosivity Index (VEI)

4.1.5.5 Impact

Any large-scale ash fall event would be devastating for Alaska, not only due to the resource constraints faced by remote communities but also because of the health impacts on the entire state. These impacts could range from potential water supply contamination to numerous

individuals experiencing respiratory problems from airborne ash fall, further exacerbating the demand for supplies. Communities like Wrangell must proactively plan for such events by installing filter systems in community buildings, shelters, and potentially distributing personal protective equipment like masks to the general public should they be required. Additionally, Wrangell relies on regional transportation efforts to ensure the delivery of essential supplies to the island. Air, water, and land transportation would be severely hindered depending on the severity of the ash fall, leaving Wrangell residents with limited transportation options. This would result could potentially result in forcing Wrangell residents to become completely self-sufficient for an undetermined amount of time.

4.1.5.6 Probability

The nearest potential volcano to Wrangell is Mount Edgecumbe, which currently poses no threat of eruption. Some Alaskan volcanoes are capable of producing large ash plumes far to the north/west region of Wrangell, these ash plumes can potentially be carried over under certain atmospheric and wind conditions. While the overall threat to Wrangell is very low on any given day, the potential for this event is largely dependent on larger volcanoes, regionally, and even globally. Due to the unpredictability this hazard is “Possible” where an event is probable within the next five years or has up to 1 in 5 years chance of occurring (1/5=20%). History of events is greater than 10% but less than or equal to 20% likely per year.

4.1.6 Severe Weather

4.1.6.1 Description

Wrangell is exposed to several types of severe weather hazards. Due to its coastal setting, temperate rainforest environment, and proximity to mountains, Wrangell can be impacted by heavy rainfall, coastal storms, high winds, heavy snowfall, and fog. Heavy rain is defined as rainfall of three inches or greater in a twelve-hour period, or six inches at two or more selected stations, or six inches or more in a twelve-hour period or less at a single station. High winds occur in Alaska when strong systems form in the North Pacific Ocean and the Gulf of Alaska. Alaska’s high winds can reach hurricane-force speeds but fall under a different classification because they are not cyclonic and do not possess other hurricane characteristics. In Alaska, high winds (winds greater than 60 mph) occur relatively frequently over coastal areas along the Bering Sea and the Gulf of Alaska. The combination of heavy rainfall, high wind events, and strong low-pressure systems can bring rough seas, leading to coastal storms. These storms typically occur in the fall and winter months.

Tragically, each year approximately 440 people lose their lives due to weather-related aviation accidents, primarily caused by low visibility and low ceilings. Fog can form rapidly and catch boaters off guard, reducing visibility to mere feet. Even the most experienced mariners can become disoriented in such conditions. Dense fog, particularly when severe, can pose significant

risks to drivers, mariners, and aviators and contributes to numerous travel accidents each year. Visibility restrictions due to fog can also impact takeoff and landing procedures, requiring specific conditions for pilots. Fog forms when water vapor in the air condenses into tiny liquid water droplets, reducing visibility. This condensation typically occurs when warm, moist air cools and comes into contact with a cooler surface, or when enough moisture is added to the air to reach saturation. Dense fog occurs when visibility drops to a quarter mile or less across widespread areas, making travel extremely challenging. Freezing fog develops when surface temperatures fall to or below freezing, causing tiny liquid droplets to freeze instantly on contact with surfaces such as vehicles and roadways. As a result, freezing fog poses significant hazards to driving, boating, flying, and other forms of transportation, with visibility often limited to one mile or less.

While heavy snowfall is common during the winter months in Alaska, it is generally moderate in Wrangell compared to other portions of the state. The National Weather Service defines heavy snowfall as snowfall that accumulates to four inches or more within a twelve-hour period, or six inches or more within a twenty-four-hour period. Alongside these heavy snowfall events, there is potential for ice accumulation and freezing rain. Freezing rain most commonly occurs in a narrow band within a winter storm that may also be 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.

4.1.6.2 Location

The Wrangell area experiences periodic severe weather impacts, with high winds and severe winter storms being the most common. The entire planning area of Wrangell can be affected by these hazards. Wrangell, nestled in the Tongass National Forest, is a part of a temperate rainforest. Wrangell has been experiencing a shift in its weather patterns in recent years. The region has witnessed a higher-than-average temperatures that persist for extended periods.

4.1.6.3 Extent

Life safety concerns include injury or fatalities from accidents, whether vehicular, maritime or aviation accidents. Severe weather also poses the risk to property and environmental damages, further disrupting critical facilities and community lifelines through potential power outages, reduced transportation abilities and other economic disruptions. Based on Table 4 the overall severity of these severe weather hazards would be “Limited” where injuries and illnesses do not lead to permanent disability. A complete shutdown of critical facilities for more than a week or damage to more than 10% of property are also considered significant disruptions. A heavy snowfall event could pose the biggest risk to disrupting any given critical facility for more than

one week, but loss of life and or injuries would most likely not result in permanent disability among the community members.

4.1.6.4 History

Wrangell is impacted by severe weather events in any given year, though the severe weather that impacts the community differs from each year. The table below provides a list of severe weather events to have impacted the Wrangell area. Each event type may not have directly impacted Wrangell; however, it occurred within close proximity or in a neighboring borough.

Table 12 Severe Weather History Southeast Alaska (NOAA, 2025)

Location	Date	Event Type	Impact
Southeast Alaska	January 18, 2005	Ice Storm	The most significant ice storm in Southeast Alaska in modern times occurred during a major overrunning event. Up to an inch of ice accumulated on surfaces in the Petersburg area Tuesday into Wednesday. Alaska Airline flights into Petersburg were cancelled and several minor traffic accidents occurred. Power lines sagged halfway to the ground due to the ice and caused outages in the community. The transmitter tower for KFSK radio iced over and caused them to go off the air for over 12 hours. Small trees and branches as large as six inches in diameter were snapped by the ice. Lastly, the Stikine River weather sensor was iced over and stopped transmitting data. A quarter inch of ice accumulation also occurred in Hyder (Tuesday) and in Yakutat (Wednesday into Thursday). Other than treacherous driving conditions, no significant impacts were reported in those communities. Light freezing precipitation (1/8" or less accumulation) also occurred in the communities of Juneau, Angoon, Kake, and Wrangell during this time. No significant impacts were reported in those areas.
Southeast Alaska	April 28, 2015	High Wind	An unseasonable storm hit the Southern Panhandle early on the morning of Tuesday April 28th. The low began to develop SSW of the Queen Charlotte Islands on Monday afternoon deepening to 979 MB over Dixon Entrance early Tuesday morning. The center moved over Sitka by 9 AM then rapidly weakened over the Eastern Gulf of Alaska Tuesday afternoon. Numerous reports of downed trees, power outages, and wind damage were reported particularly in Ketchikan. Gusts over 100 MPH were measured.
Southeast Alaska	October 9, 2015	High Wind	A deep 962 MB storm force low pressure system moved into the Eastern Gulf of Alaska on the morning of October 9th causing minor damage by wind for several coastal areas. Power outages were common and there was significant

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Location	Date	Event Type	Impact
			damage to a dock. The storm abated on the evening of Oct 9th. The maximum wind at Wrangell Airport was only 30 mph but more wind was suspected around both Petersburg and Wrangell due to power outages.
Southeast Alaska	January 25, 2016	High Wind	A Hurricane Force low was well established over the western Gulf on the night of 1/25. This system was so large that it had a strong frontal system in the eastern Gulf. A series of gale force to storm force lows developed along this system that moved northward along the outer coast then recurved back into the western Gulf. One of these systems caused extensive damage in the Edna Bay harbor late on 1/25 wrecking boats in the harbor. Max gusts in these systems were 75 to 80 mph. Public Radio in Wrangell reported power outages and very strong winds on 1/26.
Southeast Alaska	November 29, 2016	High Wind	An arctic front had become established over the Panhandle on 11/27 & 11/28. At the same time a storm force low developed well southwest of the Panhandle and moved rapidly toward the out coast while developing. The result was a radical pattern shift with a 964 MB storm off the coast con 11/29 that brought warm moist air over the arctic front while also causing high wind. Trees came down and snow was hard to remove, but no significant damage was reported. Petersburg ASOS 58 mph. Coffman Cove COOP 60 mph. Zarembo Island 60 mph. No damage reported.
Southeast Alaska	December 25, 2016	Winter Storm	A very strong Bering Sea low on 12/24 spawned a strong frontal system that raced across the Gulf to slam SE with another heavy snow event. This was a typical case of warm moist air overrunning cold air at the surface. Snowfall ranged from 1 to 2 FT. The only impact was intense snow removal.
Southeast Alaska	January 26, 2017	High Wind	A storm force low developed SSW of our forecast area deepening to 974 MB just off Cape Spencer early on the morning of 1/27. This low then dissipated over Western Gulf by afternoon causing minor damage for a few areas in SE Alaska. January 27, 2017, Kake Fuel Dock Storm Damage. SEOC Duty Officer was notified the City of Kake declared a local disaster for windstorm damage to the local fuel dock. A storm over the weekend had broken the dock and two steel pillars were lost to sea. SEOC continues to coordinate with City on related costs of damages.
Southeast Alaska	February 11, 2017	High Wind	Strong SSW flow aloft ahead of an occluded front on 2/10 brought snow, high winds, and even blizzard conditions to the Panhandle. As the front moved onshore on 2/11, warm air overrunning very cold air at the surface caused the snow

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Location	Date	Event Type	Impact
			to accumulate rapidly. White Pass was closed, and snow combined with wind gusts over 60 mph caused road and marine problems throughout SE Alaska. Some locations measured over a foot of new snowfall. Point Baker spotter recorded 60 to 70 MPH gusts on 2/11 with skiffs near sinking and branches down.
Southeast Alaska	February 27, 2017	Winter Storm	A strong upper-level disturbance moved over the Panhandle with a 1004 MBV Gale force Low just off Ocean Cape. This system rapidly deepened to 992 mb early on the morning of 2/28 as a strong front moved on to the coast dumping snow. The impact was snow removal, but no damage was reported.
Southeast Alaska	March 12, 2017	Winter Storm	On 3/12 the arctic front was over the central Panhandle as another in a series of storms moved northward from off the Pacific Northwest. By the afternoon of 3/12 the storm center had deepened to 981 MB off Dixon Entrance forcing warm moist air over the arctic air in place. The result was heavy snow for most of the Panhandle into 3/13 and lingering snow into 3/14. The impact was intense snow removal for storm totals up to 20 inches on top of an already deep snowpack. This was a setup for avalanches later that week.
Southeast Alaska	February 1, 2018	Winter Storm	On the first day of February, a strong area of frontogenesis developed with the front moving north into the southern panhandle. N-NE-E outflow wind will kept temperatures cold enough on the north side of the front to allow snow to get up to southern Admiralty Island. Increases in 850mb temps above freezing late Thursday night into Friday morning made the rain/snow line critical and difficult to forecast. Significant snowfall occurred for Port Alexander, Petersburg, Wrangell, Point Baker and Coffman Cove. Ketchikan had wintry mix. No damage was reports and the impact was snow removal. Some places could have had blizzard conditions with this event due to strong outflow. Port Alex had gusts of around 40kt during bands of snow. Highest snow falls extended a little farther south than expected. Petersburg, to Whale Pass to Thorne Bay, and Coffman Cove got buried. lighter amounts elsewhere. Snow changed to rain early in Ketchikan and overnight at Kasaan limited snow amounts to 1 to 2 inches there. Hyder still snowing as of 11 am 2/2 with 7 inches accumulated so far, and up to 9.3 inches as of 730 pm. Unknown about Port Alexander and Kake.
Southeast Alaska	February 22, 2018	Winter Storm	A short-wave upper trough moved over the Panhandle on the night of 2/22, and the associated front caused heavy snow for the Central Panhandle. Cold air in place closer to the coast

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Location	Date	Event Type	Impact
			mountains will resulted in heavy snow with a high-water content. Most snow was 10 to 1 or less which made heavy snow removal the main impact. Temperatures in Juneau warmed up into the mid 30s overnight on 2/22 causing Downtown, Lemon Creek, and the airport to change over to rain (with less than an inch of snow accumulation before that). Snow continued in the Mendenhall Valley, but rates were low enough that only around an inch of accumulation was observed. For Petersburg and Wrangell temperatures also warmed overnight 2/22 but more snow was observed before the changeover especially at Petersburg. wildly varying snow amounts with less then 1 inch at Kake and Wrangell while 5 to 6 inches were observed at 9 mile on the Mitkof highway.
Southeast Alaska	February 23, 2018	Winter Storm	The weather front swept over the central panhandle on 24 February, spreading snow over the cooler air trapped near the surface. An easterly flow pattern ahead of the front/low resulted in some upslope flow to the easterly slopes increasing the snowfall. Temperatures began warming to in the afternoon leading to a wetter snowfall in the afternoon and compaction of the snowpack. Petersburg trained spotter measured 10 inches of new snow at 1525 2/24. Impact was snow removal. No damage reported.
Southeast Alaska	April 10, 2018	High Wind	Complex low pressure persisted over the entire Gulf on 4/9 & 4/10. A very strong wave developed south of Haida Gwaii and skirted the coast of SE Alaska causing storm force wind and hurricane force gusts. There was some damage reported, and the peak wind was 100 MPH.
Southeast Alaska	November 13, 2018		A short fused-short lived, strong surface low pressure system developed on a front along the outer coast during the late morning hours on 11/13. This system was unique in that it was poorly handled by numerical models and NOT on any surface analyses. This low cause brief strong wind gusts 60 to 70 mph for Northern Prince of Wales, Kuiu, and southern Baranof Islands. There were also hurricane force gusts at Five Finger Light in Stephens Passage. Some minor damage was reported. Point Gardiner had measured gusts to 74 mph. Five Finger Light had gusts to 64 Knots. No damage was reported. Peak wind at the light was 91 mph.
Southeast Alaska	January 10, 2019	Winter Storm	Modified arctic air had moved over the Panhandle on 1/9 and 1/10 due to offshore flow from colder regions in Canada. Some temperatures had lowered to zero to +10F. On 1/10 there was a burst of warm moist air that moved over the Panhandle from the south causing numerous winter weather

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Location	Date	Event Type	Impact
			<p>advisories to be issued. Warnings were issued for both the Juneau and Hyder areas due to heavy snow. Impacts: intense snow removal, poor driving conditions, and travel disrupted. The Juneau School District closed schools. Details: Bands of snow set up over the central panhandle with the core over Juneau over an extended period of time. Outside of Juneau bands caused heavy snow in Gustavus, Hoonah, Tenakee Springs and Angoon. Prior to the snow reaching the central panhandle, snow fell across the south, changing to rain in Ketchikan and Hydaburg on time, but lasting longer over from Coffman Cove to Edna Bay north. The main low center remained over the far SE gulf/SW of Sitka. This caused NELY flow through inside passages including Klawock/Angoon and down Chatham Strait which kept surface temperatures colder longer, even though temperatures aloft were warming. The prolonged NE flow kept Angoon as below freezing until about noon Friday the 11th, at this time the low was moving inland and weakening. The wind shifted for Angoon enough to change to rain but remained cold enough for snow to continue in the Juneau area through 4pm Friday. However, during the day Friday the flakes became more icy or pellets, which caused the light fluffy snow that had fallen all day Thursday to compact down significantly and limit additional depth - although observers in Angoon and Hoonah noting still needing to clear a lot of snow off their vehicle's multiple times. Petersburg had a storm total 12 inches. Wrangell had a storm total 7 inches then turned to rain. Impact was intense snow removal and poor travel conditions.</p>
Southeast Alaska	February 6, 2019	Winter Storm	<p>Southwest flow aloft brought relatively warm moist air over the Panhandle on the afternoon of 2/5. Cold air was trapped in many places with favorable conditions for first for freezing rain, then snow. On the night of 2/5, a cold front stalled along the outer coast for additional accumulation of new snowfall. Snow persisted, although light, into 2/7 and was truly a dump. Freezing drizzle was observed at the beginning of the event, changing to snow by 2000. The Yakutat sounding showed a deep dry layer in the snow growth region. This region was saturated through the night with a change to snow. Juneau WFO began observing snow at 2200 on 2/5 with a glaze beforehand. The front then followed, and precipitation ended from north to south. Although some areas including Ketchikan stayed snow far longer than originally forecast, likely due to light winds,</p>

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Location	Date	Event Type	Impact
			heavier rates, and better forcing aloft. The big impact was heavy snow removal. Storm totals ranged from 6 to 12 inches new snowfall from this storm.
Southeast Alaska	February 26, 2021	Winter Storm	A warm front moved onshore from the southwest with heavy wet snow expected to fall in a short period of time. Rain changed back to snow in the Juneau area with a very wet slush accumulating. Temperatures remained cold enough in the upper Lynn Canal area for snow and a second wrap continued the snow into Sunday, even behind the cold front. Trained spotter in Petersburg reports 6 inches of snow in 12 hours at 5:40 pm.
Southeast Alaska	January 1, 2022	Winter Storm	A Winter storm that impacted Southeast Alaska at the end of 2021 continued into 2022. Winter storm warnings continued through this timeframe. General public reported 15.5 inches of snow has fallen from the event and has now switched over to rain.
Southeast Alaska	November 26, 2021	High Wind	A brief strong wind event knocked down trees into powerlines in Wrangell, Alaska. Days long widespread power outage was reported, with the state of Alaska declaring an emergency to get aid to the people of Wrangell. Emergency Management in Wrangell, Alaska reported multiple areas of trees knocked down by a brief strong wind event. Data from the event is sparse and no sensor was located near the damage areas, however the Zarembo Island RAWS station detected a peak wind gust of 54 miles per hour out of the Southwest.
Southeast Alaska	January 7, 2022	Winter Storm	A strong low-pressure system in the Gulf of Alaska brings Taku winds to Juneau ahead of the storm, and widespread winds and snow across Southeast Alaska. Heavy snow transitioned to rain across much of the area. This along with antecedent snowfall created roof load issues across the area with structural collapses in Juneau and Yakutat. Rain on snowpack and frozen ground created icy conditions across the area that impacted transportation for days following the event.
Southeast Alaska	February 1, 2022	Winter Storm	A gale force low produced widespread snow across Southeast Alaska. Winter storm snow amounts fell along the Icy Strait Corridor northward along with snow prone areas of the Southern Panhandle. A trained spotter in Petersburg reported 9 inches of snow at 9:30 am on February 2nd.
Southeast Alaska	February 22, 2022	Winter Storm	A short wave moving over the top of ridge across the gulf of Alaska will spread overrunning snow to the northeast gulf coast and towards the Cross Sound area Tuesday. Eventually shifting south for the Petersburg/Wrangell area Tuesday

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Location	Date	Event Type	Impact
			night. The front eventually dropped into the southern Panhandle by mid-day Wednesday. Petersburg Cooperative Observer at the Petersburg airport measured 5 inches of fresh snowfall.
Southeast Alaska	April 6, 2022	High Wind	A strong low-pressure system brought strong winds to the coastal regions of Southeast Alaska, with some locations reporting high wind speeds. Ketchikan Airport reported a wind gust of 58 mph.
Southeast Alaska	November 21, 2022	High Wind	A deepening low moving through the Gulf towards the SE coast resulted in high winds for part of the southern panhandle. There were repeated wind gusts on islands adjacent to Prince of Wales Island in excess of 70 mph, including Ship Island and Lincoln Rock. Peak gusts of 58 mph were measured at the Hydaburg Seaplane Base at 841 am and 1033 am Monday the 21st.
Southeast Alaska	November 23, 2022	High Wind	A storm force low and front moved into the gulf from the south causing high winds over portions of the southern panhandle while the northern borders had colder northerly flow to start and snow. The Hydaburg AWOS reported numerous wind gusts in excess of high wind criteria, including one wind gust at 1040 AM AKST November 23rd which measured 70 kt.
Southeast Alaska	December 22, 2022	Heavy Snow	The COOP observer in Thorne Bay reported that snow had begun around 10pm on the 22nd and measured 8 inches by 8am the next morning with heavy snow continuing to fall. They measured another 3.5 inches by 6am on the 24th when snow had ended or changed to rain. Other communities on Prince of Wales Island reported 9 inches of snow had fallen before changing to rain on the 24th.
Southeast Alaska	January 1, 2023	High Wind	A storm force low and accompanying front moved northward over SE AK. Low level winds from the frontal band mixed down to generate high surface winds. Very heavy wet snow also fell over the Klondike Highway and White Pass. Rooftop wind at the Ketchikan Airport measured a peak gust of 50-70kt between 1153am and 4pm on the 20th. COOP observer to the north at 3pm noted strong SE wind of 35-50 mph with higher gusts to 60 mph estimated and tree debris all around from high wind.
Southeast Alaska	January 20, 2023	High Wind	A storm force low and accompanying front moved northward over SE AK. Low level winds from the frontal band mixed down to generate high surface winds. Very heavy wet snow also fell over the Klondike Highway and White Pass. Hydaburg Seaplane Base measured a peak gust of 64 mph at 112pm on the 20th.

City and Borough of Wrangell Hazard Mitigation Plan

Location	Date	Event Type	Impact
Southeast Alaska	February 24, 2023	Heavy Snow	COOP station at the Petersburg Airport measured 6 inches of snow had fallen by 9pm on the 24th and another 8 inches by 830am on the 25th with snow continuing to fall. Another trained spotter in the area had around 12 inches storm total.
Southeast Alaska	March 1, 2023	Winter Storm	A strong low pressure developed over the northern Gulf of Alaska bringing significant moisture to Southeast Alaska. Cold air entrenched over the region at low levels ahead of the event allowed for significant snow to fall across the area in two major pulses. The first being along the warm front, with a period of blizzard conditions over Juneau, and the second pulse occurred as the cold front moved across the region. Snow began late on February 28th and became heavy through the following morning with periodic gusts of around 30mph. A change to rain happened in the late morning. A trained spotter south of Wrangell measured 6 inches of dense snow.
Southeast Alaska	April 9, 2023	High Wind	Reports were received that a storm blew trees onto Mitkof Highway and snapped two power poles near the Crystal Lake Hydroelectric Plant. The bulk of the damage occurred between 3- and 18-mile Mitkof Highway. around approximately 12:30 PM AKDT (11:30 AM AKST). Customers in that area were without power on Easter Sunday for more than 5 hours.
Southeast Alaska	October 9, 2023	High Wind	Marine Exchange station at Salmon Landing near Ketchikan Harbor recorded a peak wind gust of 60mph at 0603AKST. Other nearby marine sites measured similar or higher gusts in the 1 to 3 hours around the same time.
Southeast Alaska	November 8, 2023	High Wind	The Craig NWS weather station measured a peak gust of 60 mph at 1124pm on the 8th. On the opposite side of the island, a little over an hour later a wind gust of 63 mph was measured near Thorne Bay during frontal passage.
Southeast Alaska	November 20, 2023	High Wind	The Marine Exchange of Alaska mesonet station at Salmon Landing measured a gust of 67 mph at 733am on the 20th and continued to periodically reach high wind through 813pm. Peak winds were observed in Ward Cove with a gust of 75 mph at 744pm. Other mesonet stations reached near or above high wind criteria across Revillagigedo Island, with a peak wind gust of 58 mph reported by the Ketchikan ASOS at 510pm. Heavy rain in addition to the winds caused a tree to slide down a slope near Ward Cove that was reported around 1155am, and other power outages were reported in the area.

City and Borough of Wrangell Hazard Mitigation Plan

Location	Date	Event Type	Impact
Southeast Alaska	December 12, 2023	High Wind	Report of a downed tree at approximately 130pm, in the power line at 5.5-mile Zimovia Highway and another tree town at 6.5 mile. Trained spotter also reported the outage. Winds on nearby Zarembo Island saw a peak gust of 68 mph at 255pm. A second power outage was reported at 320pm with a tree down across 8-mile Zimovia Highway.
Southeast Alaska	December 23, 2023	High Wind	Low pressure tracking toward south-central Alaska swept a front from south to north over the panhandle on the 23rd. This front brought heavy snow to the upper elevations of the Haines and Klondike Highways and high wind to the southern half of the region. A high wind event from an advancing front resulted in an extended duration of high winds. The AWOS at the Hydaburg Seaplane base recorded a peak wind gust of 85 mph at 333 PM AKST December 23.
Southeast Alaska	January 13, 2024	Winter Storm	Over an extended long weekend event, a prefrontal trough followed by a stronger main system with attached moisture plume, delivered first a wave of dry powdery snow with very high snow ratios (40:1 to 50:1 in many places). The next wave/front of snow was wetter and difficult to shovel, with some places seeing a period of freezing drizzle in between the two waves. As the 2nd front tracked southward on the 16th, bringing snow to those areas and extending the duration of the event. Light snow fell during the MLK long weekend across Wrangell with heaviest rates falling on the 15th between 10am and 10pm. A trained spotter measured 14 inches storm total by late evening and others on social media confirmed that amount the next day.
Southeast Alaska	January 28, 2024	High Wind	A strong storm force low pressure system over the North Pacific lifted north and moved into the Gulf of Alaska by the morning of January 29th. There was an associated atmospheric river along the warm side of the cold front that had a significant amount of sub-tropical moisture within it. Along with the high anomalous moisture values, there was a very warm airmass with the atmospheric river which increased freezing levels across Southeast Alaska to more than 5000 feet. There was a deep snowpack at upper elevations and near sea level, which melted with the heavy rain to increase the amount of runoff into rivers and streams. Another low-pressure system developed along the frontal boundary which stalled the front over the region to produce continued prolog heavy rain but also high winds. The combination of high winds and heavy precipitation on snow at high elevations triggered a number of avalanches near Haines.

City and Borough of Wrangell Hazard Mitigation Plan

Location	Date	Event Type	Impact
			<p>The 2-day precipitation total across the northern half of the Southeast Alaska ranged from 2 to over 4 inches along with significant amount of snowmelt and runoff from the high freezing levels and the heavy rain melting the snowpack. The heavy rain triggered a small landslide in Haines near Lutak, another near mile 6 of Zimovia Highway in Wrangell. There was some minor overland flooding from poor drainage near the Haines airport by the afternoon of January 29th. Near the Juneau area there was a lot of minor flooding of small streams going over their banks from the rain and snow runoff through January 30th but there was moderate flooding near Jordan Creek that impacted a few homes, business and roadways.</p> <p>Tree fall was widespread across the region from this event due to the saturated ground and high wind gusts of 60 to 90 mph.</p>
Southeast Alaska	February 1, 2024	Heavy Snow	<p>Snow fell along the front in a narrow band centered over Juneau, Angoon, and Kuiu Island. The front slowly shifted eastward through the following day, February 1st, with rain transitioning to snow over Petersburg and northern Prince of Wales Island. Snow began to fall at the Petersburg airport at 1130am on the 1st and the COOP there measured 6 inches of snow by 9pm. A trained spotter near 9-mile Mitkof Highway measured a total of 7.5 inches the next morning.</p>
Southeast Alaska	February 27, 2024	Winter Storm	<p>A slow-moving system with cold air in place brought widespread snowfall across the panhandle. Blowing snow with reduced visibility and heavy rates were observed followed by post-frontal snow showers. A trained spotter south of Wrangell measured 4 inches of snow by 8am on the 27th with 1 mile visibility. By 7pm their total was up to 6.5 inches. Intermittent moderate snowfall continued through the night with another 2 inches falling, but the total compressing down to 7.25 inches. The Wrangell airport observer measured periodic gusts of 20-30 mph during the day on the 27th and visibility down to a quarter mile briefly.</p>
Southeast Alaska	September 30, 2024	High Wind	<p>A strong autumn low developed over the Gulf, and sent a strong front sweeping into the panhandle, bringing with it high winds to the southern panhandle and outer gulf coast, before the front weakened as it moved north. Craig weather station CRGA2 recorded a peak wind gust of 60 mph during frontal passage at 1324 AKDT.</p>
Southeast Alaska	October 12, 2024	High Wind	<p>Marine Exchange stations in downtown Ketchikan measured multiple gusts in excess of 60 mph on Saturday October 12th. The peak wind gust of 63 mph was measured at</p>

City and Borough of Wrangell Hazard Mitigation Plan

Location	Date	Event Type	Impact
			Salmon Landing at 133pm AKDT. Local officials in Ketchikan reported at 233pm AKDT that a section of road was closed due to tree damage. Earlier, as the warm front passed, this Salmon Landing location also had a single peak gust of 62 mph at 104am AKDT, but no other locations had high winds at that time.
Southeast Alaska	October 29, 2024	High Wind	The Hydaburg AWOS measured a peak gust of 56 knots or 64 mph at 326pm AKDT on the 29th. The AWOS stopped reporting after 456pm while other stations on the island measured peak gusts after this time until 10pm. The Klawock COOP noted damaging winds in their afternoon report and Craig Police reported small branches were found on the highway and some side roads.
Southeast Alaska	November 6, 2024	High Wind	The Marine Exchange station at Saxman measured a peak gust of 62 mph at 853am AKST on Wednesday the 6th. Other observation sites in the are reported peak gusts of 45-55 mph between 7am and 11am that morning. The Ketchikan Indian Community and Tribal Health Clinic reported the high winds were causing doors to be dangerously ripped open.
Southeast Alaska	November 18, 2024	Heavy Snow	Public report of heavy snowfall rates falling over eastern Prince of Wales Island Monday evening. They estimated 2 inches on the ground around 5pm and measured 8 inches by 9pm in Thorne Bay. The COOP observer measured a total of 12 inches at Thorne Bay the following morning.
Southeast Alaska	November 28, 2024	Winter Storm	A warm front which stalled over the central panhandle during an active weather pattern brought accumulating snow to more interior parts of SE AK. Cold outflow winds in the northern panhandle kept the system from advancing further N, while precipitation in the far southern panhandle remained as rain. Reports on social media were received of new snowfall in Wrangell of 8+ inches of new snowfall. One report indicated that as of 8pm on the 28th that 12 inches of snow had fallen, with eight inches of that to have fallen since noon. Another trained spotter south of town measured 10 inches by 10pm and reported it as very dense and heavy. Snow ending time is estimated.
Southeast Alaska	January 3, 2025	Heavy Snow	Light snow fell overnight but quickly became moderate to heavy with several inches stacking up between 6 to 9am. Greatest amounts were reported with social media during the 8am hour, including 6 to 8 inches on the south side of

Location	Date	Event Type	Impact
			Ketchikan. The band of snow showers shifted north of the area by noon.

4.1.6.5 Impact

The entire borough is susceptible to heavy rainfall events, coastal storms, dense fog, high winds, heavy snowfall and some ice accumulations, and the potential for freezing fog. High wind events are often triggered or accompanied by strong North Pacific and Gulf of Alaska low pressure systems. Heavy snowfall is less severe compared to other regions of Alaska, however, there have been several heavy snowfall events in the past. Dense fog events are frequent in the maritime region throughout Alaska; Wrangell Airport commonly monitors for such events. Dense fog reduces visibility on roadways, maritime channels, and aviation channels as well. Economically, these severe weather hazards pose a risk to supply chain delays, disruption to tourism, and maritime trades to be hindered as well. Heavy snowfall coupled with warming temperatures and high wind potentials also leads to greater increased risk of landslide triggers.

4.1.6.6 Probability

The overall probability of severe weather in Wrangell varies largely by hazard type for severe weather. While some hazards like high winds, winter storms or heavy snowfall might be higher than thunderstorms and freezing fog the overall probability of one of these events occurring in any given year is greater than twenty percent, making the probability “Likely” as these hazards have a up to 1 in 3 years chance of occurring (1/3=33%).

4.1.7 Wildfire

4.1.7.1 Description

Wildland fires are unplanned fires that burn in natural areas such as forests, tundra, shrublands, or grasslands. These fires often begin unnoticed and can spread rapidly, especially during dry and windy conditions. In many cases, wildland fires are first detected by dense smoke that may be visible from miles away. Fires can be caused by both human activity such as unattended campfires, burning debris, equipment use, or from natural events like lightning strikes. In Alaska, lightning caused fires are common in the Interior during summer months, while human-caused fires are more likely to occur near populated or accessible areas.

Wildland fires are categorized based on where they occur and how they interact with developed areas. These categories include forest fires, tundra fires, urban fires, and prescribed burns. Fuel is the type, amount, and condition of plants that can be burned. When there is a lot of dry, dead, or dense vegetation, fires can spread faster and be more intense. The continuation of fuel across the ground and vertically through vegetation layers also affects the fire’s behavior.

Weather is the most variable and unpredictable factor affecting wildland fires. High temperatures, low humidity, and strong winds contribute to increased fire risk and rapid spread. In contrast, cooler temperatures and higher humidity can help suppress fire activity. Additional hazards, such as beetle-killed forests caused by spruce bark beetle infestations, add to the fuel load and fire danger in many areas.

Even small wildland fires can quickly grow into emergencies if not promptly controlled. They pose significant threats to human life, property, critical infrastructure, and natural resources. Fires can damage transportation routes, disrupt power and communication systems, destroy homes and facilities, and severely degrade air quality.

Climate change plays a growing role by increasing the frequency of drought and drying out both living and dead plant matter, making ignition more likely. As Alaska's climate continues to warm, communities across the state will face increasing exposure to wildland fire risk. These impacts including longer fire seasons, potential for more lightning storms, and the changing vegetation patterns are increasing the frequency and intensity of wildland fires across the United States.

4.1.7.2 Location

Wildfires in the geographic area around Wrangell span from urbanized sections to more rugged terrain. Certain areas are inaccessible due to steep slopes, rugged terrain, and dense vegetation. Urbanized areas refer to structures or properties within urban or developed areas. For this plan's purposes, urban fires are defined as significant fires impacting or potentially affecting multiple properties. These types of fires are rare in modern and developed cities but could occur if linked to other disasters like earthquakes, aircraft crashes, lightning strikes, or human caused ignition sources. Figure 17 below provides historical mapping of wildfires within 50 miles of the City and Borough of Wrangell.

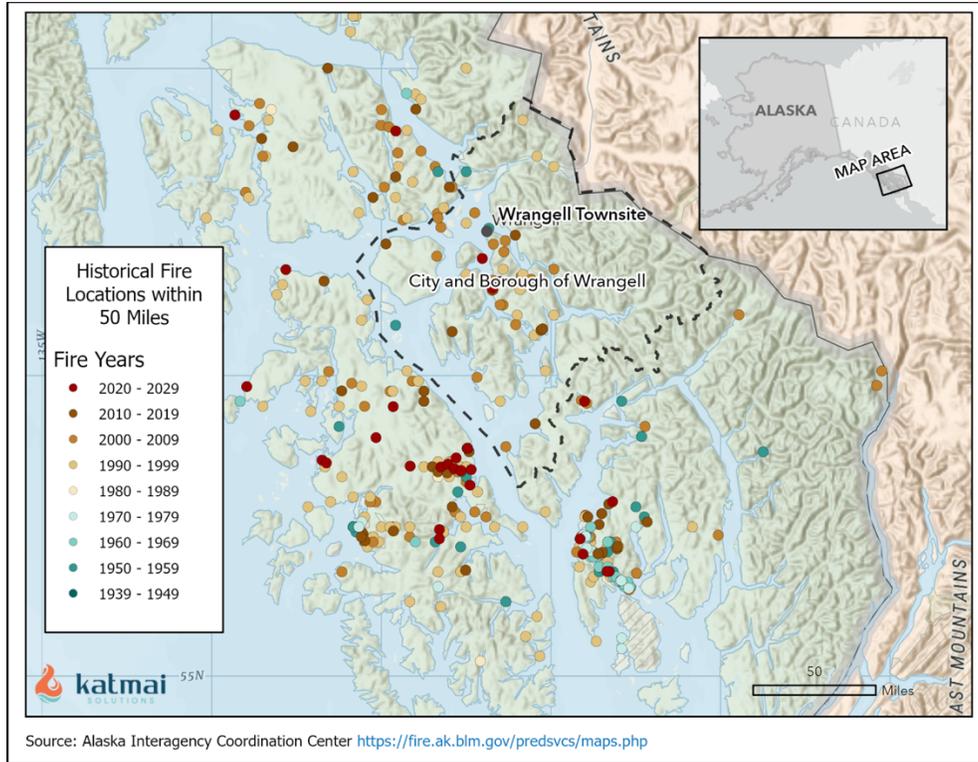


Figure 17 Historical Fire Locations Map

4.1.7.3 Extent

Wildfires within the Wrangell planning area are historically rare and generally limited in size, however, records from the Alaska Interagency Coordination Center (AICC) provide extensive data on wildfires within the region. While Wrangell is located within a temperate rainforest in the Tongass Forest, changes in the climate in recent years could increase the overall risk of wildfires within the planning area. Warmer spring, summer and fall temperatures, and a reduction in precipitation are leading to drier vegetation, lowering the moisture within the vegetation increases the amount of dry fuel for fires to burn. Factors such as humidity, wind, topography and lightning strikes play a role in shaping future fire potentials. Because of the overall limited number of large-scale fires within the planning area, the overall magnitude and severity of wildfires is “Negligible”. While critical facilities may require shutdown for no more than 24 hours, the overall amount of potential property damage is likely to be less than ten percent, as wildfires within this area are more likely to occur in the further remote densely forested portions of the borough. The risk of impact grows significantly if a fire occurs near Wrangell’s population center, where even a small event could threaten lives, destroy property, and disrupt critical services.

4.1.7.4 History

Figure 18 below provides historic fire locations within the region to Wrangell.

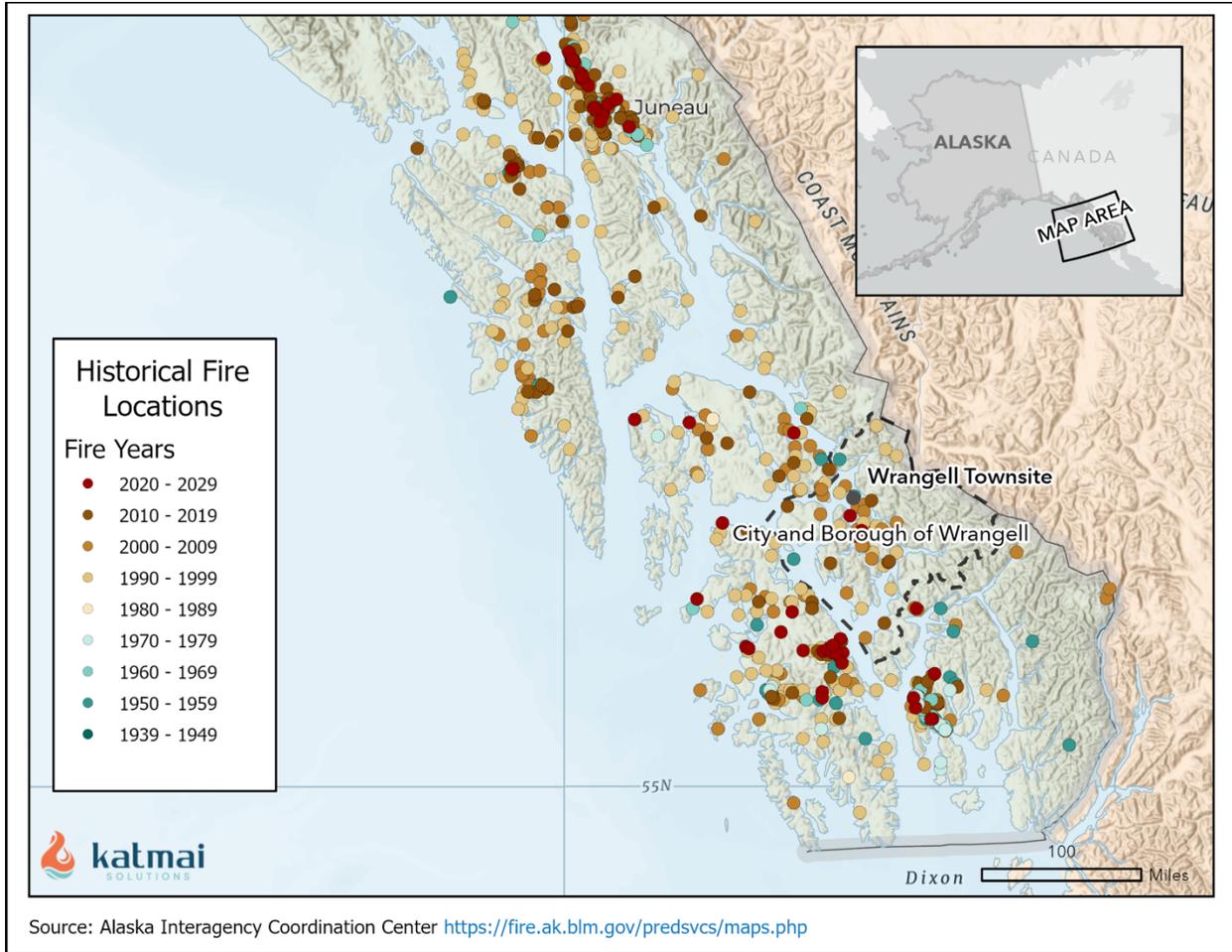


Figure 18 Historical Wildfire Neighboring Jurisdictions

Data collected from AICC identified 347 fires between 1953 and 2025, some of these fires burned less than an acre and were predominantly human caused due to uncontrolled campfires, burn pits or other negligence. Fewer fires were caused by lightning strikes. The largest fire in this database occurred in 1980 and burned 588 acres in Petersburg. The table below lists the top 25 fires within the regional area, with the largest outlier being 588 acres burned, and the smallest falling in at just 3.5 acres burned. (Alaska Interagency Coordination Center, 2025)

Table 13 Wildland Fire History

Fire Name	Fire Season	Acres Burned	Cause
N Hamilton	1980	588	Undefined
932009	1989	475	Man
032013	1990	320	Other
SMITH COVE	1993	127	Equipment
MILL	1998	118	Other
N. Thorne	1989	100	Man

City and Borough of Wrangell Hazard Mitigation Plan

Saxman	1971	65	Unknown
Copper Mountain	1997	46	Slash Burn
SUNNY HAY FIRE	1993	30	Other
Bay Log	1958	26	Debris Burning
Walker Cove	1958	19	Unknown
Alcoa	1965	14	Smoking
Harris River	1958	12	Smoking
NOSSUK	1996	10	Other
BORDER	2000	8	Logging
Rainbow Falls	2004	6	Undefined
No Name	1990	6	Camping
Blind River	1958	5.6	Campfire
BIG TROUBLE	1996	5	Children
032016	1990	5	Other
North Pt. Higgins	2005	4	Undefined
Union Bay	2002	4	Undefined
SARKAR ROUTE	1995	4	Campfire
Metlakatla Dump Fire #1	1971	4	Burning Dump
Kosciusko Bay	2004	3.5	

4.1.7.5 Impact

Past events have resulted in minimal injuries, damage to infrastructure, and only short-term disruptions. Most fires have been small enough to be quickly contained. Wrangell’s overall fire hazard remains low, but climate change is increasing the community’s vulnerability. Rising temperatures and drying vegetation create conditions where human-caused ignitions or lightning strikes may lead to more damaging outcomes than in the past. Alaska’s fire management planning incorporates this ecological function, balancing suppression efforts near communities with an understanding of fire as a natural process.

4.1.7.6 Probability

Wrangell’s forests contain flammable vegetation species, and with more frequent extreme heat days and periodic drought conditions, the likelihood of ignition is expected to rise over time. Despite these emerging risk factors, historical records indicate that most fires in the Wrangell area have been small and quickly contained, with only a few exceeding one acre in size. Additionally, development along the community’s perimeter increases exposure to wildland urban interface fire risks, while the buildup of hazardous fuels and the uncertainty of weather patterns associated with climate change further elevate concerns.

Based on this history and the criteria outlined in Table 5, the probability of a damaging wildland fire event within Wrangell is considered “Unlikely” but still possible as the event is possible within the next ten years, has a chance of occurring up to once every ten years, which is approximately 10%. The likelihood of such events occurring in history is less than or equal to 10% per year. Therefore, the chance of a large wildfire is about ten percent over the next decade, or roughly one percent chance annually. Further acknowledgment that changing climate conditions may increase this probability in the future, particularly due to warmer conditions leading to drought and drier undergrowth.

4.2 Technological Hazards

Technological hazards are hazards originating from technological or industrial accidents, dangerous procedures, infrastructure failures, or human error or omission. Technological hazards are the results of human error or technology failure, these include acts of terrorism, sabotage, or other deliberate actions that cause harm, and is not covered in this plan. While technological hazards are not a required section for the MJHMP, the planning team discussed the introduction of technological hazard analysis into the 2025 MJHMP plan. As with Natural Hazards, the examinations of the hazards in Section 4 Technological Hazards, include several factors:

- Hazard Description
- Location
- History
- Extent
- Impact
- Probability

4.2.1 High Hazard Dam (Dam Failure)

4.2.1.1 Description

Alaska Statute 46.17.900(3) defines a dam as, “artificial barrier and its appurtenant works, which may impound or divert water.” Dam safety is regulated by Alaska Statute 46.17 and 11 Alaska Administrative Code 93 Article 3, Dam Safety, which became effective in May 1987. Dam failures involve the unintended release of impounded water. A dam failure does not always involve a total collapse of the dam. Dams may fail due to structural deficiencies, poor initial design or construction, lack of maintenance or repair, weakening of the dam through aging, debris blocking the spillway, other disasters such as earthquakes, improper operation, or vandalism.

4.2.1.2 Location

The City and Borough of Wrangell has two earthen-filled dams and reservoirs, both situated

approximately a half-mile east and uphill from the city of Wrangell. These reservoirs are distinguished in elevation and are referred to as the Upper and Lower reservoirs. The lower reservoir stands at an elevation of 295 feet, while the upper reservoir is situated at 360 feet. The reservoirs are part of the Mills Creek watershed, with the lower reservoir serving as the primary municipal water source for the city, while the upper reservoir replenishes the lower reservoir.

Each reservoir is associated with two dams, both approximately 28 feet high and spanning 315 to 320 feet in length. These dams are constructed using earth over log crib dam structures. The abutments for both dams are founded on rock, while the dams themselves are built on bedrock or soil. Notably, the dams are spaced 1,500 feet apart, with an elevation difference of approximately 64 feet. According to State of Alaska Statute 11 AAC 93.157, both dams are currently classified as Class I (high hazard).

The Wrangell Emergency Action Plan for Wrangell Upper Reservoir was updated in 2024. Figure 19 provides an aerial view of the reservoir and dam locations from the 2022 Safety Inspection report and Figure 20 is the 2018 flood inundation map.

4.2.1.3 Extent

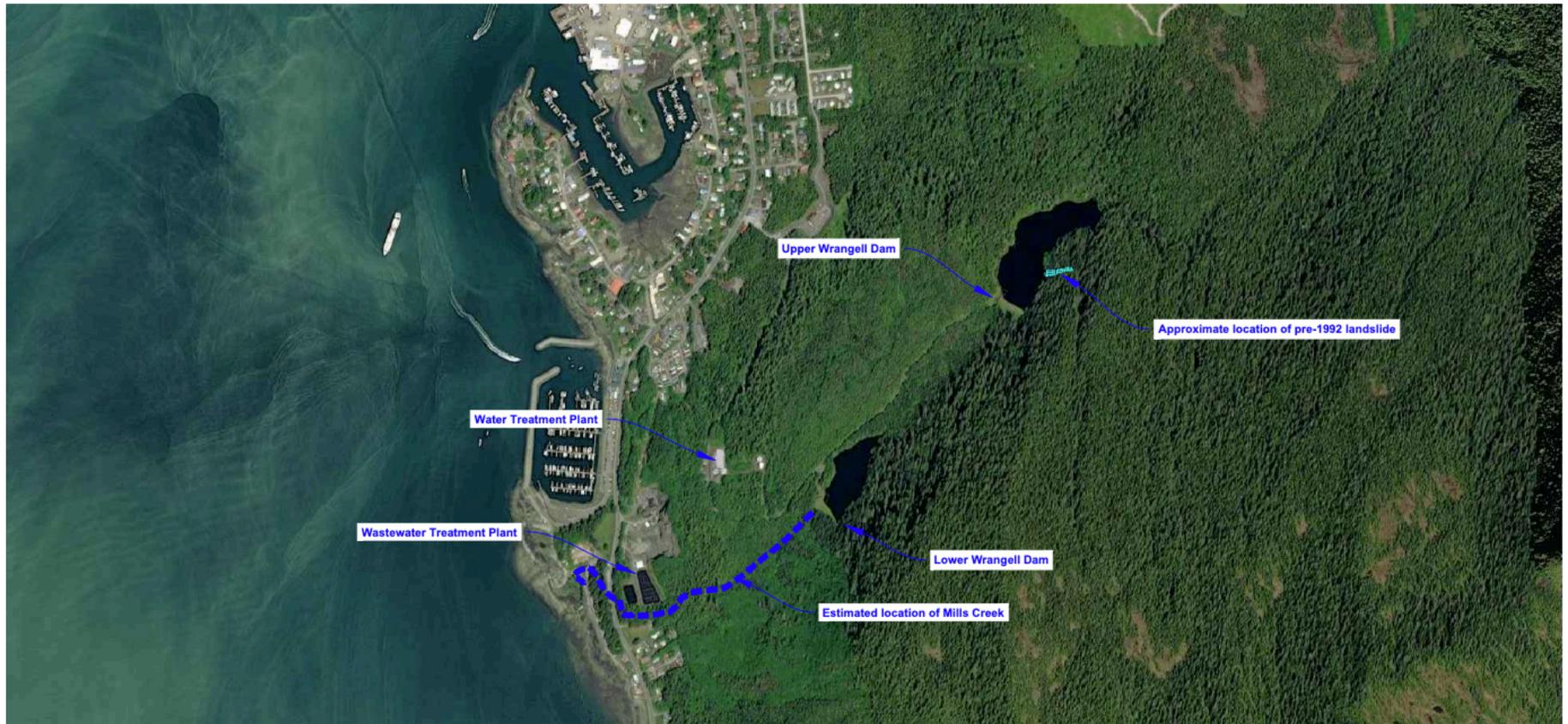
The extent of a potential dam failure is defined by the area of inundation and volume of water that is released. The Upper Reservoir has a normal storage capacity of 122-acre feet (ac-ft) and a maximum of 190 ac-ft while the Lower reservoir has a normal storage capacity of 67.5 ac-ft and a maximum capacity of 102 ac-ft. Should the Upper Reservoir exceed its maximum storage capacity of 190 ac-ft and coincide with a dam failure into the Lower Reservoir, the potential for nearly 300 ac-ft of water downstream into Wrangell is possible. The 1992 inundation map indicates floodwaters would primarily affect the Zimovia Highway along mile 1.6 to 1.9 and partial inundation possible of the southwest portion of the wastewater treatment plant. The flood waters could reach depths sufficient enough to damage roadways, sever utilities and damage facilities critical to the community. The magnitude and severity of dam failure depends largely on the amount of water that is released from such failure, however, in the event that a catastrophic failure with no warning occur the magnitude of this would be “Critical” where injuries and/or illnesses result in permanent disability. Complete shutdown of critical facilities for at least two week and the potential for more than 25% of property is severely damaged. With the potential loss of the water treatment facility functions the community could face a potential shutdown of the critical facility for at least two weeks.

4.2.1.4 History

The Lower Dam was constructed in 1900, while the Upper Dam was constructed in 1935. Both dams underwent significant modifications in 1967. The dams have been periodically repaired,

with the most recent inspection and repair efforts occurring in 2022 to 2023. Through these dam safety inspections throughout the decades, these structures are considered marginally stable during normal conditions, however, under large seismic activity they may lose stability. There is no recorded history of dam failure or inundation flooding within the Wrangell area due to the Upper and Lower Reservoirs and Dams. However, records have indicated the need for improvements, stating deficiencies in spillway capacity, outlet function and seismic stability.

DRAFT



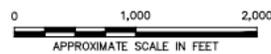
MAP ADAPTED FROM AERIAL IMAGERY PROVIDED BY ALASKA MAPPER. SLIDE AREA ESTIMATED FROM NOVEMBER 1992 SAFETY INSPECTION REPORT BY SHANNON & WILSON, INC.

NOTES



Landslide area estimated from 1992 Safety inspection report by Shannon & Wilson, Inc.

Approximate location of Mills Creek estimated from 1992 Emergency Action Plan by Shannon & Wilson, Inc.



Periodic Dam Safety Inspection
Wrangell, Alaska

SITE PLAN

November 2022

108754-001

SHANNON & WILSON, INC.
Geotechnical & Environmental Consultants

Fig. 2

Figure 19 Wrangell Upper and Lower Dam Aerial View

CITY AND BOROUGH OF WRANGELL, ALASKA



Public Map

1 inch = 419.5 feet
Date: 9/6/2018

DISCLAIMER: THESE MAPS ARE FOR PLANNING PURPOSES ONLY.



Figure 20 2018 Inundation Map Wrangell Dam (Shannon & Wilson Inc., 1993)

4.2.1.5 Impact

The failure of either dam poses a severe risk to public safety and municipal infrastructure. The Upper Dam poses the most severe impacts on the community due to the substantial amount of water stored in the Upper Reservoir. As previously stated, the direct impacts would pose the greatest risk to the Zimovia highway and the water treatment plant. Both of these community infrastructures are critical lifelines. The water treatment plant is the sole distributor of the community water supply. Without this critical facility, the community would need to rely on external sources of water. Additionally, the Zimovia highway is the only road past the southern portion of the inundation zone. Residents beyond that point would be isolated from emergency response capabilities, requiring reliance on maritime and aviation transportation efforts, as occurred during the 2023 landslide incident.

4.2.1.6 Probability

Although there is no recorded history of dam failures in Wrangell, the probability of dam failure occurrence is elevated due to the documented structural deficiencies and seismic vulnerability. Wrangell lies within a seismically active region, making earthquake induced failure a likely failure point, furthermore, any period of extreme rainfall poses a risk to the capacity of the reservoirs. Without detailed reporting on hydrological modeling available, and the contributing factor of seismic instability the overall probability is difficult to pinpoint quantitatively. With the information provided from previous records the lifespan of the dams is due for major upgrades, thus making the probability “Possible” with the potential to be higher should the dams not receive proper modifications, as the event is probable within the next five years or has up to 1 in 5 years chance of occurring (1/5=20%).

4.2.2 Energy Management

4.2.2.1 Description

An energy emergency refers to the inability to produce and transmit enough energy to the public, businesses, and industry. It can involve one or more energy resources such as heating oil, natural gas, gasoline, coal, or electricity.

An energy emergency can develop quickly. For example, a storm could cause a power line to break. It could also develop over days or weeks. During the 1973 OPEC (Oil Producing and Exporting Countries) embargo, gasoline, fuel oil, and other petroleum derivatives were in short supply. An energy emergency could even develop over years or decades. The increased development of communities puts pressure on the amount of energy needed; if a utility company expands to meet that need but the revenue is not sufficient, the resulting impacts for the utility company can be catastrophic, even leading to closure of the company.

4.2.2.2 Location

The entire Wrangell planning area carries the risk for energy failure as it can occur at any location within the geographic area. The energy infrastructure within Wrangell consists of hydroelectric that is purchased from Tyee Hydro Electric Facility, in addition the Wrangell Municipal Light & Power department maintains a 5-meg diesel power generation facility.

4.2.2.3 Extent

An energy shortage has the potential to last for days and up to even weeks depending on the cause and the overall electrical supply and demand. A local power outage from severe weather or equipment failure may affect any portion of the planning area, although a supply interruption would affect a larger portion of the community. The overall magnitude and severity of an Energy Management incident are considered “Negligible.” Injuries and illnesses can be treated with first aid. However, minor disruptions in quality of life may occur, and critical facilities and services may be temporarily shut down for less than 24 hours. This largely being based on the amount of time without power to the community, though previous mitigation efforts of diesel-powered generators have already been put in place to prevent long term durations without power.

4.2.2.4 History

Wrangell has experienced smaller scaled incidents of power outages in recent years, though they were quickly mitigated from longer outage times due to the direct availability of diesel power generators to restore power to the community within an hour of losing the main source of power and returning to the main source after no longer than a few hours of diesel operated power. In 2021 Wrangell experienced an extended duration outage from a windstorm that snapped trees and downed powerlines, portions of the island were without power, including the airport, which caused Alaskan Airline flights to be diverted to neighboring airports to the north and south. (Wrangell Newspaper Archive)

Overall, there is a lack of historical information regarding any large-scale energy management emergency.

4.2.2.5 Impact

Because Wrangell has alternate sources of power available to prevent long term outages the overall impact is low, however, this is dependent on the diesel fuel supply for the generators. Loss of electricity disrupts health facilities, schools, businesses and homes. An extended shortage could have drastic impacts to healthcare facilities and emergency response measures.

4.2.2.6 Probability

Given Wrangell’s remote location, reliance on outside hydroelectrical energy supply, and the need for import of secondary diesel fuel, the overall likelihood of a short-term outage is “Possible”, with a 1 in 5 years chance of occurring (1/5=20%)

4.2.3 Communications

4.2.3.1 Description

A communications failure is the interruption or loss of communications systems including transmission lines, communications satellites, and associated hardware and software necessary for the communications system to function. A communications failure may be the result of an equipment failure, human acts- deliberate or accidental- or the result of another hazard event.

4.2.3.2 Location

Wrangell’s communication systems consist of cellular, fiber optic, landline, and satellite links. These systems are primarily concentrated to the more populated areas of the Wrangell Borough but serve the entire planning area.

4.2.3.3 Extent

Outages may be local, or regional, but the overall severity and magnitude that communication outages have on the community is “Negligible” where injuries and illnesses can be treated with first aid, however, minor loss of quality of life may occur. Critical facilities and services may be temporarily shut down for less than 24 hours, while the disruption to communication hinders emergency response measures, the public safety departments of Wrangell have implemented redundancy efforts after the 2023 landslide incident.

4.2.3.4 History

There is no documented history of significant communication disruptions within the planning area. Although there have been minor outages, such as the 2023 landslide that disrupted communication with individuals south of the landslide, the other outages that have affected cellular or fiber optics in the past have not posed a detrimental risk to the Borough.

4.2.3.5 Impact

Communication outages hinder emergency response efforts, business operations, and personal communications. Extended failures could isolate Wrangell from outside support and delay disaster response or recovery efforts.

4.2.3.6 Probability

Given Wrangell's location and reliance on limited infrastructure, communication outages are "Possible" as the history of events is greater than 10% but less than or equal to 20% likely per year of having the chance to occur on any given year within the next five years, especially as the demand for technology increases, requiring further infrastructure to keep up with the demand.

4.2.4 Hazardous Materials Release

4.2.4.1 Description

In general, hazardous material is any substance or a material that has the potential to harm humans, animals, or the environment. A hazardous materials incident is the intentional or accidental release of toxic, combustible, illegal, or dangerous nuclear, biological, or chemical agents into the environment. The types of material that can cause a hazardous materials incident are wide ranging. Examples include materials such as chlorine, sulfuric acid, gasoline, medical/biological waste, etc. Many accidents occur at fixed sites, but incidents can also happen during transportation. Incidents are more likely to happen at fixed facilities, such as processing facilities.

4.2.4.2 Location

Wrangell's harbor, fuel storage tanks, and the transportation corridors leading to storage and delivery sites remain the primary areas of elevated hazardous material risk, as materials continue to move throughout the island by barge, truck, and other modes. Hazardous materials incidents are most likely to occur in areas where these materials are concentrated, including marine fuel operations near the harbor where petroleum products are stored and transferred by Petro Marine, and along the main waterfront corridor where Arrowhead LP Gas maintains propane storage and distribution activities. Additional community-level risks include chlorine-based coagulants and likely caustic soda used at the upland Water Treatment Plant's dissolved air flotation system, as well as household hazardous waste managed at the borough's Transfer Station near Evergreen Avenue during scheduled collection events. Petroleum fuels are also present at TK's Mini Mart located along the Zimovia Highway commercial area. These locations are in addition to other known hazardous-materials sites in the borough, such as the Trident seafood processing plant, which stores ammonia, and the Wrangell Airport, where large quantities of diesel are maintained for aviation operations.

4.2.4.3 Extent

The severity and impact of a hazardous materials release in Wrangell largely depends on the quantity and substance released. As Wrangell is not a major port or a large storage facility for large scale operations the overall severity is "Negligible." Injuries and illnesses can be treated

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with first aid, however, minor loss of quality of life may occur. Critical facilities and services may be temporarily shut down for less than 24 hours, though the possibility for an increased impact could occur.

4.2.4.4 History

According to Alaska Department of Environmental Conservation, Prevention Preparedness and Response Program (PPR) spills database there have been 101 incidents since 2010. There are no recorded incidents of large-scale hazardous material releases within the last 15 years, the largest incident occurred on August 6th, 2025, when 150 gallons of an undefined substance was released due to human error. Table 13 below describes the eight largest recorded incidents within the last 15 years.

Table 14 Hazardous Materials Spill History (Alaska Department of Environmental Conservation, 2025)

Spill Name	Spill Date	Facility Name	Location	Substance Type	Quantity Release	Units
Alumichem Wood Str & Zimovia Hwy WTP WRG	August 6, 2025	Wood Street/Zimovia Hwy	Wrangell	Other	150	Gallons
TLO Wrangell Case	March 19, 2014	Michael Allen Enterprises	Wrangell	Lead	100	Pounds
Beers home heating oil release	June 4, 2014	Mission Street 417	Wrangell	Diesel	100	Gallons
City of Wrangell Diesel Overfill WRG	December 27, 2018	City & Borough of Wrangell	Wrangell	Diesel	50	Gallons
TLO Wrangell Case	March 19, 2014	Michael Allen Enterprises	Wrangell	Diesel	50	Gallons
TLO Wrangell Case	March 19, 2014	Michael Allen Enterprises	Wrangell	Used Oil (all types)	50	Gallons
Trident Seafoods Wrangell Sodium Hypochlorite 50g	August 7, 2023	Trident Seafoods (Wrangell)	Wrangell	Sodium Hypochlorite	50	Gallons
Wrangell DOT Maintenance Shop	October 8, 2012	Wrangell Airport	Wrangell	Diesel	50	Gallons

4.2.4.5 Impact

Hazardous material releases pose the greatest risk to human health and the environment. In particular, the release of materials into streams or channels would cause contamination to

drinking water supplies, disrupt fisheries and damage the ecosystems. Clean-up of a large-scale incident would require remediation efforts that are costly and require the assistance of state and federal partners.

4.2.4.6 Probability

While small scale incidents are likely to occur, those do not pose the greatest threat on the community and environment. The greatest threat are incidents which have greater quantity of spill and costly remediation efforts, particularly large-scale events such as an Arrowhead propane tank explosion or a Petro Marine fuel tank fire, which would be far more significant than a small-scale incident for the community. The overall probability of this occurring is “Unlikely” based on data that history of events is less than or equal to a ten percent chance per year, but it is possible to occur within the next ten years.

4.2.5 Transportation

4.2.5.1 Description

The transportation system in Wrangell consists of air, road, and marine systems. All these modes have the potential for incident that could lead to a disaster. For this plan, a transportation incident is any aircraft, vehicular, or marine situation that is beyond the scope of a day-to-day incident handled by first responders.

4.2.5.2 Location

Transportation systems in Wrangell consist of air, road, and maritime travel. All these modes have the potential for accidents to occur, some having more disastrous effects than others. Wrangell Airport is the only airport on the island and is located northeast of downtown Wrangell. It is a public, state operated airport that provides daily scheduled commercial services operated by Alaska Airlines. The airport is part of the Essential Air Service (EAS) program, a U.S. Government-funded initiative that offers subsidies to airlines to ensure service to rural communities. In addition, the airport also serves as a hub for single engine planes and helicopters.

Maritime travel and access in Wrangell are a vital form of transportation for residents and commercial freight. The Alaska Marine Highway System serves communities in Southeast Alaska that do not have road access and transports passengers and vehicles through these communities.

4.2.5.3 Extent

Wrangell’s transportation system is inhibited by geography, limited infrastructure, and reliance on external connections. The airport’s single runway limits redundancy in case of operational

disruptions. Maritime transportation, though diverse, is also dependent on weather conditions and the availability of state ferry services, which have faced reductions in recent years. Seaplane service extends Wrangell's reach to remote areas but is subject to weather disruptions. While these systems are limited in certain areas, the potential for multiple modes of transportation would be crucial during a disaster. The overall magnitude and severity of an incident in or near Wrangell depend on the transportation incident, making it "Negligible" where injuries and illnesses can be treated with first aid, or minor loss of quality of life may occur. Critical facilities and services may be temporarily shut down for less than 24 hours, however, the potential increases depending on the incident type.

4.2.5.4 History

There is limited record history of any large-scale incidents in the Wrangell planning area of transportation incidents causing significant damage or loss of life. There are few recorded incidents of accidents within the Alaska Marine Highway systems occurring near Wrangell. Though small, these incidents highlight the inherent challenges of transportation in Wrangell, steep terrain, limited infrastructure and reliance on air and maritime travel.

4.2.5.5 Impact

Transportation incidents that affect Wrangell's reliance on external sources impacts the community in critical ways. These sources are utilized daily for the local economy including tourism, commercial fishing operations and the receipt and shipping of goods. During an emergency or disaster, these modes of transportation are relied on heavily for evacuation, supply chain, and response operations, for a variable of hazards.

4.2.5.6 Probability

Given the combined infrastructure limitations and environmental factors, the probability of a future transportation incident is categorized as "Possible" where the event is probable within the next five years or has up to 1 in 5 years chance of occurring (1/5=20%). While the historical occurrence is not high, the consistent high industrial transportation traffic through Wrangell presents a potential for an incident to occur.

4.3 Vulnerability Assessment

The vulnerability assessment describes and summarizes the overall vulnerability of the people and critical facilities to the hazards that can occur in Wrangell.

4.3.1 Critical Facilities Inventory

Critical facilities are the backbone of any community’s ability to function, especially during times of crisis. These facilities encompass core services such as fire and police stations, hospitals, schools, and essential utility systems that provide water, wastewater, and electricity. Additionally, multipurpose spaces like libraries, community halls, and recreational centers are often considered critical because they can serve as shelters, staging areas, or gathering points during emergencies. Together, these facilities form the infrastructure necessary to maintain essential operations.

Because of the remote nature of Wrangell, the role that critical facilities play is more significant, largely in part by limited direct connections to neighboring communities. This requires that nearly every major facility takes on added importance for response and recovery efforts. The result is a profile that not only identifies the traditional emergency service facilities but also highlights the broader range of community resources that would be relied upon in the event of a disaster. The legacy 2020 planning team created an in-depth list of critical facilities within Wrangell from the Alaska Critical Facilities database. The 2025 planning team reviewed the previous information and completed updates where needed.

Table 15 Critical Facilities List

Type	Occupants	Facilities	Address	Latitude	Longitude	Estimated Value	Building Type	Earthquake	Flood/Erosion	Ground Failure	Tsunami/Seiche	Volcano	Severe Weather	Wildland Fire
Government	8	City Hall	205 Brueger Street	56.470783	- 132.384259	\$1,697,840	GOV1	X	X	X	X	X	X	X
Government	3	U.S. Post Office	112 Federal Way	56.472538	- 132.387132	Undefined	GOV1	X	X			X	X	X
Government	5	Alaska Fish and Game	Front Street	56.470505	- 132.380631	Undefined	GOV1	X				X	X	X
Government	20	US Forest Service	525 Benett Street	56.478047	- 132.376058	Undefined	GOV1	X				X	X	X
Government	3	Public Works Office	Case Avenue	56.469635	- 132.377721	Undefined	GOV1	X	X			X	X	X
Government	3	Wrangell Municipal Light & Power Office	1064 Case Avenue	56.461768	- 132.378815	\$4,664,450	EPPL	X				X	X	X
Government	3	Capital Facilities Office	Bennett Street	56.473652	-132.37529	Undefined	GOV1	X				X	X	X
Government	3	Harbor Office	Shakes Street	56.466554	- 132.382074	Undefined	GOV1	X				X	X	X
Government	8	Public Safety Building: Offices for Police, Court System, DMV	Zimovia Highway	56.469635	- 132.377721	\$10,674,080	GOV1	X				X	X	X
Government	2	Alaska Legislative Information Office	Front Street	56.470505	- 132.380631	Undefined	GOV1	X			X	X	X	X
Government	7	WCA Tribal and Transportation offices	Zimovia Highway	56.462685	- 132.375328	Undefined	GOV1	X				X	X	X

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Government	1	US Customs office	Airport Loop Road	56.485684	-132.3812	Undefined	GOV1	X				X	X	X
Emergency Response	5	Public Safety Building: Fire and Search & Rescue	Zimovia Hwy and Bennett Street	56.469635	-132.377721	\$5,000,00	EFE0	X				X	X	X
Emergency Response	6	5.5 Mile Substation	Zimovia Highway	56.362936	-132.356211	\$936,750	GOV2	X				X	X	X
Emergency Response		12 Mile Emergency Van	Undefined	56.324971	-132.3812	Undefined	GOV2	X				X	X	X
Emergency Response	0	Alaska DEC Oil Spill Response Van/Supplies	City Barge Ramp	Undefined	Undefined	Undefined	Undefined	X				X	X	X
Emergency Response	0	Alaska DOT/PF Airport Fire Pumper Truck 3,000 gal	ARRF Bldg. / Airport Loop Road	56.48452	-132.37778	Undefined	EFE0	X				X	X	X
Emergency Response	0	US Forest Service Fire Pumper Truck	Bennett Street	56.474975	-132.374848	Undefined	Undefined	X				X	X	X
Emergency Response	0	SEARHC 10-person remote medical facility / Decon for HazCom (in Vans)	Bennett Street	Undefined	Undefined	Undefined	Undefined	X				X	X	X
Emergency Response	0	CBW/Fire Dept. MMRS (medical response system)	ARRF Bldg. / Airport Loop Road	Undefined	Undefined	Undefined	Undefined	X				X	X	X
Education	4	Wrangell School District Office	350 Bennett Street	56.472497	-132.37463	Undefined	EDU1	X				X	X	X

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Education	182	Wrangell High School (167 students, 15 teachers)	310 Reid Street	56.472159	- 132.381524	Undefined	EDU1	X				X	X	X
Education	70	Skistine Middle School (60 students, 10 teachers)	321 Church Street	56.472015	- 132.378168	Undefined	EDU1	X				X	X	X
Education	92	Evergreen Elementary School (82 students, 10 teachers)	350 Bennett Street	56.472497	-132.37463	Undefined	EDU1	X				X	X	X
Education	30	T&H Head Start	First Ave	Undefined	Undefined	Undefined	EDU1	X				X	X	X
Medical Care	Undefined	Alaska Island Community Services (AICS) Tideline Health Clinic	232 Wood Street	56.412.952	- 132.371778	Undefined	EFMC	X				X	X	X
Medical Care	6	AICS Pharmacy	333 Church Street	56.471185	- 132.380348	Undefined	COM1	X				X	X	X
Medical Care	3	Stikine Drug	202 Front Street	56.471778	- 132.383977	Undefined	COM1	X	X			X	X	X
Medical Care	2	State Public Health Nurse	Front Street	56.471329	- 132.383619	Undefined	COM7	X				X	X	X
Medical Care	80	Wrangell Medical Center	310 Bennet Street	56.471783	- 132.375702	\$20,000,000	COM6	X				X	X	X
Medical Care	60	SEARHC Hospital (under construction - 2020)	235 Wood Street	56.4635	- 132.372932	\$35,000,000	COM6	X	X	X		X	X	X
Medical Care	2	Coniffs Critters Vet	Front Street	56.470933	- 132.381628	Undefined	Undefined	X				X	X	X
Medical Care	15	AICS Dental Clinic	Front Street	56.471935	- 132.385813	Undefined	Undefined	X	X		X	X	X	X

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Community	2	Bible Baptist Church	535 Church Street	56.467667	- 132.377252	Undefined	REL1	X				X	X	X
Community	2	First Presbyterian Church	220 Church Street	56.471223	- 132.379016	Undefined	REL1	X				X	X	X
Community	2	Harbor Light Assembly of God	.5 Mile Zimovia Hwy	56.466379	- 132.375998	Undefined	REL1	X		X		X	X	X
Community	2	Hope Community Church of God	212 Bennett Street	56.470829	- 132.376445	Undefined	REL1	X				X	X	X
Community	2	Island of Faith Lutheran Church	211 Second Street	56.473544	- 132.387981	Undefined	REL1	X				X	X	X
Community	2	Seventh Day Adventist Church	432 Zimovia Hwy	56.470862	-132.37902	Undefined	REL1	X				X	X	X
Community	2	St. Phillip's Episcopal Church	Church Street	56.469777	- 132.378456	Undefined	REL1	X				X	X	X
Community	2	St. Rose of Lima Catholic Church	202 Church Street	56.471174	- 132.379918	Undefined	REL1	X				X	X	X
Community	5	Salvation Army	Zimovia Highway	56.467899	- 132.375391	Undefined	REL1	X		X		X	X	X
Community	5	First Bank	224 Brueger Street	56.470823	- 132.383292	\$400,000	COM5	X	X		X	X	X	X
Community	5	Tongass Federal Credit Union	215 Front Street	56.47134	- 132.383635	\$400,000	COM5	X	X		X	X	X	X
Community	5	Wells Fargo	115 Front Street	56.471.549	- 132.384807	\$400,000	COM5	X	X			X	X	X
Community	12	Nolan Center Convention Center, Museum & Wrangell Visitor Ctr	296 Campbell Drive	56.469838	- 132.382941	\$9,625,140	GOV1	X	X		X	X	X	X

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Community	15	Irene Ingle Public Library	124 2nd Street	56.473242	- 132.386377	\$2,198,480	GOV1	X		X		X	X	X
Community	25	Wrangell Community Center	Church Street	56.472138	- 132.381927	\$5,378,340	COM8			X		X	X	X
Community	25	Wrangell Parks and Recreation Pool	321 Church Street	56.47195	- 132.381386	Undefined	COM8	X		X		X	X	X
Community	Undefined	Harbor Dept. Warehouses	Front Street	Undefined	Undefined	Undefined	PWH		X			X	X	X
Community	4	Ava's Bed & Breakfast	15 Crest Drive	56.475081	- 132.380892	\$325,000	RES4	X				X	X	X
Community	15	Armstrong Rents	522 Front Street	56.46887	- 132.380038	\$325,000	RES4	X				X	X	X
Community	Undefined	Airport Hangers	Airport Way	Undefined	Undefined	Undefined	AMF	X				X	X	X
Community	3	Little Bitty Getaway	Church Street	Undefined	Undefined	\$300,000	RES4	X				X	X	X
Community	4	Be Still Bed and Breakfast	318 McKinnon Street	56.473676	-132.38473	\$325,000	RES4	X		X		X	X	X
Community	7	Grand View B&B	1.5 Mile Zimovia Hwy	56.451198	- 132.381104	\$325,000	RES4	X			X	X	X	X
Community	2	Heritage Harbor Boathouse	Berger Street	Undefined	Undefined	Undefined	RES4	X	X		X	X	X	X
Community	4	Mt. Dewey Garden Guest House	120 Third Street	56.474283	- 132.385587	\$325,000	RES4	X		X		X	X	X
Community	4	Mt. Dewey Sunset Bed & View	111 Mt. Dewey Lane	56.474521	- 132.386822	\$300,000	RES4	X		X		X	X	X
Community	2	Northstar Reflections Guest Suite	Zimovia Ave	Undefined	Undefined	Undefined	RES4	X				X	X	X
Community	3	Off the Hook Extended Stay	Evergreen Ave	Undefined	Undefined	Undefined	RES4	X	X		X	X	X	X

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Community	5	Reliance Harbor View	Peninsula Street	Undefined	Undefined	\$300,000	RES4	X				X	X	X
Community	6	Rooney's Roost B&B	206 McKinnon Street	56.472575	-132.384068	\$300,000	RES4	X				X	X	X
Community	4	That Place	928 Zimovia Highway	Undefined	Undefined	Undefined	RES4	X				X	X	X
Community	75	Stikine Inn, Restaurant Café	105 Skitine Avenue	56.471886	-132.38773	\$800,000	RES4	X	X		X	X	X	X
Community	8	Wrangell Extended Stay	312 Skitine Avenue	56.474777	-132.38942	\$400,000	RES5	X			X	X	X	X
Community	4	Wrangell Seawatch House B&B	506 Evergreen Avenue	56.476894	-132.390616	Undefined	RES6	X	X		X	X	X	X
Community	6	Zimovia B&B	319 Webber Street	56.472273	-132.372453	\$400,000	RES7	X				X	X	X
Community	30	Senior Apartments	351 Bennett Street	56.473022	-132.376046	\$500,000	RES3	X	X		X	X	X	X
Community	35	Wrangell IGA (Grocery)	223 Brueger Street	56.470428	-132.383706	\$400,000	COM1	X	X		X	X	X	X
Community	35	City Market (Grocery)	423 Front Street	56.47004	-132.381145	\$400,000	COM1	X	X		X	X	X	X
Community	5	Twisted Root Market	628 Shakes Street	56.467478	-132.384004	Undefined	COM1	X	X		X	X	X	X
Community	25	Elks Lodge	Front Street	56.471499	-132.385295	\$400,000	RES4	X	X		X	X	X	X
Community	5	J&W's Fast Food	120 Front Street	56.471824	-132.384411	Undefined	COM1	X	X		X	X	X	X
Community	8	Michelle's Taste of Asia	216 Front Street	56.470907	-132.381573	Undefined	COM1	X	X		X	X	X	X
Community	15	Marine Bar and Pizza	640 Shakes Street	56.466746	-132.381181	Undefined	COM1	X	X		X	X	X	X
Community	4	Notsofamous Pizza	325 Front Street	56.470769	-132.381921	Undefined	COM1	X	X		X	X	X	X

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Community	2	The Pit Stop	Front Street	56.468585	- 132.380078	Undefined	COM1	X	X		X	X	X	X
Community	8	The Cabin Cafe	305 Front Street	56.471368	- 132.382645	Undefined	COM1	X	X		X	X	X	X
Community	15	Zak's Café	Front Street	Undefined	Undefined	Undefined	COM1	X	X		X	X	X	X
Community	12	Churchills Apartments and Laundry	Shakes Street	Undefined	Undefined	Undefined	COM1	X	X		X	X	X	X
Community	75	Sea Level Seafoods	2204 Zimovia Hwy	56.458723	- 132.381508	Undefined	COM2	X	X		X	X	X	X
Community	75	Trident Seafoods, Inc.	641 Shakes Street	56.467211	- 132.381705	\$5,000,000	COM2	X	X		X	X	X	X
Community	0	Cold Storage	Shakes Street	Undefined	Undefined	\$2,633,450	COM2	X	X		X	X	X	X
Community	2	Wrangell Sentinel	205 Front Street	56.471375	-132.38403	Undefined	COM2	X	X		X	X	X	X
Community	10	Senior Center	Church Street	56.472284	- 132.385521	Undefined	COM7	X	X		X	X	X	X
Community	20	Harbor House Assisted Living	Berger Street	56.461192	- 132.384531	\$400,000	COM7	X	X	X	X	X	X	X
Community	2	Wrangell Chamber of Commerce	Undefined	56.471385	- 132.382618	Undefined	GOV1	X	X	X	X	X	X	X
Community	20	Southeast AK Regional Health Consortium (SEARHC) Offices	Church Street	Undefined	Undefined	Undefined	COM7	X	X	X	X	X	X	X
Community	Undefined	Chief Shakes Tribal House	Shakes Street	56.472284	- 132.385521	Undefined	Undefined	X	X	X	X	X	X	X
Community	Undefined	Totem Park	Front Street	Undefined	Undefined	Undefined	COM8	X	X	X	X	X	X	X
Community	2	Tribal Community House and Carving Shed	Front Street	56.470807	- 132.382318	Undefined	COM8	X	X	X	X	X	X	X

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Roads	0	Total paved road miles: 9.9			Cost per paved mile: \$5M	HRD2	X	X	X	X	X	X	X	
Roads	0	Total gravel road miles: 7.65			Cost per gravel mile: 1.5M	HRD2	X	X	X	X	X	X	X	
Bridge	0	Pats Creek Bridge	Pat's Creek Road	56.342059	- 132.338188	Undefined	HWB1	X			X	X	X	X
Bridge	0	McCormacks Bridge	Zimovia Highway	56.310421	- 132.335998	Undefined	HWB1	X			X	X	X	X
Bridge	0	City Park Bridge	Zimovia Highway	Undefined	Undefined	Undefined	HWB1	X	X		X	X	X	X
Bridge	0	SMB Park Bridge/Institute Creek	Zimovia Highway	Undefined	Undefined	Undefined	HWB1	X	X		X	X	X	X
Bridge	0	SMB near pullout/Zimovia Highway culvert	Zimovia Highway	Undefined	Undefined	Undefined	HWB1	X	X		X	X	X	X
Bridge	0	USFS Bridges on Wrangell Island	Various				HWB1			X		X	X	X
Culvert	0	Wood St/Zimovia Hwy culvert	Zimovia Highway	Undefined	Undefined	Undefined	HWB1	X	X	X	X	X	X	X
Culvert	0	Pine St/Zimovia Hwy Culvert	Zimovia Highway	56.468916	-132.3764	Undefined	HWB1	X	X		X	X	X	X
Culvert	0	Evergreen/Trailer Park Culvert	Evergreen	56.48118	- 132.391572	Undefined	HWB1	X	X		X	X	X	X
Culvert	0	Nugget Trailer Park Culvert	Zimovia Highway	Undefined	Undefined	Undefined	HWB1	X	X		X	X	X	X
Culvert	0	Spur Road Culvert	Spur Road	56.46889	- 132.333389	Undefined	HWB1	X			X	X	X	X
Dam	0	Wrangell Upper Reservoir	Wood Street	56.456118	- 132.370065	\$40,000,000	HPDE	X				X	X	X
Dam	0	Wrangell Lower Reservoir	Wood Street	56.462123	- 132.361254	\$25,000,000	HPDE	X				X	X	X

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Transportation	2	Wrangell Airport (PAWG)	1 Airport Loop Road	56.484333	- 132.369833	Undefined	ATB	X				X	X	X
Transportation	0	Wrangell Airport Runway	1 Airport Loop Road	56.484333	- 132.369833	Undefined	ARW	X				X	X	X
Transportation	0	Wrangell Seaplane Base	Shakes Street	56.466325	- 132.380018	Undefined	AFO	X				X	X	X
Transportation	15	Alaska Airlines Terminal and Hangar	1 Airport Loop Road	56.485	-132.3796	Undefined	AMF	X				X	X	X
Transportation	4	State DOT/PF Highway Maintenance	Airport Loop Road	Undefined	Undefined	Undefined	Undefined	X				X	X	X
Transportation	0	City Bulk Fuel Tanks	Zimovia Highway	Undefined	Undefined	Undefined	OTF	X				X	X	X
Transportation	8	U.S. Transportation Security Administration offices	Front Street	56.485104	-132.37954	Undefined	ATB	X				X	X	X
Transportation	0	Wrangell ports and harbors	Various			Undefined	PWS	X	X		X	X	X	X
Transportation	5	Wrangell Ferry Terminal	Stikine Avenue at Evergreen	56.474024	- 132.390154	Undefined	FPT	X	X		X	X	X	X
Transportation	4	Samson Tug & Barge	102 Outer Drive	56.471417	- 132.386619	Undefined	FMF	X	X		X	X	X	X
Transportation	1	6-mile Industrial Yard / Dock	Zimovia Highway	Undefined	Undefined	Undefined	PEQ/FMF	X	X		X	X	X	X
Transportation	5	Alaska Marine Lines Lynden Transport	520 Front Street	56.469	- 132.378956	Undefined	Undefined	X				X	X	X

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Transportation	2	Etolin Bus Company Inc.	Howell Avenue	56.470846	-132.37662	Undefined	BMFW	X				X	X	X
Transportation	0	Arrowhead Transfer and Arrowhead L.P. Gas	520 Front Street	56.469249	-132.379751	Undefined	Undefined	X		X	X	X	X	X
Transportation	3	Alpine Fuel Expediting	930 Zimovia Highway	56.463081	-132.374911	Undefined	Undefined	X		X		X	X	X
Transportation	3	LN'M Services and Gas Station	Front Street	Undefined	Undefined	Undefined	Undefined	X		X		X	X	X
Transportation	4	Petro Marine Services	1427 Peninsula Street	56.462595	-132.383143	Undefined	Undefined	X		X		X	X	X
Transportation	4	Alaska Charters and Adventures	5 Front Street	56.471477	-132.386964	Undefined	COM3	X	X		X	X	X	X
Transportation	4	Alaska Vistas	103 Front Street	56.471431	-132.387147	Undefined	COM3	X	X		X	X	X	X
Transportation	4	Alaska Waters	107 Skitine Avenue	56.471688	-132.387512	Undefined	COM3	X	X		X	X	X	X
Transportation	3	Breakaway Adventures	104 Front Street	56.471688	-132.384136	Undefined	COM3	X	X		X	X	X	X
Transportation	Undefined	Muddy Water Adventures	Undefined	Undefined	Undefined	Undefined	COM4	X				X	X	X
Transportation	3	Practical Car Rental	Airport Way	Undefined	Undefined	Undefined	COM5	X				X	X	X
Transportation	Undefined	Summit Charters	318 McKinnon Street	56.473676	-132.38473	Undefined	COM3	X				X	X	X
Transportation	2	Sunrise Aviation	Airport Loop Road	56.484624	-132.378116	Undefined	AMF	X				X	X	X

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Utility	12	Public Works Maintenance Barn	Case Avenue	56.469635	- 132.377721	Undefined	COM4	X				X	X	X
Utility	5	Wrangell Municipal Light & Power Generator Warehouse (Large)	1064 Case Avenue	56.461768	- 132.378815	\$7,392,770	EPPL	X	X		X	X	X	X
Utility	2	SE Alaska Power Agency Substation	4.5 Zimovia Highway	Undefined	Undefined	Undefined	ESSM	X				X	X	X
Utility	0	SE Alaska Power Agency / Tyee Intertie Distribution Lines	Undefined	Undefined	Undefined	Undefined	EDF	X		X		X	X	X
Utility	2	Potable Water Plant	Wood Street	56.456512	- 132.376483	\$1,199,610	PWTM	X		X		X	X	X
Utility	0	Potable Water Distribution Lines	Community-wide			Undefined	PWP	X	X	X	X	X	X	X
Utility	0	Potable Water Storage Tanks	Wood Street	56.456512	- 132.376483	Undefined		X		X		X	X	X
Utility	2	Wastewater Plant (medium)	Zimovia Hwy	56.453653	- 132.380397	Undefined	WWTM	X	X	X	X	X	X	X
Utility	0	Sewer Collection Lines	Community-wide			Undefined	PWP	X	X	X	X	X	X	X
Utility	2	Solid Waste Transfer Facility	3 Evergreen Avenue	56.485591	- 132.388848	\$1,799,510	Undefined	X		X	X	X	X	X
Utility	3	AP&T Power & Telephone	20 Front Street	56.471933	- 132.386013	Undefined	DBO	X	X	X	X	X	X	X
Utility	3	GCI Communication	325 Front Street	56.470777	-132.38195	Undefined	CBO	X	X	X	X	X	X	X
Utility	4	KSTK Public Radio - 101.7, 94.7 FM	202 St. Michael Street	56.471174	- 132.379918	Undefined	DBR	X		X		X	X	X

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	0	Cell Tower Repeater System	Undefined	Undefined	Undefined	Undefined	CBO	X		X				
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4.3.2 Summary of Vulnerability

Table 15 below lists the Borough, WCA, and the T&H infrastructures' hazard vulnerability synopsis.

Table 16 Hazard Vulnerability Synopsis

Hazard Vulnerability Synopsis				
Hazard	Percent of Jurisdiction's Geographic Area	Percent of Population	Percent of Building Stock	Percent of Critical Facilities and Utilities
Earthquake	100%	100%	100%	100%
Flood and Erosion	30%	30%	25%	42%
Ground Failure	10%	20%	10%	19%
Tsunami and Seiche	10%	30%	35%	41%
Volcanic Ash	100%	100%	100%	100%
Severe Weather	100%	100%	100%	100%
Wildland Fire	100%	100%	100%	100%

Table 17 Summary of Vulnerabilities

Hazard	Vulnerability
Earthquake	<p>Although all structures are susceptible to earthquakes, buildings within the Wrangell region constructed with wood exhibit reduced vulnerability to earthquake-induced effects compared to those constructed with alternative materials. Although it is considered "Unlikely," there is a possibility that an event could occur within the next 10 years, with a 10 percent chance of happening, as mentioned previously, the size and severity will differ. The following summarizes potential impacts from a worse-case scenario event:</p> <ul style="list-style-type: none"> • 1,408 people in 2,387 residences (approximate value \$572,000,000) • 66 people in 12 government facilities (approximate value \$42,951,700) • 11 people in 8 emergency response facilities (approximate value \$7,464,680) • 378 people in 5 educational facilities (approximate value \$37,687,500) • 318 people in 7 medical facilities (approximate value \$60,875,000) • 679 people in 59 community facilities (approximate value \$165,950,500) • 9.9 paved road system miles (approximate value \$61,875,000) • 7.65 gravel road system miles (approximate value \$14,343,750) • 11 bridges/culverts (approximate value is undefined) • 2 earthen dams (approximate value \$65,000,000) • 82 people in 25 transportation facilities (approximate value >\$593,750) • 35 people in 14 utility facilities (approximate value \$12,989,860)

<p>Erosion and Flood</p>	<p>Wrangell has experienced significant growth since the initial flood insurance rate maps were created in 1981. These maps are limited to estimating potential expansion or new development areas beyond the historical floodplain. Residents have expressed a desire for a new FEMA Flood Insurance Rate Map (FIRM) in Wrangell. Floods cause structural and contents water damage, roadbed, embankment, and coastal erosion, boat stranding, standing water, and damage to fuel tanks, power lines, and infrastructure. Buildings on slab foundations or without flood-resistant materials are vulnerable. Floods mostly affect low-lying areas, stream banks, and coastal regions. Steep slopes and unstable soil increase erosion risks, especially during intense rainfall. Pat Creek, Mill Creek, and urban low points on Zimovia Highway and Heritage Harbor have the highest potential for rapid rainfall runoff. Therefore, the Wrangell planning team estimated potential impacts from a worse-case scenario event could include:</p> <ul style="list-style-type: none"> • 525 people in 175 residences (approximate value \$71,093,750) • 14 people in 3 government facilities (approximate value \$8,372,300) • 18 people in 2 medical facilities (approximate value \$1,000,000) • 384 people in 31 community facilities (approximate value \$46,416,800) • Undefined paved road system miles (approximate value is undefined) • Undefined gravel road system miles (approximate value is undefined) • 7 bridges/culverts (approximate value is undefined) • 2 earthen dams (approximate value \$65,000,000) • 28 people in 9 transportation facilities (approximate value is undefined) • 6 people in 13 utility facilities (approximate value \$10,740,475)
<p>Ground Failure</p>	<p>Ground failure events have significant impacts on the surrounding environment, including surface subsidence, infrastructure, homes, private property and roads. Buildings constructed on slab foundations or lacking materials designed to withstand ground movement associated with ground saturation and other land subsidence are particularly vulnerable to damage, though no building design can withstand a landslide of large proportions. Wrangell’s ground failure events have caused structure and infrastructure displacement due to ground shifting, sliding, sinking, and upheaval. The following summarizes potential impacts from a severe ground failure event:</p> <ul style="list-style-type: none"> • 375 people in 125 residences (approximate value \$50,406,250) • 82 people in 7 community facilities (approximate value \$48,627,275) • Undefined paved road system miles (approximate value is undefined) • Undefined gravel road system miles (approximate value is undefined) • 2 bridge/culvert (approximate value is undefined) • 2 earthen dams (approximate value is \$65,000,0000) • 14 people in 4 transportation facilities (approximate value is undefined) • 4 people in 5 utility facilities (approximate value \$3,749,225)

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<p>Tsunami and Seiche</p>	<p>The UAF/GI, DGGS, and the National Tsunami Warning Center indicate that Wrangell has experienced minimal distant and local source tsunami threats for population and infrastructure located within the identified tsunami impact area. Wrangell’s residential, commercial, and public structures and infrastructure located adjacent to the identified tsunami impact area have a “Unlikely” risk from tsunamigenic impacts. Potentially threatened population and infrastructure includes:</p> <ul style="list-style-type: none"> • 1,050 people in 350 residences (approximate value \$142,187,500) • 11 people in 2 government facilities (approximate value \$2,122,300) • 18 people in 2 medical facilities (approximate value \$1,000,000) • 472 people in 30 community facilities (approximate value \$46,416,800) • Undefined paved road system miles (approximate value is undefined) • Undefined gravel road system miles (approximate value is undefined) • 9 bridges/culverts (approximate value is undefined) • 32 people in 10 transportation facilities (approximate value is undefined) • 13 people in 7 utility facilities (approximate value \$11,490,350)
<p>Volcanic Ash</p>	<p>While the threat to Wrangell is relatively low on any given day, the potential for this event is largely dependent on larger volcanoes in the region and even globally. Given these unpredictable conditions, the hazard is classified as “Possible.” Communities like Wrangell must proactively plan for such events by installing filter systems in community buildings, shelters, and potentially distributing personal protective equipment like masks to the general public if required. Additionally, Wrangell relies on regional transportation efforts to ensure the delivery of essential supplies to the island. However, air, water, and land transportation would be severely hindered depending on the severity of the ash fall, leaving Wrangell residents with limited transportation options. The following summaries potential impacts from a worse-case scenario event:</p> <ul style="list-style-type: none"> • 1,408 people in 2,387 residences (approximate value \$572,000,000) • 66 people in 12 government facilities (approximate value \$42,951,700) • 11 people in 8 emergency response facilities (approximate value \$7,464,680) • 378 people in 5 educational facilities (approximate value \$37,687,500) • 318 people in 7 medical facilities (approximate value \$60,875,00) • 679 people in 59 community facilities (approximate value \$165,950,500) • 9.9 paved road system miles (approximate value \$61,875,000) • 7.65 gravel road system miles (approximate value \$14,343,750) • 11 bridges/culverts (approximate value is undefined) • 2 earthen dams (approximate value \$65,000,000) • 82 people in 25 transportation facilities (approximate value >\$593,750) • 35 people in 14 utility facilities (approximate value \$12,989,860)

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<p>Severe Weather</p>	<p>The borough experiences heavy rainfall, coastal storms, dense fog, high winds, heavy snowfall, ice accumulations, and freezing fog. Strong North Pacific and Gulf of Alaska low pressure systems often trigger or accompany high wind events. Heavy snowfall is less severe than in other Alaska regions, but there have been significant events in the past. Dense fog is frequent in the maritime region, and Wrangell Airport monitors for it. It reduces visibility on roadways, maritime channels, and aviation channels. These severe weather hazards pose risks to supply chain delays, tourism disruption, and maritime trades. Heavy snowfall, warming temperatures, and high wind potentials increase the risk of landslides. Life safety concerns include accidents, and severe weather can damage property and the environment, disrupting critical facilities and community lifelines through power outages, reduced transportation, and economic disruptions. The following summarizes potential impacts from a worse-case scenario event:</p> <ul style="list-style-type: none"> • 1,408 people in 2,387 residences (approximate value \$572,000,000) • 66 people in 12 government facilities (approximate value \$42,951,700) • 11 people in 8 emergency response facilities (approximate value \$7,464,680) • 378 people in 5 educational facilities (approximate value \$37,687,500) • 318 people in 7 medical facilities (approximate value \$60,875,000) • 679 people in 59 community facilities (approximate value \$165,950,500) • 9.9 paved road system miles (approximate value \$61,875,000) • 7.65 gravel road system miles (approximate value \$14,343,750) • 11 bridges/culverts (approximate value is undefined) • 2 earthen dams (approximate value \$65,000,000) • 82 people in 25 transportation facilities (approximate value >\$593,750) • 35 people in 14 utility facilities (approximate value \$12,989,862)
<p>Wildland Fire</p>	<p>The planning team stated that persistent and recurring unseasonably hotter temperatures create drought conditions that are ideal for increasing the susceptibility of wildland fires. Climate change and flammable vegetation species are prevalent throughout Wrangell’s forest’s locations, especially since extreme heat days have been increasing, and drought conditions are an annual occurrence. Consequently, fire frequency is likely to rise in the future. The following summarizes potential impacts from a worse-case scenario event:</p> <ul style="list-style-type: none"> • 1,408 people in 2,387 residences (approximate value \$572,000,000) • 66 people in 12 government facilities (approximate value \$42,951,700) • 11 people in 8 emergency response facilities (approximate value \$7,464,680) • 378 people in 5 educational facilities (approximate value \$37,687,500) • 318 people in 7 medical facilities (approximate value \$60,875,000) • 679 people in 59 community facilities (approximate value \$165,950,500) • 9.9 paved road system miles (approximate value \$61,875,000) • 7.65 gravel road system miles (approximate value \$14,343,750) • 11 bridges/culverts (approximate value is undefined) • 2 earthen dams (approximate value \$65,000,000) • 82 people in 25 transportation facilities (approximate value >\$593,750) • 35 people in 14 utility facilities (approximate value \$12,989,862)

5 – Mitigation Strategy

5.1 Hazard Mitigation Strategies

While there are numerous ways to mitigate hazards, not all are suitable for every situation. Each situation demands careful evaluation to determine the most appropriate activities. Below, are some general strategies that can be engaged to mitigate hazards.

5.1.1 Structural Features

Structural projects are designed to reduce hazard impacts and limit exposure to at-risk areas. Examples include dams, levees, and engineered shoreline protections. In Wrangell, large-scale structural mitigation features are limited, but smaller-scale efforts such as culvert upgrades, flood control measures, and slope stabilization projects are relevant to local conditions. While these measures can reduce hazard risk, reliance on structural solutions alone is not recommended in Wrangell due to the community's location, topography, and susceptibility to hazards such as winter storms, landslides, and coastal storms.

5.1.2 Land Use Planning

Land use planning is an effective way to guide development away from areas most at risk from natural hazards. For Wrangell, this means limiting development in landslide-prone areas, floodplains, and steep slopes. Future planning decisions can reduce vulnerability by prioritizing new development in safer locations and incorporating hazard risk assessments into local planning processes.

5.1.3 Zoning

Zoning ordinances establish standards for how land can be used and developed. Communities can apply zoning to restrict new construction in hazard-prone areas or to require additional protections, such as higher elevations for structures in areas exposed to flooding. Wrangell's zoning ordinances can be used to manage growth at the wildland-urban interface, where wildfire potential is elevated, and along the shoreline, where coastal flooding or erosion may occur.

5.1.4 Capital Improvement Plan

A Capital Improvement Plan (CIP) directs public investment in long-term infrastructure projects. Wrangell can use the CIP process to fund hazard mitigation priorities, such as replacing undersized culverts, upgrading harbor facilities to withstand storm surge, or reinforcing critical

public buildings to meet seismic standards. Conversely, not extending infrastructure into hazard-prone areas can act as a form of passive mitigation, making development in those areas cost-prohibitive for private investment.

5.1.5 Open Space Preservation

Open space preservation helps limit development in areas prone to hazards by designating them as permanent open space. In Wrangell, this could include steep unstable slopes, or coastal buffer zones. These areas can provide environmental benefits such as water storage or fire breaks while also keeping people and property out of harm's way.

5.1.6 Acquisition

Acquisition involves purchasing properties in hazard-prone areas to permanently remove development risk. Once acquired, structures are removed, and the land is kept as open space. (FEMA Hazard Mitigation Assistance Guidance, 2015).

5.1.7 Relocation

Relocation is an alternative to acquisition where existing structures are physically moved to safer areas. While this can be more expensive, it may be the most viable option for preserving important housing or community structures. Relocation has been used in small Alaska communities where erosion or flooding has threatened infrastructure.

5.1.8 Building Codes

Building codes establish minimum construction standards designed to protect health, safety, and property. In Wrangell, adoption and enforcement of updated building codes can reduce vulnerability to earthquakes, windstorms, and heavy snow loads. It is far more cost-effective to incorporate hazard-resistant standards into new construction than to retrofit older buildings. Ensuring compliance through inspections is essential for effectiveness (Alaska Department of Commerce, Community, and Economic Development, 2023).

5.1.9 Insurance

Insurance, such as the National Flood Insurance Program provides financial recovery after a disaster by covering repair and replacement costs. Wrangell does not participate in the NFIP, which allows property owners to obtain flood insurance, residents have expressed interest through the MJHMP Community Survey to reinstate the NFIP in the community.

5.1.10 Education

Public education is a vital tool for hazard mitigation, especially in Wrangell where community resilience depends on residents understanding local risks. Education efforts may include landslide hazard campaigns, wildfire prevention programs, or earthquake preparedness trainings. Hazard education helps residents take individual action, reduces vulnerability, and increases community-wide readiness (Alaska Division of Homeland Security and Emergency Management, 2022).

Table 18 Human and Technical Resources for Hazard Mitigation

Staff/Personnel	Principal Activities Related to Hazard Mitigation
City and Borough of Wrangell	
Planner or engineer with knowledge of land development and land management practices	The CBW has staff with this knowledge or works with planning and engineering consultants or contractors as needed
Engineer or professional trained in construction practices related to buildings and/or infrastructure	The CBW Director of Public Works and staff Capital Facilities have this knowledge
Planner or engineer with an understanding of natural and/or human-caused hazards	The CBW Director of Public Works and staff Capital Facilities have this knowledge
Floodplain Manager	The CBW does not have a Floodplain Manager
Surveyors	The CBW works with planning and engineering staff, consultants, or contractors as needed.
Staff with education or expertise to assess the jurisdiction’s vulnerability to hazards	The CBW has staff with this knowledge or works with planning and engineering staff and consultants or contractors as needed
Personnel skilled in Geospatial Information System (GIS) and/or Hazards Us-Multi Hazard (Hazus-MH) software	The CBW has staff with this knowledge and work with a contractor as necessary.
Scientists familiar with the hazards of the jurisdiction	The CBW works with consultants or contractors as needed
Emergency Manager	The CBW’s Fire Chief and Police Chief and their staff have this knowledge
Finance (Grant writers)	CBW’s Directors of Economic Development, Finance and Capital Facilities Director fulfills this capacity
Public Information Officer	The Borough Manager and Borough Clerk
WCA and T&H	
Planner or engineer with knowledge of land development and land management practices	The WCA works with planning and engineering consultants or contractors as needed.

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Staff/Personnel	Principal Activities Related to Hazard Mitigation
	The T&H has staff with this knowledge and works with planning and engineering consultants or contractors as needed.
Engineer or professional trained in construction practices related to buildings and/or infrastructure	The WCA works with planning and engineering consultants or contractors as needed. The T&H has staff with this knowledge and works with planning and engineering consultants or contractors as needed.
Planner or engineer with an understanding of natural and/or human-caused hazards	The WCA works with planning and engineering consultants or contractors as needed. The T&H has staff with this knowledge and works with planning and engineering consultants or contractors as needed.
Floodplain Manager	WCA and T&H do not have a Floodplain Manager
Surveyors	The WCA works with planning and engineering consultants or contractors as needed. The T&H has staff with this knowledge and works with planning and engineering consultants or contractors as needed.
Staff with education or expertise to assess the jurisdiction’s vulnerability to hazards	The WCA works with planning and engineering consultants or contractors as needed. The T&H has staff with this knowledge and works with planning and engineering consultants or contractors as needed.
Personnel skilled in Geospatial Information System (GIS) and/or Hazards Us-Multi Hazard (Hazard-MH) software	The WCA works with planning and engineering consultants or contractors as needed. The T&H has staff with this knowledge and works with planning and engineering consultants or contractors as needed.
Scientists familiar with the hazards of the jurisdiction	The WCA works with planning and engineering consultants or contractors as needed. The T&H has staff with this knowledge and works with planning and engineering consultants or contractors as needed.
Emergency Manager	The WCA Tribal Administrator fulfills this position as needed. The T&H CETHITA President fulfills this position as needed.
Finance (Grant writers)	Tribal Bookkeeper as applicable.
Public Information Officer	The Borough Manager and Tribal Administrator as jurisdictionally applicable

Table 19 Financial Resources for Hazard Mitigation

Type	Administrator	Purpose	Amount
General Fund	Borough Assembly and Tribal Council	Program operations and specific projects.	Variable
General Obligation Bonds	Borough Assembly and Tribal Council	Used for the construction and/or acquisition of improvements to real property broadly available to residents and visitors. Such facilities include but are not limited to libraries, hospitals, parks, public safety facilities, and cultural and educational facilities.	Variable
Special Tax and Revenue Bonds	Borough Assembly and Tribal Council	Used finance capital projects that: 1) have an identified budgetary stream for repayment (e.g., specified fees, tax receipts); 2) generate project revenue but rely on a broader pledge of general fund revenues to reduce borrowing costs or 3) finance the acquisition and installation of equipment for the local jurisdiction's general governmental purposes.	Variable
Indian Community Development Block Grants	HUD	Provides operational funds for tribal management activities	Project-specific
Indian Environmental General Assistance Program	U.S. Environmental Protection Agency (EPA)	Provides funding for tribal environmental improvement activities	Project-specific
Indian Housing Block Grant	HUD	Assists IRA Tribes with obtaining adequate housing	Variable
Employment and Training Administration, Disaster	Department of Labor	Provides disaster related unemployment by supporting employment and training activities	Variable

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Type	Administrator	Purpose	Amount
Unemployment Assistance			
Hazard Mitigation Grant Program (HMPG)	FEMA	Supports pre- and post-disaster mitigation plans and projects. Available to Alaska communities after a presidentially declared disaster has occurred in Alaska, administered by Alaska DHS&EM.	Project-specific
Homeland Security Preparedness Technical Assistance Program	FEMA/DHS	Supports preparedness technical assistance activities in support of the four homeland security mission areas (i.e., prevention, protection, response, recovery) and homeland security program management.	Project-specific
Assistance to Firefighters Grant Program	FEMA/U.S. Fire Administration	Provides equipment, protective gear, emergency vehicles, training, and other resources needed to protect the public and emergency personnel from fire and related hazards. Available to fire departments and nonaffiliated emergency medical services providers.	Project-specific
Land and Water Conservation Funds	U.S. Department of the Interior	Supports the protection of federal public lands and waters and voluntary conservation on private land.	Project-specific
Community Action for a Renewed Environment	U.S. EPA	Offers financial and technical assistance offers an innovative way for a community to organize and take action to reduce toxic pollution (e.g., stormwater) in its local environment. Through this program, a community creates a partnership that implements solutions to reduce releases of toxic pollutants and minimize people’s exposure to them.	Project-specific
Clean Water State Revolving Fund	U.S. EPA	Provides low-cost financing to eligible entities on state and tribal lands for water quality projects, including all types of non-point source, watershed protection or restoration, estuary management projects, and more traditional municipal wastewater treatment projects	Variable
Flood Control and Coastal Emergencies	USACE	Authorizes the USACE under PL 84-99, Flood Control and Coastal Emergencies for emergency management activities. Under PL 84-99, the Chief of Engineers, acting for the Secretary of the Army, to undertake activities including disaster preparedness, advance measures, emergency operations (flood response and post flood response), rehabilitation of flood control works threatened or destroyed by flood, protection or repair	Project-specific

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Type	Administrator	Purpose	Amount
		of federally authorized shore protective works threatened or damaged by coastal storm, and provisions of emergency water due to drought or contaminated sources.	
The Cooperative Watershed Management Program	U.S. Department of the Interior Bureau of Reclamation	Supports WaterSMART strategy by providing funding to watershed groups to encourage diverse stakeholders to form local solutions to address their water management needs. Funding is provided on a competitive basis for watershed group development and watershed restoration planning and implementation of watershed management projects.	Project-specific
Weatherization Assistance Program	U.S. Department of Energy (DOE)	Reduces energy costs for low-income households by increasing the energy efficiency of their homes. It is the nation's single largest residential whole-house energy efficiency program. The program works through local weatherization agency. Once DOE awards the grants, states contract with more than 700 local agencies nationwide to deliver services. All work is energy-related, and does not include new roofing, siding, or similar structural improvements. The average expenditure is \$6,500 per home.	\$6,500 per project

Table 20 Legal and Regulatory Resources for Hazard Mitigation

Name	Description	Hazards Addressed
Comprehensive Plan	Road map for community change	Physical environment and community history include severe weather, erosion/coastal storm surge, wildfire
Land Use Plan	Guides local permitting process	All
Emergency Response Plan	Guides emergency response	All
Building Code	Defines safe building practices ensuring long-term community goals are not threatened	All
Zoning Ordinances	The CBW can exercise this authority	
Subdivision and Special Purpose Ordinances	The CBW can exercise this authority	

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5.2 Mitigation Action Plan

The Mitigation Action Plan outlines the projects, policies, and initiatives Wrangell will undertake to meet the goals and objectives of this Hazard Mitigation Plan (HMP). These actions are organized by the hazards they address, with strategies that reduce risk across multiple hazards identified as “multi-hazard” initiatives. This framework ensures the community can prioritize projects that not only protect life and property but also strengthen long-term community resilience.

5.2.1 Community Priorities and Updates

To ensure the Mitigation Action Plan reflects current needs, Wrangell conducted a review of existing mitigation actions and incorporated community feedback. Shifts in community priorities, such as infrastructure resilience, emergency preparedness, and sustainable land use, have been integrated into the revised plan. Adjustments were made to account for lessons learned from past hazard events, new development patterns, and emerging risks. This iterative process ensures the Mitigation Action Plan remains a living document, responsive to Wrangell’s unique conditions.

5.2.2 Tracking and Status Monitoring

Each action item in the Mitigation Action Plan is accompanied by a status update, including whether the project is completed, in progress, ongoing, or deferred. This tracking mechanism increases transparency and accountability, while also allowing Wrangell to evaluate the effectiveness of implemented strategies over time. Updates will be reviewed annually and documented in progress reports, consistent with FEMA’s guidance for maintaining mitigation plans.

5.2.3 Funding and Timelines

Many identified projects currently do not have dedicated or identified funding. As a result, timelines remain contingent on securing financial support through federal, state, and local programs. Wrangell will pursue funding opportunities such as FEMA’s Hazard Mitigation Grant Program (HMGP). Once funding is secured, project-specific timelines will be established, with priority given to high-risk areas and critical facilities.

5.2.4 Future Development and Adaptation

The Action Plan is designed to evolve over time, reflecting changes in Wrangell’s hazard exposure, available resources, and community needs. Future updates will include the identification of new projects, reprioritization of existing items, and potential partnerships with

regional and state agencies. Each action will continue to be assessed based on feasibility, cost-effectiveness, and overall benefit to the community. The plan's iterative nature ensures Wrangell remains proactive in reducing long-term risk and safeguarding community assets.

5.2.4 NFIP Participation

Wrangell no longer participates in the NFIP, any reports or studies regarding flood or inundation zones are from 1976-1982.

WCA does not participate in the NFIP program, any information utilized to plan for flooding incidents are from the previous flood insurance study published in 1981.

Table 21 Mitigation Action Plan

Hazard	Description	Jurisdiction	Potential Funding	Time Frame	Priority	Status
Dam Failure	Provide public awareness and response education for residents within the potential flood impact zone of the reservoir dams	Borough	Borough and Tribal Budget	Ongoing	Medium	Ongoing
Earthquake	Complete Dam stabilization and replacement	Borough			High	Needs review
Earthquake	Integrate hazard construction methodologies into newly constructed infrastructure and public buildings.				High	Needs review
Earthquake	Identify buildings and facilities that must be able to remain operable during and following an earthquake event.			Ongoing		Completed with EOP updated.
Earthquake	Contract a structural engineering firm to assess the identified buildings and facilities to determine their structural integrity and devise a strategy to	Borough DHS&EM	State Grants PDM	Ongoing	Medium	Significant updates to public safety building and water

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Hazard	Description	Jurisdiction	Potential Funding	Time Frame	Priority	Status
	improve their earthquake resistance.					treatment plant.
Flood and Erosion	Provide public awareness and response education for residents within the potential flood impact zone of the reservoir dams				Medium	Ongoing
Flood and Erosion	Develop a storm Water management plan for sheet flood prone areas of city.				Low	Needs review
Ground Failure	Continued public education.	Borough, Tribes			High	Ongoing
Ground Failure	Conduct studies of unstable soils.	Borough DHS&EM	State Grants PDM	>1 year	High	
Multi-Hazard	Develop a public outreach and education programs regarding potential hazard impacts and personal planning preparations (annual health fair, educational fliers, school visits, high school senior project, hazard awareness week).			Ongoing	High	Ongoing

City and Borough of Wrangell Hazard Mitigation Plan

Hazard	Description	Jurisdiction	Potential Funding	Time Frame	Priority	Status
Multi-Hazard	Develop a list of internal and external suppliers of equipment, supplies (batteries, shovels etc.), medical supplies (i.e. voluntary registry of equipment such as earthmoving, generators, etc.).				Medium	Ongoing
Multi-Hazard	Develop or refine local emergency announcement procedures and back up plans.	Borough, Tribes		Completed	Medium	Ongoing, EOP completed, other plan updates ongoing.
Multi-Hazard	Obtain and install a Siren Warning system to alert for various emergencies or disasters.			Ongoing		Not completed: looking to move it to the public safety building with advancements in technology.
Multi-Hazard	Develop and install a signage program for hazards posted at key facilities or locations.	Borough, Tribes		Ongoing	Medium	Needs review

City and Borough of Wrangell Hazard Mitigation Plan

Hazard	Description	Jurisdiction	Potential Funding	Time Frame	Priority	Status
Multi-Hazard	Continued public education.	Borough, Tribes	Borough and Tribal Budget	Ongoing	High	
Tsunami/Multi-Hazard	Siren and lights at both ends of town for Tsunami and other hazardous warnings	Borough DHS&EM	PDM or HMGP State DHS&EM/ NOAA (NTHMP), State DHS&EM / Homeland Security Grants	>1 year	High	Ongoing
Tsunami/ Dam Failure/ Multi-Hazard	Inundation Mapping	State DHS&EM NOAA/NTHMP	NOAA/NTHMP	>5 years	Medium	Needs review
Volcanic Ash/ Multi-Hazard	Provide adequate supplies of breathing apparatus for vulnerable populations, first responders, and critical facility crews.	Borough	Borough and Tribal Budget	>1 year	Medium	
Multi-Hazard	Determine needs of equipment that may be needed during an event to assure its continued and safe operation	Borough	Borough and Tribal Budget	>1 year	Medium	

City and Borough of Wrangell Hazard Mitigation Plan

Hazard	Description	Jurisdiction	Potential Funding	Time Frame	Priority	Status
Energy Management/ Multi-Hazard	Increase back up power generation: Purchase Generators to provide enough back up power to provide essential services and sustain community; Purchase portable generating units for needs for vulnerable populations (elders, medical). Purchase portable generating units for essential services; Explore alternative power sources such as wind and solar for emergency services; Work with Alaska Dept. of Transportation to purchase back-up generator for the airport	Borough DHS&EM	HMGP grant/Assistance to Firefighters Grant Program grants	2-3 years	Medium	
Multi-Hazard	Encourage weather resistant building construction materials and practices.	Borough USFS	Borough and Tribal Budget	<1 year	Medium	
Multi-Hazard	Develop alternative water sources: Investigate further feasibility of Sunrise Lake;					Remove sunrise lake. Desalinization

City and Borough of Wrangell Hazard Mitigation Plan

Hazard	Description	Jurisdiction	Potential Funding	Time Frame	Priority	Status
	Consider Desalination; Investigate SMB water supply and hooking into existing system; Explore water opportunities from Institute Creek, the 6.5-mile mill creek for emergency use and hooking into existing system.					still a factor. Shoemaker Bay
Severe Weather	Increase water storage capacity: Dredge existing reservoirs and perform stump removal; install a bypass line to the upper reservoir.			Completed	Medium	Completed
Severe Weather	Encourage weather resistant building construction materials and practices.				Medium	Acquiring funding sources
Severe Weather	Research and consider instituting the National Weather Service program of “Storm Ready”.	Borough NWS	Borough and Tribal Budget	<1 year	High	Needs review
Volcanic Ash	Provide adequate supplies of breathing apparatus for vulnerable populations,				Medium	Needs review

City and Borough of Wrangell Hazard Mitigation Plan

Hazard	Description	Jurisdiction	Potential Funding	Time Frame	Priority	Status
	first responders, and critical facility crews.					
Volcanic Ash	Determine needs of equipment that may be needed during an event to assure its continued and safe operation.			Ongoing	Medium	Ongoing
Wildland Fire/Communications	Develop a local coordinated response and communication channel with the USFS.			Ongoing	High	
Wildland Fire	Develop, adopt, and enforce burn ordinances that control outdoor burning, require burn permits and restricts open campfires during identified weather periods (wind, dry etc.)			Ongoing		Needs review
Wildland Fire	Develop a local Smokey Bear awareness campaign with the USFS to educate against fires and mitigate fire threats.	Borough	Borough and Tribal Budget	Ongoing	Low	
Energy Management	Increase back up power generation: Purchase generators to provide	Borough, Tribes	Borough and Tribal Budget	Ongoing	Medium	Completed

City and Borough of Wrangell Hazard Mitigation Plan

Hazard	Description	Jurisdiction	Potential Funding	Time Frame	Priority	Status
	enough back up power to provide essential services and sustain community; Purchase portable generating units for needs for vulnerable populations (elders, medical); Purchase portable generating units for essential services; Explore alternative power sources such as wind and solar for emergency services; Work with Alaska Dept. of Transportation to purchase back-up generator for the airport					

Table 22 Capital Improvement Projects

Project	Total Project Amount	Project Description and Status
Public Safety Building Rehabilitation	\$ 5,500,000.00	35-year-old building requires Building Rehabilitation to exterior shell, including roofs, siding, exterior walls, doors and windows.
Wrangell Medical Center - building demolition and site reuse plan	\$ 2,000,000.00	Undefined
Storm Drain Plan Development	\$ 175,000.00	Undefined

City and Borough of Wrangell Hazard Mitigation Plan

<p>Reservoir Dams Stabilization and Improvements</p>	<p>\$ 10,500,000.00</p>	<p>Both of Wrangell's dams are listed in the Alaska Dam Inventory as Class I (high) hazard potential classification, with long-recognized deficiencies. Two separate stabilization studies, one performed by the USFS and the other by the USACE, yielded factors of safety against sliding during a seismic event well below 1.0 and attributed the instability to poor foundations soils under the dam that are potentially liquefiable. Due to the proximity of residences to the dams, and the lack of a warning system, the possibility of loss of life is high due to spontaneous dam failure and a high velocity of water through the floodplain. Loss of Life and Property would affect 14 mobile homes, 9 single family residential homes, and the community's wastewater treatment plant. While a new dam may be proposed with a higher cost, the project costs shown here is derived from a 2006 Corps estimate of \$7,700,000 to repair the existing dams with annual cost escalation/inflation added as a placeholder until an engineer's estimates fully developed.</p>
<p>Upper Reservoir Bypass (Connection to Treatment Plant)</p>	<p>\$3,540,000.00</p>	<p>This project will provide a direct connection of the upper reservoir to the water treatment plant. As it is currently configured, water from the upper reservoir overflows the spillway or is siphoned into an open ditch as the conveyance to the lower reservoir. this project is currently under engineering design. Future funding for the construction of this work is needed. Due to the proximity of residences to the dams, and the lack of a warning system, the possibility of loss of life is high due to spontaneous dam failure and a high velocity of water through the floodplain. Loss of Life and Property would affect 14 mobile homes, 9 single family residential homes, and the community's wastewater treatment plant.</p>
<p>Shoemaker Bay Float Construction</p>	<p>\$ 10,000,000.00</p>	<p>Priority in governors' capital budget for State Garbor funding for FY 2018</p>

City and Borough of Wrangell Hazard Mitigation Plan

Water Treatment Plan Improvements	\$ 13,000,000.00	Undefined
Water Main Distribution System Replacement, Phase 1 - updated costs based on existing funding in place vs. shortfall		DEC Loan paperwork underway; DEC MMG received.
Fire Engine/Pumper	\$275,000.00	Undefined
Water Main Distribution System Replacement, Phase 2 (Zimovia Highway)	\$2,262,229.00	Undefined
Back-up Diesel Generation	\$2,700,000.00	Undefined
SCBA's for personal Protective Equipment	\$ 83,700.00	Undefined

DRAFT

6 – Plan Adoption, Implementation, Maintenance

6.1 Plan Adoption

6.1.1 Jurisdictional Adoption

The 2025 City and Borough of Wrangell Multi-Jurisdictional Hazard Mitigation Plan was formally adopted by the City and Borough of Wrangell Assembly via resolution on [To be completed]. A scanned copy of the resolution follows this page. It will also be kept on file with City and Borough of Wrangell, and an additional copy will be sent to DHS&EM and FEMA.

6.1.2 Tribal Government Adoption

All tribal governments will comply with applicable federal statutes and regulations in effect, with regard to any grants or funding awarded to the Tribe for mitigation actions.

The 2025 City and Borough of Wrangell Multi-Jurisdictional Hazard Mitigation Plan was formally adopted by the Wrangell Cooperative Association Tribal Council via resolution on [To be completed]. A scanned copy of the resolution follows this page. It will also be kept on file with Wrangell Cooperative Association Tribal Council and additional copy will be sent to DHS&EM and FEMA.

The 2025 City and Borough of Wrangell Multi-Jurisdictional Hazard Mitigation Plan was formally adopted by the Central Council of the Tlingit and Haida Indian Tribes of Alaska via resolution on [To be completed]. A scanned copy of the resolution follows this page. It will also be kept on file with Central Council of the Tlingit and Haida Indian Tribes of Alaska, and additional copy will be sent to DHS&EM and FEMA.

6.2 Plan Implementation

Following the adoption of the 2025 Wrangell MJHMP and final approval from FEMA, the Planning Team members will focus on the identified mitigation action project items ensuring they are actively integrated into the community planning process, these mitigation goals will be integrated into the existing City and Tribal planning documents. This includes reviewing items such as local and tribal regulatory tools to identify opportunities for incorporating mitigation principles. The Planning Department will coordinate with relevant departments to incorporate the plan into stand in policies, procedures, long-term planning documents, and budgets. It will also consult with the WCA, whose members and facilities reside within the borough, to ensure both CBW and WCA interests are represented. Short-term operational changes may include job description updates, work plans, site reviews, and staff training. Long-term changes may include revisions to comprehensive plans, capital improvement plans, zoning and building codes, permitting, and other planning tools. To enhance cost effectiveness and align with long-term strategy, mitigation projects must be included in annual departmental budgets, eliminating reliance solely on grant programs and integrating hazard mitigation into comprehensive land use planning.

The WCA will collaborate with CBW staff to ensure hazard mitigation is integrated into both day-to-day operations and long-term planning. In the short term, this may involve training staff, reviewing projects for mitigation strategies, and adjusting current or future work plans to align with mitigation goals. Long-term efforts will include updating the integrated comprehensive plan and other capital improvement-focused projects. The WCA will ensure that mitigation projects are included in yearly budgets by coordinating with the CBW. Additionally, the WCA will ensure that its facilities, services, and community members are fully represented in the new MJHMP, and Tribal priorities are integrated into local hazard mitigation strategies.

6.3 Plan Update and Monitoring

The CBW and Tribal partners will follow a structured process to ensure the MJHMP is effectively monitored, evaluated and updated. The Planning Team members will utilize the guidelines provide in this section.

Monitoring

- Planning team members shall serve as the respective contact for their departments, or tribal entity.
- The Planning Team Lead will serve as the primary custodian of the MJHMP, maintaining official records, tracking progress on mitigation actions, and ensuring compliance with FEMA requirements.
- The Planning Team will conduct an annual review to:
 - Assess progress on mitigation actions.
 - Identify new hazards, vulnerabilities, or changes in risk.
 - Document completed projects and update priorities.
- Hazard mitigation considerations will be incorporated into capital improvement plans, land-use planning, and departmental work plans to maintain alignment with MJHMP goals.

Evaluation

- Effectiveness of mitigation actions will be measured using indicators such as:
 - Reduction in risk exposure.
 - Cost-benefit outcomes.
 - Improvements in community resilience.
- Input from Tribal partners, community members, and CBW staff will be solicited during evaluations to ensure the plan reflects local priorities and equity considerations.
- The MJHMP will be reviewed against FEMA and State requirements to maintain eligibility for mitigation funding.

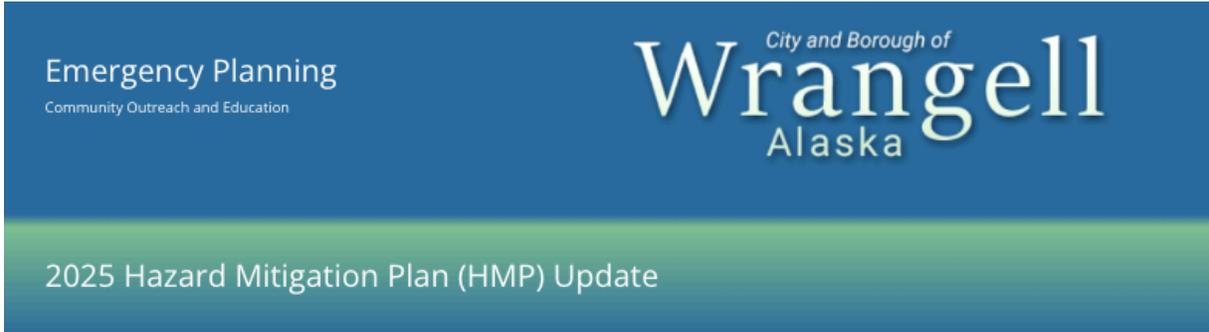
Plan Updates

The MJHMP will be formally updated every five years in accordance with 44 CFR §201.6, or sooner if significant changes occur (e.g., major disasters, new hazard data, or regulatory changes).

- Substantive changes, such as new mitigation projects or updated risk assessments, will be documented through interim amendments approved by the Planning Team.
- Updates will include a transparent process for public input and Tribal consultation to ensure inclusive representation of priorities.

Appendix A: Public Participation and Planning Process Documentation

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View the Current
HMP

Survey
The City and Borough of Wrangell has developed a Community Input Survey to assist in providing the public an outlet to contribute to the Hazard Mitigation Plan update. This survey is anonymous and will be used to develop portions of the plan.

Click Here
to
Complete
the Survey

Hazard Mitigation Plan

The City and Borough of Wrangell has contracted with Katmai Preparedness Solutions LLC. (Katmai Solutions) to work with staff, stakeholders, and community partners to update the Borough's existing Hazard Mitigation Plan (HMP). This update will involve assessing current hazards, vulnerabilities, and mitigation strategies, and incorporating any new data or changes in risk since the last update.

The HMP update will comply with FEMA's Local Mitigation Planning Policy Guide (FP 206-21-0002) and be structured to meet all requirements for FEMA approval. The plan will include a prioritized list of mitigation actions, with a focus on actionable and fundable projects that align with current funding opportunities.

What is Hazard Mitigation?

Natural hazards have the potential to cause property loss, loss of life, economic hardship, and threats to public health and safety. While an important aspect of emergency management deals with disaster recovery (i.e., those actions that a community must take to repair damages and make itself whole in the wake of a natural disaster), an equally important aspect of emergency management involves hazard mitigation.

Hazard mitigation actions are efforts taken before a disaster happens to lessen the impact that future disasters of that type will have on people and property in the community. They are things you do today to be more protected in the future. Hazard mitigation actions taken in advance of a hazard event are essential to breaking the typical disaster cycle of damage, reconstruction, and repeated damage. With careful selection, hazard mitigation actions can be long-term, cost-effective means of reducing the risk of loss and help create a more disaster-resistant and sustainable community.

What is a Hazard Mitigation Plan?

A hazard mitigation plan is a well-organized and well-documented evaluation of the hazards that a jurisdiction is susceptible to, and the extent to which these events will occur. Hazard mitigation plans identify an area's vulnerability to the effects of the hazards, as well as the goals, objectives, and actions required for minimizing future loss of life, injury, property damage, and economic disruption as a result of hazard events.

Purpose and Need for the Plan

A hazard mitigation plan is developed BEFORE a disaster strikes. The plan identifies community policies, actions, and tools for long-term implementation to reduce risk and potential for future losses. Adopted, implemented and maintained on an ongoing basis, the plan will gradually, but steadily, lessen the impacts associated with hazard events in the City and Borough of Wrangell.

Under the federal Disaster Mitigation Act of 2000 (DMA 2000), as of November 1, 2004 communities that do not have a FEMA-approved hazard mitigation plan in place are no longer eligible for FEMA project grant monies under long standing programs such as the Flood Mitigation Assistance Program (FMA), Hazard Mitigation Grant Program (HMGP) and the Building Resilience Infrastructure and Communities (BRIC).

City and Borough of Wrangell Hazard Mitigation Plan

Outcomes: Identifying Mitigation Projects and Other Benefits

A major focus of this plan will be to identify effective mitigation projects and realistic implementation strategies, including identifying potential funding streams. This includes projects that may be eligible for federal funding through FEMA grants or other federal sources, as well as to projects that may not qualify for federal funding but are still important to a community. This planning process will help lay the groundwork for implementation of both federally fundable and non-federally fundable mitigation projects.

In addition to identifying effective mitigation projects, a plan will also assist the Town in the following ways:

- Increased understanding of hazards and risk the Town faces;
- Eligibility for federal funds for pre-disaster mitigation planning under DMA 2000;
- Developing partnerships that support planning and mitigation efforts and may offer potential financial savings, including: reduced flood insurance premiums, broader resources for funding of mitigation projects, and enhanced benefit-cost ratios;
- Enhanced coordination of hazard mitigation with comprehensive planning and zoning;
- Development of more sustainable and disaster-resistant communities; and
- Reduced long-term impacts and damages to human health and structures, and reduced repair costs.

Proactive mitigation leads to the development of sustainable, cost-effective projects. In contrast, reactive mitigation tends to yield “quick-fix” alternatives that may cost much and accomplish little. Proactive mitigation is also far more cost-effective than paying to clean up and rebuild after disasters happen. Danger to population and damage to property can be reduced if the region evaluates where and how disasters may occur, and takes steps to reduce those risks.

Participation

Resident and stakeholder participation is a vital part of the hazard mitigation planning process. Due to the COVID-19 pandemic, in lieu of in-person outreach at this time, we will continue to update this page with ways you can keep informed and engaged in the City and Borough of Wrangell HMP. Keep checking back regularly for information on planning progress, to take our survey, and to review and comment on the draft plan.

Process Overview



The planning process will follow the following eight phases through to project implementation. This includes several key steps:

- Organize the planning partnership.
- Research a full range of hazards.
- Identify the most significant hazards (the ones that present the most risk to the Town); these will be the focus of the plan.
- Identify the location and extent of hazard areas.
- Identify assets located within hazard areas.
- Characterize existing and potential future assets at risk by analyzing land uses and development trends.
- Assess vulnerabilities to the identified hazards.
- Identify local, state, and federal capabilities that support hazard mitigation.
- Develop a mitigation strategy by evaluating and prioritizing goals, objectives, and hazard mitigation actions.
- Adopt the plan.
- Implement the plan and monitor its progress.

While natural disasters cannot be prevented from occurring, the continued implementation of our hazard mitigation plan over the long-term will gradually, but steadily, lessen the impacts associated with hazard events in our region.

If you would like more information regarding how to get involved in the project, please contact Dorianne Sprehe at wrgfd@wrangell.com

Wrangell Volunteer Fire Department
Published by Anna Allen
· July 7 at 10:30 AM · 🌐



BOROUGH MEETINGS THIS WEEK

HAZARD MITIGATION PLAN
Open House | Monday, July 7th at 1:00PM

BOROUGH ASSEMBLY MEETING
Meeting | Tuesday, July 8th at 5:30PM

PLANING & ZONING COMMISSION
Meeting | Thursday, July 10th at 6:00PM

Visit wrangell.com for more information on meetings

City and Borough of Wrangell
July 7 at 10:00 AM · 🌐

Want to hear more about the borough's activities? Want to speak on a certain issue? Here is our weekly roundup of public meetings in the borough! Click the link below t... **See more**

No insights to show ⓘ [Create ad](#)

👍 Like 💬 Comment ➦ Share

Comment as Wrangell Volunteer Fire Department



Published by Anna Allen



July 7 at 8:46 AM · 🌐

Happening today!

The poster features a background image of a mountain landscape with a lake. The text is centered on a dark blue background with gold accents. It includes the City and Borough of Wrangell logo, the event title, an invitation to participate, a QR code for a public survey, the website URL, and details on when, where, and how to ask questions.

City and Borough of Wrangell
Alaska

Hazard Mitigation Plan Update Public Meeting

You're invited to be a part of the community planning effort

Please join the City and Borough of Wrangell with Katmai Preparedness Solutions to update the Borough's existing Hazard Mitigation Plan (HMP). This update will involve assessing current hazard, vulnerabilities, mitigation strategies, and incorporating any new data or changes in risk since the last update.

SCAN TO PARTICIPATE IN THE PUBLIC SURVEY
OR VISIT
WRANGELLPLANNING.COM
FOR MORE INFORMATION

When?
July 7th, 2025
1:00PM - 5:00PM

Where?
City Hall
205 Brueger Street
Wrangell, AK

Questions?
Contact Morgan Greenwood at
Morgan.Greenwood@KatmaiSolutions.com

City and Borough of Wrangell
June 23 at 11:46 AM · 🌐

City and Borough of Wrangell Hazard Mitigation Plan



Wrangell Volunteer Fire Department

Published by Jordan Bunes



June 23 at 12:05 PM · 🌐



Wrangell Hazard Mitigation Plan (HMP)

City and Borough of Alaska



What is a HMP?

In an effort to reduce or eliminate risks from natural hazards, HMP's are a detailed plan outlining strategies for communities to focus on. This is done through disaster analysis, risk assessments and proposing actions to minimize the impacts. Ultimately, this contributes to the goal of a prepared and resilient community

Key Components of a HMP

- Hazard Identification
- Risk Assessment
- Vulnerability Assessment
- Mitigation Strategies

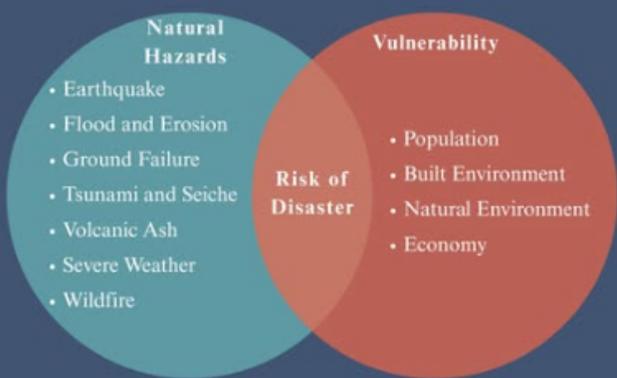
HMP Review and Update

Periodically the HMP will be reviewed and revised. This process ensures the plan remains effective and relevant by reevaluating risks, vulnerabilities, and mitigation strategies.

Understanding Risk

- Impacts on a planning area (*location*)
- How severe the impacts could be (*extent*)
- Frequency of events (*previous occurrences*)
- Likelihood of occurring in the future (*future probability*)
- What portions of the community are most likely to be affected (*vulnerability*)
- Potential consequences to life safety, property and environment (*impacts*)

Risk assessments analyze the relationship between hazards and the community.



Natural Hazards

- Earthquake
- Flood and Erosion
- Ground Failure
- Tsunami and Seiche
- Volcanic Ash
- Severe Weather
- Wildfire

Vulnerability

- Population
- Built Environment
- Natural Environment
- Economy

Risk of Disaster



City and Borough of Wrangell

June 23 at 11:47 AM · 🌐



Wrangell Volunteer Fire Department

Published by Jordan Bunes



· June 23 at 12:05 PM · 🌐



Come check it out!

The poster features a scenic background of Wrangell, Alaska, with mountains and a lake. The text is centered on a dark blue background with gold decorative lines. It includes a QR code for a public survey and contact information for Morgan Greenwood.

**City and Borough of Wrangell
Alaska**

Hazard Mitigation Plan Update Public Meeting

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Where?
City Hall
205 Brueger Street
Wrangell, AK

Questions?
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Morgan.Greenwood@KatmaiSolutions.com



City and Borough of Wrangell



WRANGELL HMP SIGN-IN SHEET

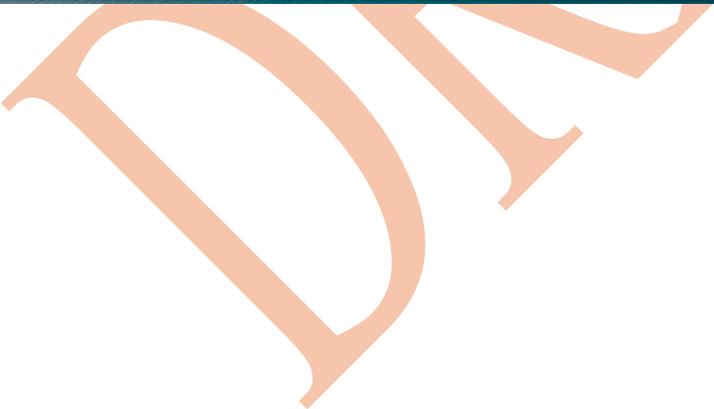
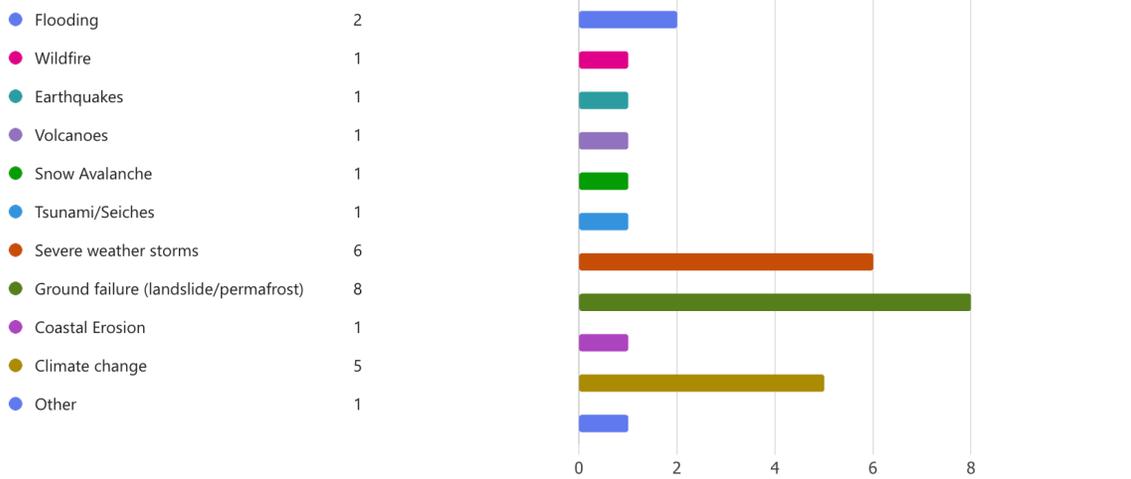
#	NAME	EMAIL	ROLE	JULY 7, 2025
1	EXAMPLE	YOUR_EMAIL@ACCOUNT.COM	RESIDENT / BUSINESS OWNER / LOCAL OFFICIAL	
2	Morgan Green wood	morgan. katmai wood@katmaisolutions	Public Safety Consultants	
3	Kim Wickman	kgpford.wca@gmail.com	WCA	
4	Lexie Hauges	igaptech.wca@gmail.com	WCA	
5	Jordan Bunniss	firechief@wrangell.com	Fire chief, Wrangell Fire Dept	
6	Anna Allen	wrgfd@wrangell.com	Fire Ems Admin, Wrangell fire dept.	
7	Dan Nelson	Dan.Nelson@Katmaisolutions	Principal Consultants	
8				
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estions

Responses Overview Active

Responses 9	Average Time 18:10	Duration 354 Days
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1. In the past 10 years, which of the following natural hazard events have you experienced? Check all that apply. [More details](#)

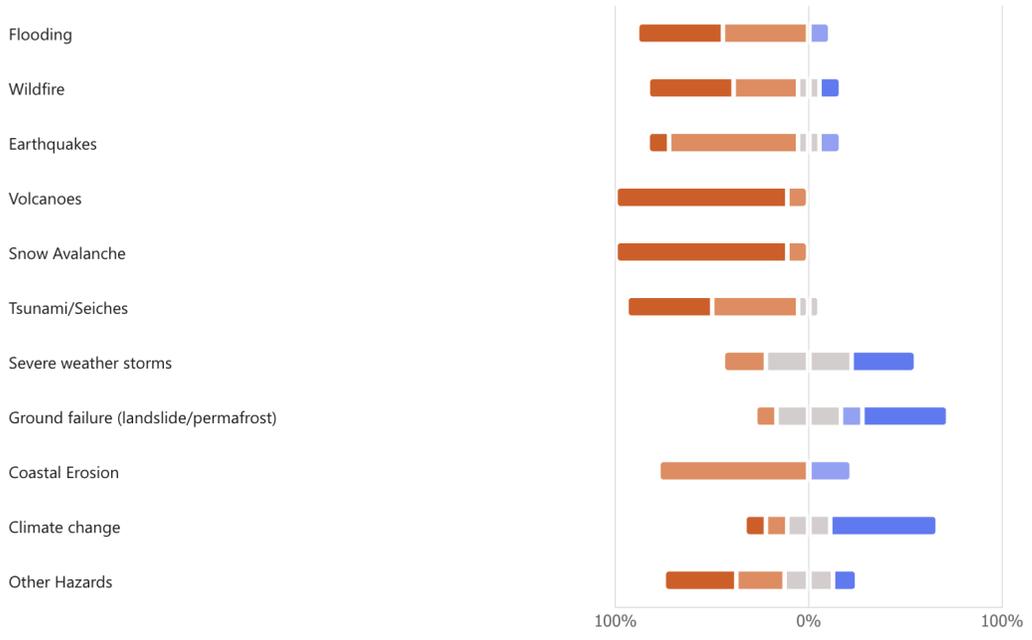


City and Borough of Wrangell Hazard Mitigation Plan

2. How concerned are you about the following natural hazards in the City and Borough of Wrangell? Please select one for each hazard.

[More details](#)

● Not Concerned
 ● Somewhat Concerned
 ● Concerned
 ● Very Concerned
 ● Extremely Concerned



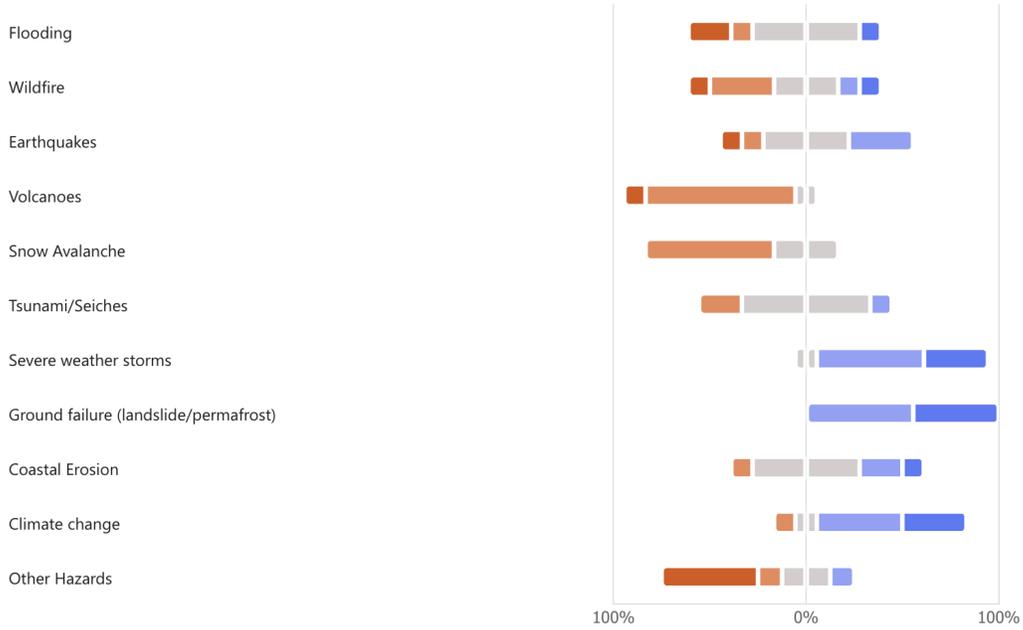
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City and Borough of Wrangell Hazard Mitigation Plan

3. How vulnerable to damage are the structures in the community from

[More details](#)

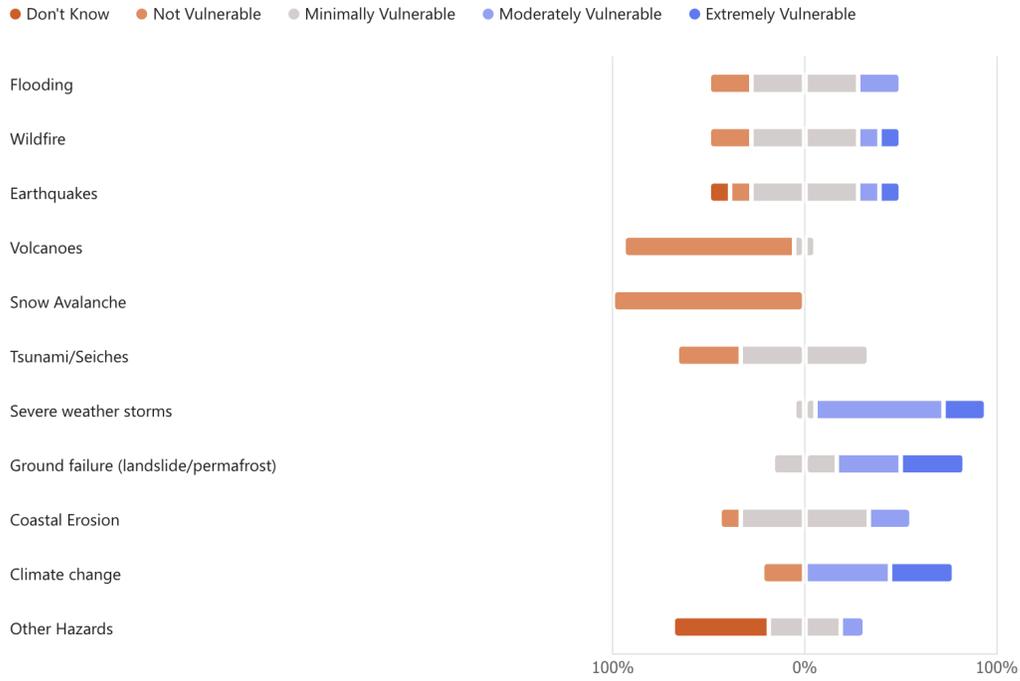
● Don't Know ● Not Vulnerable ● Minimally Vulnerable ● Moderately Vulnerable ● Extremely Vulnerable



DRAFT

City and Borough of Wrangell Hazard Mitigation Plan

4. How vulnerable to damage are the critical facilities within our community from: [Critical facilities include areas such as the airport, bulk fuel storage tanks, generators, hospital and medical facilities, public safety building, schools, landfills, sewage lagoons, and stores.] [More details](#)



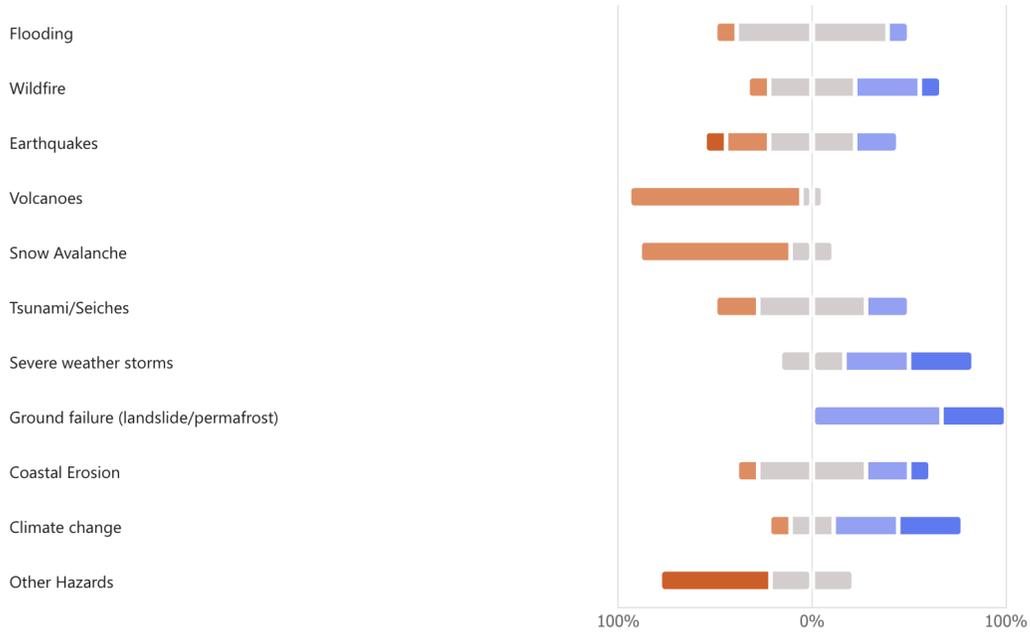
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City and Borough of Wrangell Hazard Mitigation Plan

5. How vulnerable to displacement, evacuation or life-safety is the community from:

[More details](#)

● Don't Know ● Not Vulnerable ● Minimally Vulnerable ● Moderately Vulnerable ● Extremely Vulnerable



DRAFT

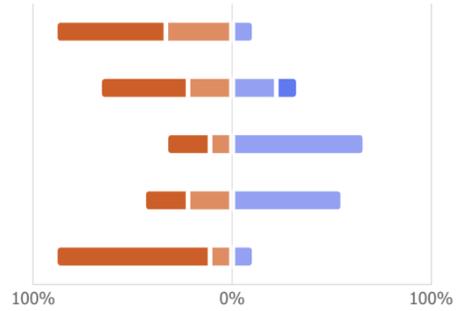
City and Borough of Wrangell Hazard Mitigation Plan

6. Have you or someone in your household:

[More details](#)

● Have Done ● Plan To Do ● Not Done ● Unable To Do

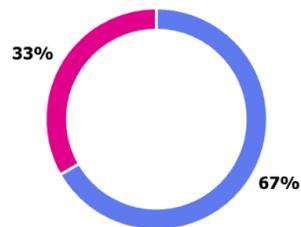
- Attended meetings or received written information on natural disasters or emergency preparedness?
- Spoke with family members about what to do in case of a disaster or emergency?
- Made a "Household/Family Emergency Plan" in order to decide what everyone would do in the event of a disaster?
- Prepared a "Disaster Supply Kit" including extra food, water, medications, batteries, first aid items, and other emergency...
- Been trained in First Aid or CPR?



7. Would you be willing to make your home more resistant to natural disasters?

[More details](#)

● Yes 6
● No 3

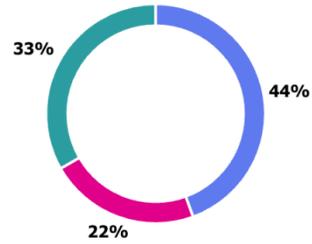


City and Borough of Wrangell Hazard Mitigation Plan

8. Would you be willing to spend more money on your home to make it more disaster resistant?

[More details](#)

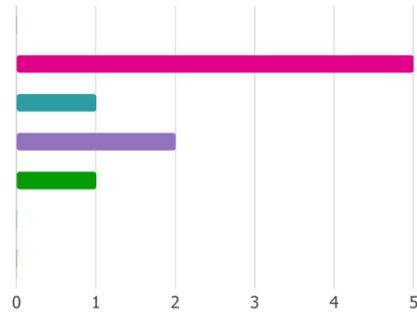
- Yes 4
- No 2
- Don't Know 3



9. How much are you willing to spend to better protect your home from natural disasters? (check only one)

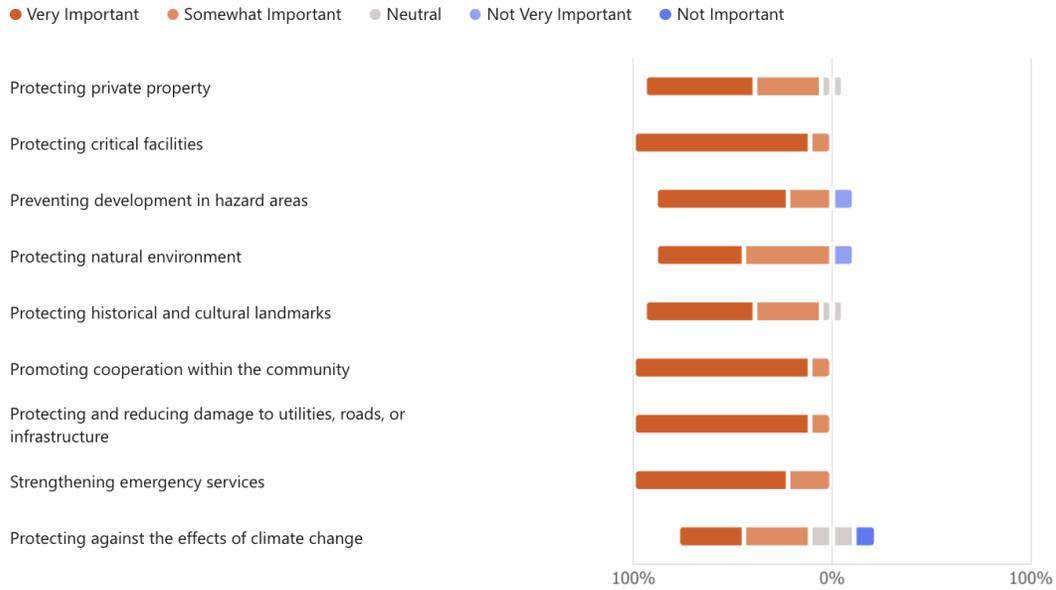
[More details](#)

- Less than \$100 0
- \$100-\$499 5
- \$500 and above 1
- Nothing/Don't Know 2
- Whatever it takes 1
- Desire to relocate for protection 0
- Other 0



City and Borough of Wrangell Hazard Mitigation Plan

10. Please check the box for the following statements to best describe their importance to you. Your responses will help us determine your community's priorities for planning for these mitigation activities. [More details](#)



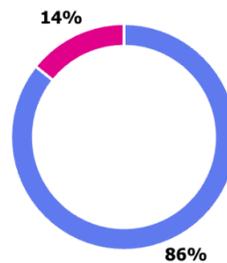
11. Do you have other suggestions for possible mitigation actions/strategies? [More details](#)

2
Responses

Latest Responses
"Emergency preparedness exercises"
...

12. Have you previously experienced an emergency response from the City and Borough of Wrangell? How would you rate the response? [More details](#)

- Excellent 6
- Good 1
- Fair 0
- Needs Improvement 0



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13. Please indicate why you choose this rating, and what areas of response work well and what needs improvement.

[More details](#)

1
Responses

Latest Responses

...

14. Please indicate your age:

[More details](#)

8
Responses

Latest Responses

"51"

"52"

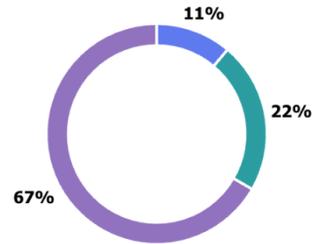
"78"

...

15. How long have you lived in Wrangell?

[More details](#)

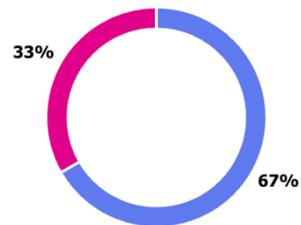
● less than 5 years	1
● 5 to 10 years	0
● 11 to 20 years	2
● 21 or more years	6



16. Do you own or rent your home?

[More details](#)

● own	6
● rent	3



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