Whatcom County

COUNTY COURTHOUSE
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Agenda Bill Master Report

File Number: AB2021-616

File ID:	AB2021-616	**Version:**	1	**Status:**	Approved
File Created:	10/22/2021	**Entered by:**	FBurkhar@co.whatcom.wa.us		
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Assigned to:	Council Finance and Administrative Services Committee			**Final Action:**	12/07/2021
Agenda Date:	12/07/2021			**Enactment #:**	RES 2021-057

Primary Contact Email: jgargett@co.whatcom.wa.us

TITLE FOR AGENDA ITEM:

Resolution adopting the Whatcom County Natural Hazards Mitigation Plan

SUMMARY STATEMENT OR LEGAL NOTICE LANGUAGE:

See attached proposed resolution and plan

HISTORY OF LEGISLATIVE FILE

Date:	Acting Body:	Action:	Sent To:
11/09/2021	Council Finance and Administrative Services Committee	FORWARDED TO COUNCIL WITH RECOMMENDED MOTION(S)	
	Aye: 2	Byrd, and Frazey	
	Nay: 0		
	Absent: 0		
	Temp Absent: 1	Browne	
11/09/2021	Council	HELD IN COMMITTEE	Council Finance and Administrative Services Committee
	Aye: 6	Browne, Buchanan, Byrd, Donovan, Elenbaas, and Frazey	
	Nay: 0		
	Absent: 1	Kershner	
11/23/2021	Council Finance and Administrative Services Committee	WITHDRAWN	
11/23/2021	Council	WITHDRAWN	

12/07/2021	Council Finance and Administrative Services Committee			RECOMMENDED FOR APPROVAL
		Aye:	2	Browne, and Frazey
		Nay:	0	
		Absent:	1	Byrd
12/07/2021	Council			APPROVED
		Aye:	6	Browne, Buchanan, Byrd, Donovan, Frazey, and Kershner
		Nay:	1	Elenbaas
		Absent:	0	

Attachments: Proposed Resolution, Ex. A 01-Section 1, Ex. A 02-Section 2, Ex. A 03A-Bellingham-Section 3, Ex. A 03B-Blaine-Section 3, Ex. A 03C-Everson-Section 3, Ex. A 03D-Ferndale-Section 3, Ex. A 03E-WCFCZD-Section 3, Ex. A 03F-LWWSD-Section 3, Ex. A 03G-Lynden-Section 3, Ex. A 03H-MSD-Section 3, Ex. A 03I-Nooksack-Section 3, Ex. A 03J-POB-Section 3, Ex. A 03K-Sumas-Section 3, Ex. A 03L-Whatcom-Section 3, Ex. A 04-Section 4

PROPOSED BY: Sheriff's Office

INTRODUCED: 12/7/21

RESOLUTION NO. 2021-057

ADOPTING THE WHATCOM COUNTY NATURAL HAZARDS MITIGATION PLAN

WHEREAS, identification of natural hazards and development of plans to reduce or eliminate the associated long term risk to human life and property results in a safer community; and

WHEREAS, the Disaster Mitigation Act of 2000 (P.L. 106-390 / 44 CFR Parts 201.6) reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur; and

WHEREAS, states, communities, and special purpose districts must have an approved mitigation plan in place prior to receiving post-disaster Hazard Mitigation Grant Program (HMGP) funds; and

WHEREAS, the planning process is intended to facilitate cooperation between state and local authorities and encourages local input; and

WHEREAS, Whatcom County participated in a collaborative hazard mitigation planning and up-date process;

NOW, THEREFORE, BE IT RESOLVED by the Whatcom County Council that the Whatcom County Natural Hazards Mitigation Plan, a multi-jurisdictional plan dated September 30, 2021 and attached hereto as Exhibit A, is hereby adopted.

APPROVED this 7th day of December, 2021.

ATTEST: COUNTY COUNCIL OF WHATCOM COUNTY STATE OF WASHINGTON

Dana Brown-Davis, Clerk of the Council

WHATCOM COUNTY COUNCIL
WHATCOM COUNTY, WASHINGTON

Barry Buchanan, Council Chair

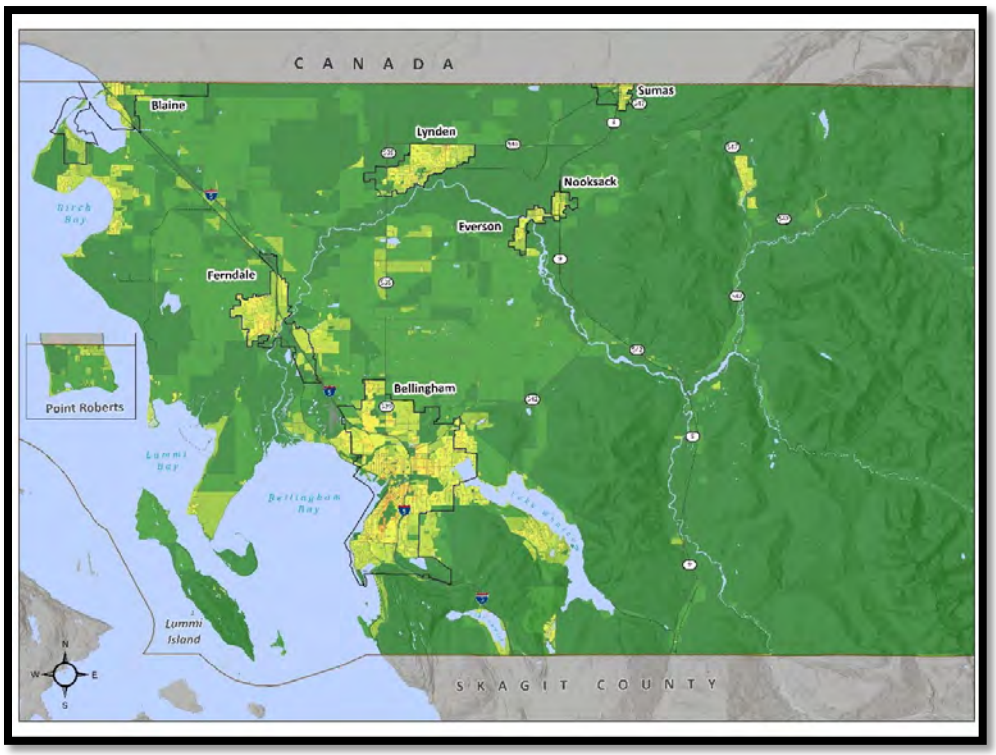
APPROVED AS TO FORM:

/s/ Brandon Waldron (via e-mail 10/22/21)/FB
Civil Deputy Prosecutor

Exhibit A

Whatcom County

Natural Hazards Mitigation Plan



A MULTI-HAZARD, MULTI-JURISDICTIONAL PLAN DEVELOPED FOR THE BENEFIT OF ALL CITIZENS AND GOVERNMENTAL JURISDICTIONS WITHIN WHATCOM COUNTY

Prepared by:
Whatcom County Sheriff's Office Division of Emergency Management
and
The Resilience Institute of Western Washington University

September 30, 2021

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ACKNOWLEDGMENTS

Funding Acknowledgements

Whatcom County Sheriff's Office Division of Emergency Management contracted with Western Washington University's Resilience Institute to develop the 2021 Whatcom County Natural Hazards Mitigation Plan Update. Funding for this project was made possible through funding provided by the U.S. Department of Homeland Security.

Geographic Information Systems Maps

The maps for the 2021 update of the Plan were created by Western Washington University's Resilience Institute, with support from the university's Spatial Institute, unless indicated otherwise.

The datasets used in the maps in this Plan were from the following sources:

- Washington Department of Natural Resources – Wildland-Urban Interface (2019), Boulder Creek Fault Zone Seismic Scenario (2017), and Liquefaction Susceptibility (2010)
- Washington Geological Survey – Landslide Inventory (2020)
- Federal Emergency Management Agency – National Flood Hazard Layer (2019)
- Whatcom County – Tsunami Inundation (contour polygons, 2020)
- U.S. Geological Society – Mount Baker Volcano Lahar and Blast Zone Boundaries (1995)
- Whatcom County Planning and Development Services – City Limits, County Boundaries, Urban Growth Area
- Washington State Department of Transportation – Railroads, Roads, Highway
- Washington State Department of Natural Resources -- Tsunami Hazard maps for North Puget Sound (2021)

AUTHORITY

This Plan is adopted by:

Entity	Approving Authority	Date Adopted	Ordinance
City of Bellingham	Mayor Seth Fleetwood & City Council Members		
Port of Bellingham	Executive Director Rob Fix & Port Commission		
City of Blaine	Blaine City Council		
City of Everson	Mayor John Perry & City Council Members		
City of Ferndale	Mayor Greg Hansen & City Council Members		
Meridian School District	Dr. James Everett, Superintendent		
City of Lynden	Mayor Scott Korthuis & City Council Members		
City of Nooksack	Mayor Jim Ackerman & City Council Members		
City of Sumas	Chamber President Ron Fadden & City Chamber Members		
Whatcom County	County Executive Satpal Sidhu & Whatcom County Council Members		
Whatcom County Flood Control Zone District	County Executive Satpal Sidhu & Whatcom County Council Members		
Lake Whatcom Water & Sewer District	District Board of Commissioners		

INTRODUCTION

In 2021, Whatcom County Sheriff's Office, Division of Emergency Management (DEM) undertook the process of updating the *Whatcom County Natural Hazards Mitigation Plan* (cited herein as "Plan"). Natural hazards mitigation process was instigated by the Code of Federal Regulation (CFR) 201.6 (see Appendix A), enacted in October 2002 and amended in September 2004. The purpose of the Plan is to facilitate a net reduction in the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during immediate recovery from a disaster.

Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), 42 U.S.C. 5165, as amended by the Disaster Mitigation Act of 2000 (DMA) (P.L. 106-390), provides for States, Tribes, and local governments to undertake a risk-based approach to reducing risks to natural hazards through mitigation planning. The National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 *et seq*, reinforced the need and requirement for mitigation plans, linking flood mitigation assistance programs to State, Tribal and Local Mitigation Plans.

After a presidential major disaster declaration, mitigation funding becomes available. The amount is based on a percentage of the total federal grants awarded under the Public Assistance and Individuals and Households Programs for the entire disaster. Projects are funded with a combination of federal, state, and local funds. Information on this program and application process is disseminated at public briefings and by other means.

Section 322 of the amended Stafford Act essentially states that as a condition of receiving a disaster loan or grant:

> "The state **and** local government(s) shall agree that natural hazards in the areas affected shall be evaluated and appropriate action taken to mitigate such hazards, including safe land-use and construction practices. **For disasters declared after November 1, 2004, all potential applicants (sub-grantees) must have either their own, or be included in a regional, locally adopted and FEMA approved all hazard mitigation plan in order to be eligible to apply for mitigation grant funds."**

The regulations governing the mitigation planning requirements for local mitigation plans are published under 44 CFR §201.6. Under 44 CFR §201.6, local governments must have a FEMA-approved Local Mitigation Plan in order to apply for and/or receive project grants under the following hazard mitigation assistance programs:

- **Hazard Mitigation Grant Program (HMGP).**

  The Hazard Mitigation Grant Program (HMGP) provides funds to States, Territories,

Indian Tribal governments, local governments, and eligible private non-profits (PNPs) following a Presidential major disaster declaration.

- **Pre-Disaster Mitigation (PDM)**
- **Flood Mitigation Assistance (FMA)**

  The Pre-Disaster Mitigation (PDM) Program and Flood Mitigation Assistance (FMA) programs provide funds annually to States, Territories, Indian Tribal governments, and local governments. Although the statutory origins of the programs differ, both share the common goal of reducing the risk of loss of life and property due to natural hazards.

Mitigation is the cornerstone of emergency management. It is an integral part of the ongoing effort to lessen the impacts disasters can have on people's lives and property through damage prevention and flood insurance. The impact on human lives and communities is lessened through measures such as building safely within the floodplain or removing homes from the floodplain altogether; engineering buildings and infrastructures to withstand earthquakes; and creating and enforcing effective building codes to protect properties from floods, hurricanes, and other natural hazards.

The mitigation plan contains a five-year action plan matrix, background on the purpose and methodology used to develop the mitigation plan, profiles of Whatcom County and participating jurisdictions, sections on the natural and technological that occur within the county, and multiple appendices.

WHATCOM COUNTY BACKGROUND

Whatcom County, the northwestern most county of Washington State, comprises an area of 2,120 square miles. It is bordered to the north by Canada and to the west by the Strait of Georgia, a deep-water ship transit, and another waterway called the Rosario Strait. The eastern half of Whatcom County is composed of the North Cascades Mountain range, which occupies roughly two-thirds of the entire County. No Whatcom County roads that originate in the western half of the County connect to the eastern half; towns in eastern Whatcom County can only be accessed by driving more than 60 miles through Skagit County to the south. An unusual characteristic of Whatcom County is that not all of its populated areas are contiguous with the mainland part of the County; these areas include Point Roberts and Lummi Island. Only 4.5% of the land area is incorporated, while the majority is unincorporated. According to the U.S. Census Bureau, the population of Whatcom County grew from an estimated 209,790 in 2015, to an estimated 228,000 in 2020, an 8% increase. Most of this growth, 70%, occurred within the incorporated areas of Whatcom County. Development has followed a similar pattern.

The Washington State Growth Management Act (GMA) was adopted by State Legislature in 1990 (Revised Code of Washington Chapter 36.70A) to address the threat that uncoordinated and unplanned growth posed to the environment, sustainable economic development, and the quality of life in Washington, including the minimizing the risks natural hazards pose to local communities. The GMA requires state and local governments to manage Washington's growth by identifying and protecting critical areas and natural resource lands, designating urban growth areas, preparing comprehensive plans and implementing them through capital investments and development regulations. According to the code, critical areas include frequently flooded areas and geologically hazardous areas, natural hazards specifically addressed in the Whatcom County Natural Hazard Mitigation Plan. The GMA regulates development in these areas and has the potential to affect hazard vulnerability and exposure at the local level. Whatcom County and its planning partners are in compliance with the provisions of the GMA and other regulations (e.g., Endangered Species Act, Clean Water Act, Shoreline Management Act, and the Washington State Building Code) that limit development in frequently flooded and geologically hazardous areas.

The Natural Hazard Mitigation Plan is constantly under review and efforts are made to reflect changes in priority. For example, in 2017 the Whatcom County Council added to its Critical Areas Chapter paragraph "16.16.350 Volcanic Hazard Areas-Standards." While not denying the construction of structures in a lahar zone, this paragraph requires deliberate evaluation of the possible lahar path and development of an emergency evacuation plan with life-saving action as the primary consideration.

The NHMP both informs and is informed by Whatcom County Planning and Development policies and regulations and other planning documents, including the Whatcom County Comprehensive Plan (November 2020; specifically, Chapter 2 Land Use and Chapter 10 Environment). While development has continued to occur within Whatcom County, the Natural Hazards Mitigation Plan has been used as one of the documents to determine the impacts that the hazard(s) may have in areas that are being developed.

An understanding of the geography, weather, industries, and characteristics of Whatcom County is critical to an ability to mitigate the natural hazards identified in this Plan. Some of these characteristics are discussed below.

A. CLIMATE

Annual precipitation varies greatly, depending on elevation, as follows:

1. Lowlands: rainfall varies from 30 to 40 inches
2. East toward the Cascade Mountains: precipitation increases
3. Near Mount Baker (elevation 10,778 feet): 140 inches, snow is possible year round

B. GEOGRAPHY

Major geographic features of Whatcom County are grouped as follows:

1. **Lowlands (West of Cascade Foothills):** These lowlands are part of the Fraser/Nooksack river-deltas system. This system runs north from the Chuckanut Mountains to the mouth of the Fraser River, where Vancouver, British Columbia (B.C.) is sited. To the south (beyond the Chuckanut Mountains, in Skagit County) is the delta of another great river, the Skagit River. These river deltas are important to Whatcom County because of their related flood, earthquake, and volcano hazards.
2. **Mount Baker Foothill Communities:** Scattered through the rural area along the Valley Highway (Highway 9) and up through the foothills along the Mount Baker Highway (State Route [SR] 542), crossing all three forks of the Nooksack River, are the Mount Baker Foothill communities of Van Zandt, Acme, Wickersham, Welcome, Kendall, Maple Falls, and Glacier.
3. **Nooksack River:** There are more than 1,325 miles of stream in the Nooksack River, its tributaries, and associated independent streams. The river originates in the mountains as three forks (North, Middle, and South) that converge near Deming. Its watershed

basin comprises most of the County's eastern lands. The river corridor links the various landscapes of Whatcom County.

4. **Coast and Islands:** There are 134 miles of seacoast in Whatcom County: 51% is steep, eroding sea bluff (such as the mountain view coast at Birch Point); 16% is rocky shoreline, which includes parts of Lummi Island; 17% is accreting (building up or extending shoreline); and 5% is estuarine shore.
5. **Lakes:** There are 245 lakes In Whatcom County: four large reservoirs inside the Federal Lands (Ross, Diablo, Gorge, and Baker Lakes) and two large natural lakes in the Chuckanut region (Lake Whatcom and Lake Samish). Seven lakes are more than 100 acres in size:
    - Whatcom (5,000 acres)
    - Samish (825 acres)
    - Terrell (440 acres)
    - Silver (185 acres)
    - Padden (150 acres)
    - Wiser (125 acres)
    - Judson (112 acres)
6. **The North Cascades Mountains:** Roughly two-thirds of eastern Whatcom County is federally managed land contained in the North Cascades Mountains, which is controlled by the U.S. Forest Service and the U.S. National Park Service. The Cascades extend from Canada's Fraser River south beyond Oregon. They shape the climate and vegetation over much of the Pacific Northwest.
    - The Mount Baker-Snoqualmie National Forest lies east of the foothills and west of the "North Unit" of North Cascades National Park.
    - The North Cascades National Park is located adjacent to the east portion of the Mount Baker-Snoqualmie National Forest.
    - East of the North Cascades National Park is the Pasayten Wilderness, administered through the Okanogan National Forest. This is a road-less area.
7. **National Forest and Parks.** There are about 460,000 acres of National Forest Lands and about 400,000 acres of National Park Lands within Whatcom County. Three roads

connect western Whatcom County with the federal lands:

- The Mount Baker Highway (SR 542) provides access to the Mount Baker Recreation Area.
- The Middle Fork Road (a secondary, more primitive entrance) leads to the hiking and camping region on the south and west sides of Mount Baker, including the Twin Sisters area.
- Highway 20 (through Skagit County) is the principal access to Baker Lake, as well as to North Cascades National Park.

Two parts of the North Cascades National Park Complex are located in Whatcom County:

- The North Unit (Picket Range) – roadless, primitive, high country .
- Ross Lake National Recreation Area – Seattle City Light with three dams on the Skagit River.

C. TRANSPORTATION

1. Major Roads

- Interstate 5 (I-5), which connects Mexico to Canada, runs north and south through Whatcom County.
- SR 9 traverses north and south, crossing the South and North Forks of the Nooksack River.
- Mount Baker Highway (SR 542), from Bellingham, intersects SR 9 and winds east to Mount Baker.
- Chuckanut Drive (SR 11), from Bellingham, south along the coast to Skagit County

2. Marinas

- In Bellingham, Squalicum Harbor is the second largest marina in Puget Sound. More than 1,800 pleasure craft, commercial boats, and fishing vessels are moored here.
- In Blaine, Drayton Harbor includes pleasure craft and a fishing fleet.

- Point Roberts is accessed by water from the Strait of Georgia or by land through Canada.
- Semiahmoo Marina contains approximately 300 slips and is located near the Canadian border.
- Private marinas are located along Bellingham Bay (including Fairhaven), Lummi Island, Gooseberry Point, Sandy Point, Birch Bay, and Eliza Island.

3. Rail

- Bellingham is on Amtrak routes from Seattle and Vancouver, B.C.
- Rail freight corridors along SR 9 and the Puget Sound shoreline (i.e., along Chuckanut Bay to Bellingham) connect freight from the south into Canada, with additional sidings that connect these two routes.
- There is rail along the I-5 corridor to Blaine and northwest to the Cherry Point vicinity.
- Rail from Cherry Point to Custer links with the I-5 rail corridor.

4. Vessel Traffic Lanes

- Deep Draft Commercial Vessels
- Barges
- Tug boats
- Commercial fishing vessels
- Recreation boats
- Federal Vessels
- Vessels accessing shipyards in Fairhaven and Bellingham Bay

5. Ferry Crossings

- The Alaska Marine Highway System Ferry departs from Bellingham to Alaska.
- The Whatcom County Ferry crosses Hales Pass from Gooseberry Point to Lummi Island (an approximately 8-minute transit time).
- Plover Passenger Ferry crosses from Blaine to Semiahmoo Spit; this ferry is open seasonally on the weekends from Memorial Day to Labor Day.
- Commercial sight-seeing ferries to the San Juan Islands and Victoria, Canada,

depart from the Bellingham Ferry Terminal.

- Canadian Ferries cross northwestern Whatcom County waterways: Tsawwassen through Strait of Georgia, to Channel Islands, and to Sidney on Vancouver Island, B.C.

6. Rivers

- The Nooksack River and many tributaries and independent streams are used by canoes, kayaks, small fishing boats, and for rafting float trips.

D. AIR TRANSPORTATION

- Bellingham International Airport: Commercial jets use a 6,700 X 150-foot asphalt runway
- Lynden Municipal Airport: 2425 X 40-foot asphalt runway
- Point Roberts Airport: 2400 X 150 turf runway
- Vancouver International Airport, an "air hub" with worldwide nonstop flights, is 45 miles north in Vancouver B.C.
- Sea-Tac International Airport is 90 miles south in Seattle, Washington

E. LAND TRANSPORTATION

- Whatcom Transportation Authority (WTA)
- Greyhound bus
- Private charters/shuttles
- Taxis
- Car rentals

F. SERVICES

1. Hospital

- Peace Health St. Joseph Medical Center, including its Outpatient Center, is the only hospital in Whatcom County.
- Several health clinics are found in Whatcom County, primarily in Bellingham.

2. Local Media

- Two television stations with out-of-state production: KVOS on Channel 12 is produced in Chicago with its primary market being lower BC and Vancouver Island. KBCB is an Illinois based Christian Television station, running only Christian programming, again mainly focused on lower mainland.
- Several companies provide television cable services
- Telephone companies:
  - Century Link Communications in Bellingham
  - Whidbey Telephone Company in Point Roberts
  - Frontier in the remainder of Whatcom County
  - Comcast (IP Service)
- Ten radio stations: AM/FM
- Emergency Alert System Station: KGMI (790 AM)
- One daily newspaper
- Seven weekly newspapers
- Two monthly publications

3. School Districts: Public Education, Kindergarten through 12th grade

- 35 elementary schools
- 11 middle schools
- Nine high schools
- Numerous private schools

4. Colleges/Universities

- Bellingham Technical College
- Northwest Indian College
- Western Washington University

- Whatcom Community College
- Washington State University Cooperative Extension – Whatcom County

5. Utilities

- Electricity: Puget Sound Energy, Public Utility District (PUD) #1, Blaine PUD, Sumas PUD, and Bonneville Power (to direct-service customers)
- Gas: Cascade Natural Gas supplies gas directly to customers; Williams Natural Gas Pipeline, Arco Natural Gas Pipeline, and Olympic Pipeline supply retailers.
- Water: approximately 350 public water systems in Whatcom County; Bellingham, Lynden, Blaine, Glacier, Nooksack, and Sumas have their own water districts; and some smaller communities rely on private wells and lakes
- Cogeneration plants: three natural gas-fired cogeneration plants are located in Whatcom County: Sumas Cogeneration Company LP in Sumas; - PSE Ferndale Generating Station in Ferndale; and Encogen Cogeneration Plant in Bellingham.

WHATCOM COUNTY PRESIDENTIAL DISASTER DECLARATIONS

When natural hazard event impacts are large, the state may request a Presidential Disaster Declaration. The table below lists the Presidential Disaster Declarations for Whatcom County from 2009 until the publication of this plan update in June 2021. Where available, dollar value represents the estimate Whatcom County public assistance per capita impacts, as established in the Preliminary Damage Assessment (PDA) Report for the event. Complete data is available through https://www.fema.gov/disasters/disaster-declarations database.

Year	Level of Community Impact (Estimated)	Date	Disaster Types	Federal Disaster #
2009	Whatcom County included in declaration as an amendment to the original declaration. No per capita impact available for Whatcom County at time of PDA	30-Jan-2009	Severe Winter Storm, Landslides, Mudslides, and Flooding	1817

2008	$4.12 per capita impact	2-Mar-2009	December 2008 Severe Winter Storm and Record and Near Record Snow	1825
2010-2014	No Major Disaster Declarations			
2015	Below $3.57 per capita threshold	15-Oct-2015	Severe Windstorm	4242
2015	$10.50 per capita impact	20-Oct-2015	Wildfires and Mudslides	4243
2017	$10.05 per capita impact	21-Apr-2017	Severe Winter Storms, Flooding, Landslides, and Mudslides	4309
2019	$25.71 per capita impact		Straight-Line Winds, Flooding, Landslides, and Tornado	4418
2020	$10.26 per capita impact	23-Apr-2020	Severe Storms, Flooding, Landslides, and Mudslides	4539
2020	No per capita impact assessed	22-Mar-2020	Covid-19 Pandemic	4481

WHATCOM COUNTY STATE DECLARATIONS AND OTHER DISASTERS

Not all events that occur reach a Presidential Declaration. Whatcom County experiences many events that do not reach the threshold of even a gubernatorial declaration. This does not mean the events are not impactful or costly. It just means the threshold levels for the State have not been reached ($780,000 for Whatcom County, $10,750,000 for the State). In addition, Whatcom County, and Whatcom County response agencies, do not have a standardized cost and impact documentation methodology which makes it difficult to adequately track the full scope of an event. Understanding the actual costs and impacts of all natural hazard events is a goal of Whatcom County in the 2021-2025 timeframe. However, the following list of natural hazard events did occur between 2012 and 2020:

Year	Designation	Title	Estimated COSTS
2016	2016	Winter Storm	$250,000
2016	3207	Reese Hill Wildfire	$350,000
2016	3764	Wind and Rain	$200,000
2017	0971	2500 Rock Slide	$150,000
2017	1905	June Ferndale Suspicious Oder	$75,000
2017	4928	December Ice Storm	$600,000 (includes utility damages)
2017		June Mudslide	$50,000
2017	0347&0448 / FEMA 4309	Feb 2017 Storms	$1,500,000
2017	3957	Winter Storms 2016/2017	$750,000
2018	0439	20 Shetland Court Landslide	$25,000

2018	4434	Flooding and Windstorm	$575,000
2018	4615 / FEMA 4418	December Storms	$4,750,000
2018	05	Fire and Dry Fuel Proclamation	$25,000
2019	0410	February Severe Storms	$675,000 (includes utility damages)
2020	0256 / FEMA 4539	Super Bowl Flood	$3,500,000
2020	0256	January Kind Tide Event	$150,000
2020	0265	COVID-19	$50,000,000 (not calculated in total, on-going)
2021	1379	Mt Baker/Kelly Road Wildland Fire	$25,000
			(Total excluding COVID-19) $13,650,000 **or $2,730,000 per year**

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SECTION 1. PLAN MISSION, GOALS, AND UPDATE PROCESS

PLAN MISSION

The mission of the *Whatcom County Natural Hazards Mitigation Plan* is to promote sound public policy designedto protect citizens, critical facilities, infrastructure, private property, and the environment from natural hazards. This can be achieved by increasing public awareness, documenting resources for risk reduction and loss-prevention, and identifying activities to guide the county towards building a safer, more sustainable/resilient community.

PLAN GOALS

The plan goals describe the overall direction Whatcom County jurisdictions, organizations, and citizens can take to work toward mitigating risk from natural hazards.

The goals represent stepping-stones between the broad direction of the mission statement and the specific recommendations outlined in the action items. Key Contributors reviewed the Plan Goals from the 2011 Whatcom County Natural Hazard Mitigation Plan and determined them to be still valid. In the current plan, however, the plan goals were expanded, providing additional detail to more clearly define and clarify those goals. The Plan goal topics are:

1. **Protect Life, Property and Public Welfare.**
    a. Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to losses from natural hazards.
    b. Reduce losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards. Improve hazard assessment information to make recommendations for discouraging new development and encouraging preventive measures for existing development in areas vulnerable to natural and technological hazards.
2. **Increase Public Awareness.**
    a. Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.
    b. Provide information on tools, partnership opportunities, and funding resources to assist inimplementing mitigation activities.

3. **Preserve and Enhance Natural Systems.**

    a. Encourage development of acquisition and management strategies to preserve open space.

4. **Encourage Partnerships and Implementation.**

    a. Strengthen communication and coordinate participation among and within public agencies, citizens.

    b. Engage with non-profit organizations, business, and industry to gain a vested interest in implementation.

    c. Encourage leadership within public and private sector organizations to prioritize and implement local, county, and regional hazard mitigation activities.

5. **Ensure Emergency Services.**

    a. Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure.

    b. Strengthen emergency operations by increasing collaboration and coordination among publicagencies, non-profit organizations, business, and industry.

    c. Coordinate and integrate natural and technological mitigation activities, where appropriate, withemergency operations plans and procedures.

INTEGRATION OF FEMA GUIDANCE

The mitigation plan belongs to the local community. While FEMA has the authority to approve plans in order for local governments to apply for mitigation project funding, there is no required format for the plan's organization. When developing the mitigation plan, keep the following guiding principles in mind:

- Focus on The Mitigation Strategy. The mitigation strategy is the plan's primary purpose. All other sections contribute to and inform the mitigation strategy and specific hazard mitigation actions.
- Process Is As Important As The Plan Itself. In mitigation planning, as with most other planning efforts, the plan is only as good as the process and people involved in its development. The plan should also serve as the written record, or documentation, of the planning process.
- This Is Your Community's Plan. To have value, the plan must represent the current needs and values ofthe community and be useful for local officials and stakeholders. Develop the mitigation plan in a way that best serves your community's purpose and people.

The suggested mitigation actions are summarized into four types: (1) Local Planning and Regulations, (2) Structure and Infrastructure Projects, (3) Natural Systems Protection, and (4) Education and Awareness Programs. Examples of activities that can be used to accomplish each mitigation goal are identified, as well asthe relevant FEMA publications or resources, if applicable.

FEMA recognizes that local governance structures vary, and that the authority to implement mitigation strategies (e.g., land use planning and zoning, building code enforcement, infrastructure improvements, floodplain management, etc.) may not reside within a single governmental entity. In addition, certain FEMA hazard mitigation assistance programs accept applications from private, nonprofit organizations and other quasi-governmental entities that do not necessarily align with traditional geopolitical boundaries. To ensure these potential sub-applicants to FEMA mitigation assistance programs meet the eligibility requirements for mitigation plans under 44 CFR §201.6, FEMA has identified procedures for several of these entities.

Reference: FEMA's Local Mitigation Planning Handbook, March 2013

Federal Regulations

Federal regulations regarding the planning process and updating of multi-jurisdictional hazard mitigation plans can be found in 44 CFR 201.6. The "Planning Process" subsection (b) of 44 CFR 201.6 requires an open public involvement process to be developed and documented as part of the Plan. According to this section, the public involvement process shall include:

1. An opportunity for the public to comment on the Plan during the drafting stage and prior to Plan approval.
2. An opportunity for neighboring communities; local and regional agencies involved in hazard mitigation activities; agencies that have the authority to regulate development; and businesses, academia, and other private and non-profit interests to be involved in the planning process.
3. Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

FEMA's Local Mitigation Planning Handbook, March 2013

"A community must review and revise an existing plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities and resubmit for approval within 5 years to continue to be eligiblefor FEMA mitigation project grant funding."

REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involvedin hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(c)(2))
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))

A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4) (i))
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(ii))
B3. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))
C1. Does the Plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))

REGULATION CHECKLIST Regulation (44 CFR 201.6 Local Mitigation Plans)
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3))
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3) (i))
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects foreach jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3) (ii))
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (includingcost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3) (iv)); (Requirement §201.6(c)(3) (iii))
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans,when appropriate? (Requirement §201.6(c)(4) (ii))
D1. Was the Plan revised to reflect changes in development? (Requirement §201.6(d)(3))
D2. Was the Plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))
D3. Was the Plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))

The "Plan Content" subsection (c) of 44 CFR 201.6 requires the Plan to include documentation

of the planning process including how it was prepared, who was involved, and how the public was involved. The "Plan Review" subsection (d)(3) of 44 CFR 201.6 states that jurisdictions with adopted plans are required to review, revise if appropriate, and resubmit plans for approval within 5 years to continue to be eligible for Hazard MitigationGrant Program funding.

PLAN UPDATE PARTICIPANTS

Plan Update Participants

The Plan is intended to be multi-jurisdictional; therefore, all of the jurisdictions included in the 2021 Plan dedicated time and effort to provide jurisdiction-specific information contained throughout the 2021 Planupdate.

The following jurisdictions assisted in the development of this Plan Update:

- Bellingham
- Blaine
- Everson
- Ferndale
- Lake Whatcom Water & Sewer District
- Lynden
- Meridian School District
- Nooksack
- Port of Bellingham
- Sumas
- Whatcom County
- Whatcom County FloodControl Zone District

Key Contributors That Provided Jurisdiction-Specific Information

City of Everson	Rollin Harper (Planning Contractor)
City of Bellingham	Liz Coogan, Emergency Management
	Claire Foglesong, Natural Resources Policy Manager
	Chris Behee, Sr GIS Analyst-Planning & Community Development

City of Blaine	Stacie Pratschner, Community Development Director
City of Nooksack	Rollin Harper (Planning Contractor)
City of Ferndale	Jori Burnett, City Administrator
City of Lynden	Mike Martin, City Administrator
City of Sumas	Dan DeBruin, Chief of Police Rollin Harper (Planning Contractor)
Lake Whatcom Water and Sewer District	Justin Clary, General Manager Rich Munson, Safety Officer
Meridian School District	Dr. James Everett, Superintendent
Port of Bellingham	Scott McCreery, Emergency Management/Safety Officer
Whatcom County	John Gargett, Whatcom County Sheriff's Office-Division of Emergency Management, Deputy Director Wally Kost, Sheriff's Office Division of Emergency Management Paula Harris, River and Flood Manager Andy Wiser, Geohazards Specialist, Planning and Development Services Roland Middleton, Special Programs Manager, Public Works
Whatcom County FCZD	Paula Harris, River and Flood Manager

In addition to the participating jurisdictions mentioned above, smaller agencies throughout the County were invited to participate in the development and adoption of the Hazard Mitigation

Plan.

The Whatcom County Information Technology, GIS Group was responsible for locating and collecting all natural hazard-related GIS data updates from local and state sources.

In order to involve the public in the 2021 Plan update, the Whatcom County Sheriff's Office Division of Emergency Management advertised and conducted, three virtual Community disaster preparedness workshops, and maintained a 24/7 online virtual town hall meeting on their website concerning the plan update process - (https://www.whatcomcounty.us/3569/2021-Natural-Hazards-Mitigation-Plan). These meetings provided opportunities for participation in the 2021 Plan update and, just as importantly, provided opportunities to solicit information and comments from the citizens of Whatcom County and to better involve them in the Plan.

In addition to the Whatcom County Sheriff's Officer Division of Emergency Management, Western Washington University's Resiliency Institute was contracted to support the 2021 Plan update.

PLAN UPDATE PROCESS

2021 Plan Update Timeline and Milestones

COVID -19 negatively impacted normal plan update processes. Aside from most emergency services focused on responding to urgent medical requirements; other government agencies were closed and directed to work from home. This in turn hindered group interaction, which is an essential part of updating the Natural Hazard Mitigation Plan. Nevertheless, Whatcom County and participating communities undertook an aggressive planning schedule to update this plan once restrictions began to be relaxed. The following timeline along with associated actions reflect the update process used by Whatcom County and participating communities:

Date	Activity
1/20/2021	Initial communication with participating communities
1/27/2021	Virtual kickoff meeting with NHMP communities
1/29/2021	Created 2021 Natural Hazard Mitigation Plan webpage for public use https://www.whatcomcounty.us/3569/2021-Natural-Hazards-Mitigation-Plan

1/29/2021	Created Natural Hazard Mitigation Plan Group SharePoint site for posting reference and planning materials and planning member interaction
2/09/2021	Conducted second NHMP planning team meeting focused on planning timeline and update responsibilities
2/11/2021	Virtual meeting with Dr. Rebekah Paci-Green from Western Washington University (WWU) Resilience Institute on NHMP criteria, and contract scope-of-work
2/24/2021	Conducted third NHMP planning team meeting; clarified timeline, responsibilities, individual community meeting with WWU contract personnel
3/01/2021	Virtual meeting between Whatcom County Planning and Development Services Geohazard Specialist Andy Wiser and WWU to update responsibilities.
3/02/2021	Virtual meeting between River and Flood Manager Paula Harris and WWU to update responsibilities.
3/4/2021	WWU email communication with Stefan Freelan from Western Washington University discussing asset geospatial analysis process.
3/05/2021	Virtual meeting between WCSO DEM and WWU regarding mapping/GIS updates
3/09/2021	Conducted fourth NHMP planning team meeting; Dr. Paci-Green updated planning team on tables to be introduced
3/09/2021	WCSO DEM and WWU coordinated with Kevin Zerbe (WA State Hazard Mitigation Officer) concerning HHMP tables (quantitative vs qualitative information)
3/15/2021	Lake Whatcom Water and Sewer District met with WWU to discuss updating their sub-section in Section 3.
3/15/2021	WCSO-Public Information Officer began publicizing MNHMP public meeting through traditional and social media sources; local communities dovetailed

	publicity on their community websites
3/17/2021	The City of Bellingham points of contact met with WWU to discuss updating their sub-section in Section 3.
3/19/2021	The City of Ferndale points of contact met with WWU to discuss updating their sub-section in Section 3.
3/22/2021	The Port of Bellingham point of contact met with WWU to discuss updating their sub-section in Section 3.
3/23/2021	Conducted first public County-Wide GoToWebinar concerning Whatcom County's Natural Hazard Mitigation Plan. Addressed all hazards, Community-POCs introduced selves, and answered questions. Meeting time 1830-2000
3/24/2021	Conducted fifth NHMP planning team meeting; Dr. Paci-Green updated planning team on community progress, Jasmine Ro provided update on mapping/GIS products which were loaded into GroupShare site for all planners to review and comment on
3/25/2021	Virtual meeting between Special Programs Manager for Public Works Roland Middleton and WWU to update responsibilities.
3/26/2021	Lynden point of contacts met with WWU to discuss updating their sub-section in Section 3.
4/5/2021	Email communication with Chris Behee discussing natural hazard map comments and updating jurisdiction and urban growth area data.
4/05/2021	WCSO-DEM put out press release concerning NHMP public workshop meeting #2 scheduled for April 13, 2021
4/06/2021	Email communication with Stefan Freelan from Western Washington University reviewing population data.
4/06/2021	Conducted sixth NHMP planning team meeting
4/06/2021	WWU shares critical facilities and wildfire map examples for critique; shares updated annual review and progress table for critique.

4/10/2021	The City of Blaine points of contact met with WWU to discuss updating their sub-section in Section 3.
4/13/2021	Coordinated with WA DNR on status of new wildland fire modeling which is slated to be released in the near future.
4/13/2021	State NFIP Coordinator David Radabaugh meet with WWU to update NFIP figures in Appendix D.
4/13/2021	Conducted second public County-Wide GoToWebinar concerning Whatcom County's Natural Hazard Mitigation Plan. Addressed all hazards, Community-POCs introduced selves, and answered questions. Meeting time 1830-2000
4/15/2021	WCSO-DEM forwarded updated Section 3 to WWU
4/16/2021	WCSO-DEM sent updated Severe Storm Section to WWU
4/16/2021	WCSO DEM sent updated Wildland Fire Section to WWU
4/19/2021	WWU sends Lynden a finalized community profile for review
4/19/2021	Point of contact for Everson, Nooksack and Suman sent updated Section 3 community profiles to WWU
4/19/2021	Email communication with Stefan Freelan from Western Washington University reviewing geospatial analysis tools.
4/20/2021	Paula Harris sends updated flood hazard section and updated NFIP material for Appendix 5 to WWU
4/20/2021	Conducted seventh NHMP planning team meeting; WWU shares updated UGA, community boundary, critical facilities, wildfire, flood, seismic and tsunami map examples for review and critique
4/20/2021	Ferndale sends updated critical facilities list to WWU
4/20/2021	Lake Whatcom Water and Sewer District sends updated Section 3 community profile to WWU

4/20/2021	Port of Bellingham District sends updated Section 3 community profile to WWU
4/21/2021	Meridian School District sends updated Section 3 community profile to WWU
4/22/2021	Andy Wiser sends updated geological hazards section to WWU
4/22/2021	Ferndale sends updated Section 3 community profile to WWU
4/23/2021	Meeting with John Gargett from Whatcom County discussing tsunami hazard data and coastal erosion data.
4/27/2021	City of Bellingham sends updated Section 3 community profile to WWU
4/27/2021	Roland Middleton sends updated Swift Creek Alluvial Fan hazard description to WWU
4/28/2021	WSDOT Avalanche Forecaster Harlan Sheppard met with WWU to update the Avalanche sub-section in Section 2.2.
4/30/2021	Email communication with Stefan Freelan from Western Washington University discussing geospatial analysis steps for percent of population in hazard area calculations.
5/11/2021	Conducted third public County-Wide GoToWebinar concerning Whatcom County's Natural Hazard Mitigation Plan. This workshop focused on aggregate updates and new GIS features to be included in the plan. Meeting time 1830-2000

PUBLIC INVOLVEMENT

Despite the high level of effort required to develop and implement mitigation strategies, it is ultimately up to the people that comprise each community and jurisdiction to determine the success of the Plan in the event of a natural hazard. Therefore, public involvement is essential in each step of the planning process. Whatcom Countyuses a variety of methods to provide public outreach and involvement during and following Plan development including public meetings and web-based outreach.

Public Meetings

Whatcom County Sheriff's Office Division of Emergency Management used social media, public meeting announcements, website and presentations at association meetings to jurisdictional representatives (i.e., Cities, Fire Districts, and School Districts) to advertise the meetings. The purposes of the meetings were to review the 2016 Plan, advise the public regarding the update process, and receive public feedback. Each representative in attendance was provided a checklist to complete that included specific jurisdictional and natural hazard information to be updated for the 2016 Plan. The same checklists were delivered to representatives not in attendance to ensure that similar updates were completed.

Every October, the DEM hosts an annual flood meeting to bring all of the agencies involved in responding to flood events together to review response procedures. Agencies involved in emergency response include:

- U.S. Army Corps of Engineers (USACE)
- National Weather Service
- Red Cross
- Whatcom County Sheriff's Office
- Police departments within cities impacted by flooding
- Fire departments within cities impacted by flooding
- Fire departments within unincorporated Whatcom County impacted by flooding
- Whatcom County Maintenance and Operations Division
- British Columbia Ministry of Environment
- Washington State Department of Transportation (WSDOT)
- Local media
- Water Districts
- Tribal Jurisdictions
- Parks Management

Additional annual meetings facilitated by the DEM include a winter storm meeting, a Local Emergency Planning Committee meeting, and an Emergency Planning Council meeting. The Local Emergency Planning Committee is composed of various representatives from around the County and the annual meeting is open to the public. The Emergency Planning Council is composed of elected officials and holds annual private meetings.

WEB-BASED OUTREACH

The Whatcom County Sheriff's Office Division of Emergency Management utilizes an extensive website that is frequently updated with the most recent hazard preparation materials, hazard updates, and emergency event press releases. Hazard preparation materialspublished on the website include disaster planning documents, a disaster preparedness handbook,[1] and other hazard-specific information (e.g., earthquakes, fires, floods, and winter storms). Hazard updates on the site include the latest weather and road conditions and emergency road closures and restrictions. Emergency event press releases are also published on the website that follows incidents in progress or weather events of alert level concern. The website also includes links to the Washington State Emergency Management Division (EMD), the City of Bellingham Office of Emergency Management, the American Red Cross Mount Baker Chapter, and the FEMA websites. The site was used capture input on the Natural Hazard Mitigation Plan with a page that was dedicated as a "virtual town hall"on the Mitigation Plan update efforts.

[1] Available on the Whatcom County DEM wesite at:
http://www.co.whatcom.wa.us/dem/pdf/emergency_resources–guide.pdf

ELEMENTS NEW TO THE 2021 PLAN

Note: This *Table of Changes* documents pertinent changes made from the 2016 Whatcom County Natural Hazards Mitigation Plan (WCNHMP) to the 2021 WCNHMP Plan update.

Plan Section	Changes in the 2021 Whatcom County Natural Hazard Mitigation Plan (WCNHMP) Update
Introduction	The 2021 WCNHMP retains the same integrity in the Introduction, as the 2016 WCNHMP. The list of natural hazard impacts was more fully described. The list of federally declared disasters was updated for 2016-2020 and the county per capita impacts, as given in the Preliminary Damage Assessment Reports, were added for all declarations from 2009 to present. Further, a list of state-level emergency declarations related to natural hazards was also added to more fully encompass natural hazard impacts to the county.
Section 1: Plan Processand Development	The 2021 WCNHMP retains the same integrity in Section 1, as the 2021 WCNHMP. The stakeholders list was updated, as was the description of public outreach and plan preparation. County planning goals for natural hazard mitigation were edited to increase clarity.
Section 2: Hazard Summaries	The 2021 WCNHMP retains the same integrity in Section2, as the 2016 YC HMP. Other Hazards of Concern for epidemic/disease, Hazardous Materials Release, Supply Chain Disruption, and Terrorist Attack were removed as these hazards are not classified as natural hazards and the country is not currently submitting an enhanced plan.
Section 3: Community and Special District	The 2021 WCNHMP retains the same integrity in Section 3, as the 2016 WCNHMP, but with improved format and significant additions to content. These changes include: • Consistent maps were created for all communities and special districts, including population density, urban growth area (where

Profiles and Mitigation Strategies	appropriate), critical facilities, and hazard exposure maps for earthquake, tsunami, landslide, lahar, flood, and fire. A list of other planning documents the WCHMP will inform or shape. • Three former sections -- hazard description, presence of hazards, and the hazard impacts on community – were merged into a single Presence of Hazards and their Impacts section. Furthermore, the severity of each hazard's impacts was qualitatively assessed and the percentage of area in a community exposed to the hazard was quantitatively assessed and provided to give better context to how the hazard may impact the community or special district. • The Critical Facilities List was updated to include a qualitative assessment of the significance of each facility to community function, using a 3-point scale of moderate, high and very high. • In the 2016 plan, Critical Facilities were ranked qualitatively, based upon practitioner and expert opinion. In the 2021 update, ranking was consistently calculated across all communities and special districts by considering the significance of the facility, its exposure to eight hazards, and a 3-point scale of frequent, rare, and very rare to account for the frequency of each of these hazards. • Based upon the consistent hazard maps created for all communities, geospatial analysis was used to populate a detailed table of area and assets exposed, by hazard. • A new public outreach and education section was added to highlight the important of public awareness in natural hazard mitigation and to spur further outreach and education in the future. • In the 2016 plan, a section on Mitigation Strategies and Projects for the previous planning period (2010-2014) combined ongoing project updates and potential mitigation actions, often without distinguishing between the two. In the 2021 plan, the section has been retitled • Status of Ongoing and 2016-2020 Hazard Mitigation Actions. In

	this section ongoing, completed, and discontinued actions are listed. To increase transparency, each action includes a short description of activities during the 2016-2020 planning period, even if the action will continue as an ongoing action into the future. • In the Hazard Mitigation Strategy 2021-2025 section, the country-wide hazard mitigation goals are reiterated to orient the reader to the focus and goals of the strategy. Readers are directed to Appendix E to see a list of potential mitigation actions options. • The Mitigation Action Prioritization section better clarifies that actions are being prioritized based upon overall feasibility and criticality of action. The county plans to move towards a more systematic identification of evaluation criteria in the next plan update. • The table of mitigation actions for 2021-2025 now includes a column for identifying which planning goal(s) each action addresses. The table also now distinguishes between ongoing actions that are continuing from the 2016-2020 planning period (italic, alpha-numeric label, and ongoing in title) and those that are new actions for 2021-2025 (numeric label). • Communities were further encouraged to provide a more detailed description of the action as it pertains to their community or special district in this 2021-2025 mitigation actions table. • The Annual Review and Progress table to be used each year has also been updated. A column for each year was added so that readers can better see how actions progress over 2021-2025. A notes column was also added to provide the updater a place to explain progress. Both ongoing and new actions are included in the table.
Section 4: Plan Maintenance	The 2021 WCNHMP retains the same integrity in Section 4, as the 2016 WCNHMP.

Appendices	The 2021 WCNHMP retains the same integrity in Appendices, as the 2016 WCNHMP. In Appendix D: NFIP Participation, claims, policies, and repetitive loss structure numbers were updated for every community. The Progress Report Form (Appendix F) Contact List (Appendix G) were also updated.

PLAN ORGANIZATION

This Plan Is Organized into Four Sections and Multiple Appendices.

Section 1: Plan Process and Development

The first section contains information pertaining to the Plan development process, including:

1. Natural Hazards Mitigation Planning
    a. Federal Regulations
    b. Plan Update Participants
    c. Public Involvement
2. Plan Revisions

Section 2: Hazard-Summaries

The second section contains information specific to the natural hazards present in Whatcom County. This section is broken down into:

1. Hazard-Related Definitions
2. Background Information
3. History
4. Vulnerability Assessment
5. Mitigation Strategies

Section 3: Community and Special District Profiles and Mitigation Action Plans

The third section contains jurisdiction-specific chapters, with the following information for each:

1. Contact Information
2. Approving Authority
3. Planning Process
    a. Key Contributor List
    b. Plan Maintenance
    c. Public Outreach and Education
4. Overview of Hazards and Assets

a. Geography
b. Growth Trends
c. Presence of Hazards and their Impacts
d. Natural Hazards Maps
e. Critical Facilities List and Assessment Ranking

5. Areas and Assets Exposed, Per Hazard
6. Status of 2015-2021 and Ongoing Hazard Mitigation Actions
7. Hazard Mitigation Strategy for 2021-2025
    a. Whatcom County Hazard Mitigation Goals
    b. Jurisdiction-Specific Mitigation Goals (Optional)
    c. Mitigation Action Options
    d. Mitigation Action Prioritization
    e. Identified Mitigation Actions 2021-2025
    f. Annual Review Process

Section 4: Plan Maintenance

This section ends with a description of how the Plan will be maintained in the future.

Appendices

A. Capabilities Listing (documents, processes, and resources reviewed and added by the team)
B. List of Acronyms and Abbreviations
C. Whatcom County Risk Assessment and Mitigation Strategies (RAMS) Assessment (wildland-fire related)
D. 2015 Plan Development Process
E. National Flood Insurance Program (NFIP) Status
F. Whatcom County Mitigation Ideas
G. Whatcom County 2021 Contact List

This Plan is an evolving document that will eventually include additional information and discussions of additional natural hazard studies, man-made hazards such as terrorism, and

general updates as they become available.

STATE AND FEMA PLAN REVIEW PROCESS

1. Submitting the Plan.

a. Once the planning team is confident the plan meets the required elements and includes all supporting documentation, forward the plan to your State Hazard Mitigation Officer (SHMO) or State Mitigation Planner. It is critical that all supporting documentation related to the planning process and other components of the plan are included in the initial submittal. Incomplete plan submittals can delay plan approval. The State will review the plan and work with you on any required revisions for approval.

b. Once the State is satisfied that the plan meets the requirements, the SHMO will forward the plan to the FEMA Regional Office for review and approval. FEMA will conduct its review within 45 days, if possible, and provide a completed Local Mitigation Plan Review Tool to the State. The FEMA Regional Office and the State may contact you to discuss additional revisions to the plan to ensure that it meetsthe Federal regulation. Once FEMA determines the plan meets the regulation, FEMA will notify the SHMO that the plan is approvable pending adoption (APA), or approved if the community has already adopted the mitigation plan.

2. Approval Pending Adoption.

- To avoid repeated attempts to adopt the plan prior to FEMA approval, many communities obtain a notice from FEMA that the plan is APA before adopting the plan. As a time-saving measure, communities are encouraged to submit the final draft of the mitigation plan to the State and FEMA for review prior to formal adoption by the elected officials or other authorized governing body. If FEMA determines the plan is not approvable and requires revisions, the community will be able to make revisions before initiating the plan adoption process, therefore avoiding unnecessary delays in plan approval.

3. Plan Approval.

- Upon receiving the record of adoption from the State, FEMA will issue an official approval letter stating which jurisdictions have adopted and are approved and eligible for FEMA Hazard Mitigation Assistance programs. The approval letter will include the expiration date 5 years from the date of the letter. Attached to the

approval letter will be a final Local Mitigation Plan Review Tool that provides feedback on the strengths of the plan, recommendations for plan improvements during future plan updates, and suggestions for implementing the mitigation strategy.

4. Local Adoption of the Plan.

- Adoption by the local governing body demonstrates the community's commitment to implementing the mitigation strategy and authorizes responsible agencies to execute their actions. The final plan is not approved until the community adopts the plan and FEMA receives documentation of formal adoption by the governing body of the jurisdiction(s) requesting approval. The governing bodies are typically the Town Board, City Council, County Commissioners, and/ or Board of Selectmen. While planadoption usually occurs through a formal resolution, council minutes, consent agendas, or other formsof adoption are acceptable if allowed by local law.

5. Multi-Jurisdictional Adoption.

- Each jurisdiction seeking plan approval must adopt the plan. If you choose to use the APA process, it is important to coordinate the adoptions of all the jurisdictions as soon as the plan receives APA status. The governing bodies may have different meeting schedules, which prevent all the jurisdictions from adopting at the same time. If possible, coordinate the adoptions and submit documentation to the State at the same time.
- At least one of the participating jurisdictions must adopt the plan within 1 year of FEMA's APA notice. FEMA will issue an official approval letter stating which jurisdictions have adopted the plan and are eligible for FEMA hazard mitigation assistance programs. The plan will expire 5 years from the date of FEMA's approval letter for the mitigation plan. The approval letter and date are generated with the first jurisdiction adopting the plan. The plan approval date remains the same regardless of when other participating jurisdictions adopt the plan. It is important to coordinate the adoption process to ensure that all participants are covered by the plan for the full 5 years. Plan updates follow the same adoption process.

6. Procedures for Adding Additional Jurisdictions to the HMP.

This procedure was developed by the Whatcom County Sheriff's Office Division of Emergency Management in cooperation with the Washington State Emergency

Management Division. This procedure has been incorporated into the plan as part of the 2021 plan update.

a. A jurisdiction not included in this update and wishing to join the plan contacts the Whatcom County Sheriff's Office Division of Emergency Management with the request to become a participant of the plan.

b. The Whatcom County Sheriff's Office Division of Emergency Management provides the jurisdiction with a copy of the planning requirements and any other pertinent data.

c. The jurisdiction reviews the plan and develops the portions of the plan that are specific to the jurisdiction as directed by the Whatcom County Sheriff's Office Division of Emergency Management staff. The portion of the plan must meet the requirements of the current FEMA's Local Mitigation Planning Handbook, March 2013.

d. The new jurisdiction submits its portions of the plan to the Whatcom County Sheriff's Office Division of Emergency Management and the new jurisdiction plan is forwarded to the State Hazard Mitigation Program Manager for review and compliance with current Local Multi-Hazard Mitigation Planning Guidance.

e. The State Hazard Mitigation Program Manager reviews the new jurisdiction plan for compliance with current Local Multi-Hazard Mitigation Planning Guidance in conjunction with the Whatcom County Multi-Jurisdictional Hazard Mitigation Plan. If the new jurisdiction does not meet the required standard, the State Hazard Mitigation Program Manager will work with the jurisdiction to resolve issues until it does.

f. The State Hazard Mitigation Program Manager forwards the new jurisdiction plan to FEMA Region X for review and comment.

g. Upon approval from FEMA Region X, the new jurisdiction is considered part of the Whatcom County Multi-Jurisdictional Hazard Mitigation Plan and will comply with the update schedule of the plan.

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SECTION 2.1. HAZARD SUMMARIES

The following eight natural hazards were identified to be significant risks to the county, and specifically hazardous to the populated western areas of Whatcom County:

1. Earthquakes
2. Flooding
3. Coastal Flooding
4. Geologic Hazards
5. Severe Storms
6. Tsunamis
7. Volcanoes
8. Wildland Fires

The updated Hazard Identification and Vulnerability Analysis (HIVA) was received late in the plan update process and will be the basis for the next version of the all-hazards plan.

The following sections describe the seven significant natural hazards and their potential threats to Whatcom County. Much of the information collected in these hazard summaries came from local experts working in hazard assessment or hazard mitigation for a specific hazard. The summaries describe the hazards, convey the areas at potential risk from each hazard, and describe mitigation measures as implemented in the past or to be implemented in the future to manage the effects of natural disasters in Whatcom County.

Each hazard description is organized into the following parts:

Hazard	Related Definitions
Background Information	General description of the hazard relevant to Whatcom County and Washington State
Background Information	General description of the hazard relevant to Whatcom County and Washington State
History	Historical background on the presence of the hazard in Whatcom County; much of this information was obtained from agencies such as FEMA, the Washington Department of Natural Resources (WDNR), and the U.S. Geological Society (USGS)

Vulnerability Assessment	Descriptions of specific areas within the county at risk for each hazard, when this information was available
Mitigation Strategies	Recommended mitigation strategies to lessen the dangers posed by each hazard

Whatcom County's Planning and Development Services provided the hazard GIS datasets, except for the Wildland Fire data, which came from WDNR's North Region. For the current update, new hazard maps were produced by the Western Washington University GIS Department depicting specific hazards posed to municipalities throughout Whatcom County.

See sub section 2.2 for the list of Other Hazards of Concern, including:

1. Avalanches
2. Coastal Flooding/Tidal Overflow
3. Dam Failure
4. Drought

EARTHQUAKES

A. DEFINITIONS

Earthquake Sudden motion or trembling in the earth. This can be caused by the abrupt release of accumulated energy on a fault or by volcanic or magmatic activity.

Crust Outermost major layer of the Earth, ranging from about 10 to 65 km in thickness worldwide. The uppermost 15 to 35 km of crust is brittle enough to produce earthquakes.

Fault Fracture along which the blocks of crust on either side have moved relative to one another, parallel to the fracture.

Liquefaction Phenomenon in which loosely packed, saturated sediments lose intergranular strength in response to strong seismic shaking, causing major damage due to excessive ground settlement.

Lithosphere The outer solid part of the earth, including the crust and uppermost mantle. The lithosphere is about 100 km thick, although its thickness is dependent on age. The lithosphere below the crust is brittle enough at some locations to produce earthquakes by faulting, such as within a subducted oceanic plate.

Subduction zone A place where two lithospheric plates come together, one riding over the other. The process of subduction is where the oceanic lithosphere collides with and descends beneath the continental lithosphere.

B. BACKGROUND INFORMATION

For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as the plates that form the Earth's surface slowly move over, under, and past one another. The speed of these plates is variable: sometimes they move gradually and at other times the plates are locked together, unable to release the accumulating energy. This energy can also be generated by a sudden dislocation of segments of the Earth’s crust, by a volcanic eruption, or even by anthropogenic-caused explosions. When the accumulated energy grows strong enough, the plates break free, resulting in an earthquake. If the earthquake occurs in a populated area, it may result in injury or death, and extensive property damage. The most destructive earthquakes are caused by natural dislocations of the crust. The crust first bends, and when the

stress exceeds the strength of the rocks, breaks and "snaps" into a new position.

Geologists have discovered that earthquakes tend to occur along faults, which reflect zones of weakness in the Earth's crust. Even if a fault zone has recently experienced an earthquake, however, there is no guarantee all stress has been relieved, and another earthquake could still occur. Relieving stress along one part of a fault may also increase stress in another part, increasing the probability that an earthquake could occur nearby.

The Juan de Fuca Plate is an ocean tectonic plate that is colliding with the North American Continental Plate near the western coast of Washington State in a subduction zone called the Cascadia Subduction Zone (CSZ). The CSZ is shown in Figure 1. The CSZ extends from southern B.C. to northern California. One of the results of the colliding forces at the CSZ is the uplift that is occurring and is forming the Olympic and Cascade Mountain Range. The convergence of these two plates also creates a more immediate concern: earthquakes. Subduction zone earthquakes can be powerful and sustained for greater lengths of time than other types of earthquakes.

Geologic work along the Oregon and Washington coasts, and Puget Sound and tsunami (commonly called a tidal wave) data from Japan, indicate very large magnitude quakes occur, on average, every 550 years along the CSZ. The last major subduction quake to occur along the Washington Coast occurred in 1700 (Atwater, et al., 2015).

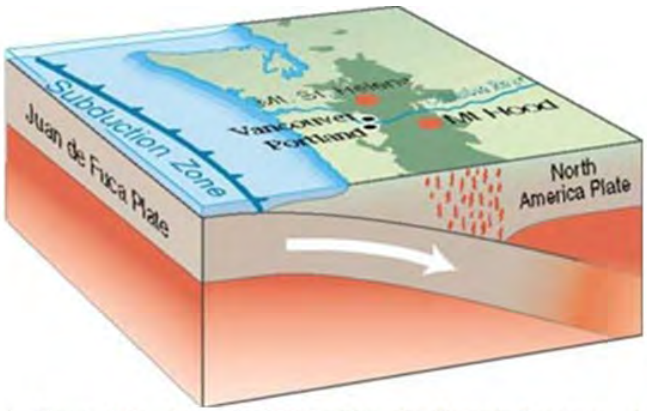
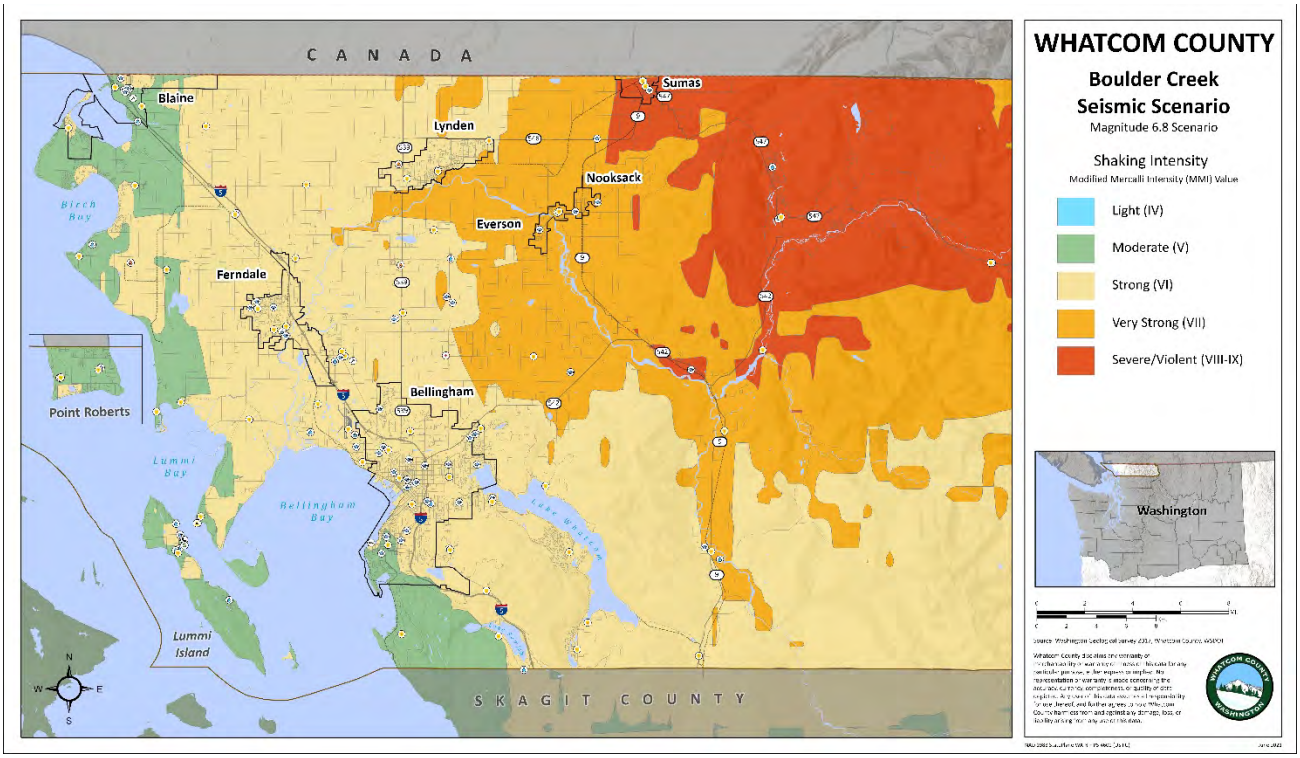


Figure 1 Courtesy of USGS Earthquake Hazards Program.

Earthquakes can also be produced by movement along faults within the North American plate (known as “intraslab” earthquakes). Recent geologic investigations have revealed a number of fault zones in the Puget Sound region of Western Washington, including several recently active faults in Whatcom County. These faults record a number of Holocene (a geologic epoch beginning 10,000 years ago) earthquakes that not only produced substantial ground movement, but also resulted in the rupturing of ground surface. The close proximity of population centers to these fault zones and the potential

for surface rupture should be considered when seismic hazard assessments and engineering designs are prepared. Local faults that have been mapped include the McCauley Creek Thrust Fault near Deming and the Boulder Creek Fault and associated Kendall Fault Scarp in the North Fork Nooksack River Valley. The Kendall Fault moved as recently as 900 years ago with an earthquake magnitude potentially larger than the magnitude 6.8 Nisqually earthquake of 2001 (Sherrod, et al, 2013). The Nisqually earthquake, an intraslab earthquake that occurred under Anderson Island, 11 miles northeast of Olympia, was felt in Bellingham, which lies 120 miles to the north. Recent published research identifies a set of northwest-trending Holocene faults capable of producing 6.0-6.5 Magnitude earthquakes beneath the communities of Sandy Point, Birch Bay and (Kelsey, et al., 2012). A Boulder Creek Fault earthquake would be extremely damaging to Whatcom County, as shown in the map below, because it is within County borders.



Washington Department of Natural Resources (WA DNR) 2017 Boulder Creek Fault Zone seismic scenario of magnitude 6.8 data. Displays extent and severity of the modeled earthquake in the Modified Mercalli Intensity (MMI) scale. According to the MMI Scale:

- *Light shaking (IV) generally corresponds to the earthquake Felt indoors by many, outdoors by few during the day: At night, some are awakened. Dishes, windows, and*

doors are disturbed; walls make cracking sounds. Sensations are like a heavy truck striking a building. Standing motor cars are rocked noticeably.

- *Moderate Shaking (V) Felt by nearly everyone; many awakened: Some dishes and windows are broken. Unstable objects are overturned.*
- *Strong Shaking (VI) Felt by all, and many are frightened. Some heavy furniture is moved; a few instances of fallen plaster occur. Damage is slight.*
- *Very Strong (VII) Damage is negligible in buildings of good design and construction; but slight to moderate in well-built ordinary structures; damage is considerable in poorly built or badly designed structures; some chimneys are broken.*
- *Severe-Violent (VIII-IX) From considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. In some places, damage is considerable in specially designed structures; well-designed frame structures are thrown out of plumb. Damage is great in substantial buildings, with partial collapse. Buildings are shifted off foundations. Liquefaction occurs.*

According to the USGS, Washington ranks fifth in the United States of those states at risk of earthquakes with a magnitude 3.5 or greater. As of 2016, 424 earthquakes occurring in Washington since 1974 accounted for 2.0% of all earthquakes in the United States. Additionally, according to a FEMA study, Washington ranks second in the nation (after California) of states that are susceptible to earthquake losses.

C. RECENT HISTORY IN WHATCOM COUNTY

Each year, more than 1,000 earthquakes are recorded in Washington. Of these, 15 to 20 cause ground movements strong enough to be felt. According to the USGS, recent geologic findings indicate that earthquakes generated within the CSZ pose a significant hazard to urban areas of the Pacific Northwest. Evidence gleaned from syntheses of global subduction zone attributes, as well as from local tsunami deposits, suggests that major earthquakes occurred in the Pacific Northwest perhaps as recently as 300 years ago (Atwater, et al., 2015).

The most recent earthquake to cause widespread damage in Washington occurred in 1965. Since that time, the state's population has more than doubled from roughly 3 million in 1965 to 7.7 million in 2020. Washington residents have largely forgotten the 1965 earthquake, and this has contributed to a general lack of public awareness of the state's earthquake hazards. Some scientists suggest that even larger earthquakes have occurred every several hundred or

thousand years in the Pacific Northwest. The Nisqually earthquake, although less severe than the one in 1965, occurred in 2001. This quake was centered 120 miles to the south of Whatcom County, yet was still felt in and caused damage in the area. The April 1990 Deming earthquake swarm included a magnitude 5.0 event that is one of the largest earthquakes recorded in northern Puget Sound between 1920 and 1990 (Amadi, 1992). Table 1 lists the Pacific Northwest's largest earthquakes over the last 150 years.

Table 1. Recent Pacific Northwest Earthquakes 4.5 Magnitude or Greater

Date	Depth	Magnitude	Approximate Location
December 1872	Shallow	7.3	North Cascades
October 1877	Shallow	5.3	Portland, Oregon
December 1880		?	Puget Sound
November 1891		?	Puget Sound
March 1893	Shallow	4.7	SE Washington
January 1896		5.7	Puget Sound
March 1904		5.3	Olympic Peninsula, Eastside
January 1909	Deep	6.0	Puget Sound
August 1915		5.6	North Cascades
December 1918		7.0	Vancouver Island
January 1920		5.5	Puget Sound
July 1932	Shallow	5.2	Central Cascades
July 1936	Shallow	6.4	SE Washington
November 1939	Deep	6.2	Puget Sound
April 1945		5.9	Central Cascades
February 1946		6.4	Puget Sound
June 1946	Deep	7.4	Vancouver Island
April 1949	54 km	7.1	Puget Sound
August 1949		8.1	Queen Charlotte, B.C.
August 1959	35 km	5.5	North Cascades, Eastside
November 1962	18 km	5.3	Portland, Oregon
April 1965	63 km	6.5	Puget Sound
February 1981	7 km	5.8	South Cascades
April 1990	12.6 km	5.0	Deming
March 1993		5.6	Scotts Mills, Oregon
September 1993	Varies	6.0	Klamath Falls, Oregon
January 1995	16 km	5.0	Robinson Point
May 1996	7 km	5.3	Duvall
February 2001	52 km	6.8	Nisqually – Anderson Island
June 2001	40.7 km	5.0	Satsop
April 2003	50 km	4.8	Olympic Peninsula, Eastside
July 2004	29 km	4.9	Newport, Oregon
August 18, 2004	28 km	4.7	Newport, Oregon

Date	Depth	Magnitude	Approximate Location
January 2009	58 km	4.5	Poulsbo

Note: *Information obtained from the Pacific Northwest Seismograph Network (http://www.pnsn.org)*

Most of Washington's earthquakes occur within the Puget Sound region, between Olympia and the Canadian border, along the western side of the Cascade Mountains, and along the Washington-Oregon border. Distant earthquakes also affect Washington, such as the two Vancouver Island, B.C., quakes listed in Table 1 that were felt in Washington.

Damage caused by earthquakes is not limited to the obvious, such as architectural failure in buildings due to the heavy swaying created from an earthquake. Many deaths worldwide are the result of materials falling from buildings to sidewalks and streets below. Ground rupture along an active fault can also cause serious structural damage and disrupt transportation routes. Landslides can also be triggered by earthquakes, as can lateral spreading, which is similar to a landslide but occurs on relatively flat ground adjacent to a slope or waterbody resulting from the loss of lateral support due to seismic shaking. A potential hazard that is unique to Bellingham Bay is the potential for an earthquake-induced landslide on the face of the Nooksack River Delta. Such a landslide could generate a tsunami in Bellingham Bay and impact the Lummi Peninsula and Bellingham.

Liquefaction is another significant hazard that sometimes results from an earthquake, resulting in ground failure due to the loss of intergranular strength (bearing capacity) or liquefaction-induced settlement. Liquefaction and related phenomena have been responsible for tremendous amounts of damage in earthquakes around the world. Liquefaction occurs in saturated soils, when the pore spaces between individual soil particles are sufficiently filled with water. The shaking from an earthquake causes the pore water pressure within the soil to increase to the point where the soil particles readily move with respect to each other and the soil loses its ability to support structures. Once liquefaction has begun in an area, such as under a building, structural support to the foundation would be lost and the building would likely fail. Liquefaction is described in more detail in the "Geologic Hazards" section of this Plan.

Population-dense areas in Whatcom County could be significantly impacted by future earthquakes and their related hazards. The nature and extent of earthquake risk in Washington is determined by a variety of factors, such as estimating the level of predicted ground movement and identifying sites susceptible to ground rupture, enhanced seismic shaking, differential ground settlement from liquefaction, and tsunamis. Combining such hazard information with information concerning the distribution of population, types of building construction, and technological hazards in the County allows for assessing earthquake damage.

For this Plan, all the identified critical facilities are classified as affected by earthquakes since all of Whatcom County is at risk. Future revisions to the Plan will include each critical facility's building structure and more accurate assessments of vulnerability to earthquake danger. Seismic acceleration and response maps are periodically updated by the USGS as new research is published better defining local and regional seismic hazards, and is adopted by local building codes and incorporated in building design by structural engineers.

D. VULNERABILITY ASSESSMENT

The entire population of Whatcom County is vulnerable to the effects and impacts of an earthquake. An earthquake event in urban areas would involve especially elevated risk levels. Tall structures built on seismically-sensitive soils and fill are particularly at risk, due to the potential for liquefaction and lateral spreading. The earthquake risk in Bellingham and other coastal communities in Whatcom County is enhanced where saturated artificial fill was placed along the shoreline during the early to mid-1900's, or -where municipal garbage or wood waste was used as fill over tide flats.

Possible types of damage from an earthquake may include, but will likely not be limited to:

a. Cracking and/or structural failure of foundations, chimneys, decorative cornices, parapet walls, and cantilevered porches or roofs
b. Wall failure in older buildings of non-reinforced masonry construction
c. Damage to waterfront buildings and piers built on piles and artificial fill
d. Structural damage or failure of bridges
e. Damage to streets and roads
f. Damage to railways and airport facilities
g. Broken water lines and natural gas lines
h. Power and communication failures due to damage of electrical and telephone distribution systems
i. Failure of 'dry-stacked' retaining walls on steep slopes in areas of residential development

Examples of potential earthquake impacts to Whatcom County are provided in the five sections below.

1. Landslide Impacts

Landslides can be triggered by earthquakes or by a combination of geologic and climatic factors. The latter are discussed in more detail under Geologic Hazards. Landslides can directly damage a structure built on the landslide or in an area where landslide debris runs out and is deposited (including the base of a hill or an alluvial fan).

Earthquake-induced landslides could impact various locations throughout the County. A lahar (a mud flow originating from a volcano) from Mount Baker could also be triggered during an earthquake. Depending on the specific area of initial failure, the lahar could flow into Baker Lake and cause damage in the Skagit River system or could flow down either the North or Middle Forks of the Nooksack River reaching as far as Sumas and Bellingham Bay. For details regarding lahars, see the "Volcanic Hazards" section of this Plan.

Examples of other locations that may experience earthquake-related landslide include: the Chuckanut Mountains and Chuckanut Drive residential areas built on steep slopes in Bellingham and Sudden Valley; development and roads on or below steep slopes, or within the run-out zone (including alluvial fans) for landslides (such as Nelson Road on the west side of the Van Zandt Dike and Slide Mountain near Kendall); the Mount Baker Highway east of Deming; State Route 9 south of Acme; unstable coastal bluffs on Lummi Island, the Lummi Peninsula, Point Roberts, Cherry Point, Point Whitehorn, Semiahmoo, and Drayton Harbor; Sehome Hill and the Western Washington University campus; and Sumas Mountain. Landslides could also occur on the steep face of the Nooksack River delta in Bellingham Bay, displacing water and sending waves across the bay. This list is intended to illustrate the range of locations where landslides could happen and is not an inclusive list of all possible locations.

The recently published *Landslide Inventory of Western Whatcom County*, produced by the Washington State Department of Natural Resource Geology and Earth Resources, provides a highly improved methodology for the identification of deep-seated landslides discernable by LIDAR image analysis. The inventory identifies both active and dormant (or relict) landslides, and enhanced shaking associated with a large magnitude seismic event has the potential to reactivate dormant deep-seated landslides as well as accelerate or further destabilize currently active deep-seated landslides. Not included in the inventory is the likely location of shallow translational landslides (generally defined as not deeper than the vegetation rooting zone). This type of slope failure does not typically produce geomorphic features discernible in LIDAR and is commonly identified through GIS-based slope stability modeling that determines slope conditions susceptible to shallow failure, and subsequent modeling to determine run-out potential. Neither products are currently available in Whatcom County. The inventory does, however, delineate the location of alluvial fans, which can serve as a proxy for the likely run-out

potential for shallow translational landslides, and these areas should be considered susceptible to earthquake-induced landslides, especially if seismic activity coincides with an extended period of wet weather resulting in saturated soil conditions. Additional information on hazards common to alluvial fans is included under 'Landslides' in the section on Geological Hazards, below.

2. Transportation Impacts

Bridges are the most vulnerable component of highway systems, such as the I-5 overpasses. Bridge foundations in liquefiable soils can move, allowing the spans they support to fail. Areas at significant risk are Roeder Avenue bridges near Georgia Pacific and over Whatcom Creek Waterway; I-5 over Whatcom Creek; the Mount Baker Highway at Cedarville and Everson; Highway 9; and Guide Meridian and Hannegan Road bridges over the Nooksack River. An additional impact is that supporting columns can buckle.

1. Railways. Railway bridges have performed well in earthquakes, but may be subject to liquefaction, such as those along the Bellingham waterfront. Additionally, landslides may cover the tracks.
2. Airports. The Bellingham Airport runway is at low to moderate susceptibility to liquefaction.
3. Pipelines: Water, Wastewater, Liquid Fuel, Natural Gas. Water pipelines commonly fail in earthquakes, quickly draining the water system, making water unavailable for fire suppression, drinking, toilet flushing, etc. Sewer pipelines are often gravity systems and a change in grade can impact system operation. The sewer lines relying on pumps will not work if there is no electric power. These sewer pipelines are vulnerable to flotation if the ground around them liquefies. Liquid fuel and natural gas pipelines that are constructed of steel with welded joints have performed well in earthquakes, except in extreme conditions. The high-pressure lines are made of welded steel or polyurethane plastic, which are flexible. Pipelines constructed of brittle materials are the most vulnerable. Water and older gas distribution systems contain brittle materials, such as cast iron and asbestos cement. Additionally, pipelines buried in liquefiable soils or landslide areas may fail. For example, landslide movement was a likely factor in the rupture, explosion, and fire in 1997 of a natural gas pipeline on Sumas Mountain.

E. MITIGATION STRATEGIES

Earthquakes have long been feared as one of nature's most damaging hazards. Earthquakes

occur without warning and, after only a few seconds, leave casualties and damage. Therefore, it is important that each person and community take appropriate actions to protect lives and property.

Although earthquakes cannot be prevented, current science and engineering provide tools that can be used to mitigate the damage. Scientists can now identify, with considerable accuracy, where earthquakes are likely to occur and what forces they might generate. Modern engineering has resulted in design and construction techniques that allow buildings and other structures to survive the tremendous forces of earthquakes.

In May 2021 ShakeAlert will be deployed in Washington State by the United States Geological Survey. The system allows the identification of hazardous seismic events and automatically triggers warning systems and alerts registered mobile phones. In the event of a Cascadia Subduction Zone Earthquake, centered 200+ miles west of Whatcom County, many tens of seconds warning time can be provided, allowing for individuals to evacuate or shelter in place prior to arrival of initial seismic wave. Additional mitigation can be achieved through the cessation of construction activities, transportation, industrial processes and other critical activities such as medical procedures. It is important to note that earthquakes generated on local crustal faults may produce lesser magnitude seismic events, but may be associated with more intense, although often shorter duration, ground shaking. Furthermore, early detection systems would only be capable of providing a few seconds of early warning for near-source earthquakes, which is commonly considered ineffective to deploy seismic hazard mitigation measures.

FEMA's National Earthquake Hazards Reduction Program (NEHRP) has four basic strategies related to the mitigation of hazards caused by earthquakes:

1. Promote understanding of earthquakes and their effects
2. Work to better identify earthquake risk
3. Improve earthquake-resistant design and construction techniques
4. Encourage the use of earthquake-safe policies and planning practices

Further study of earthquake behavior and better delineation of shallow crustal fault location, extent, potential earthquakes magnitude and recurrency interval will lead to improved preparation and response to earthquakes.

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FLOODING

A. DEFINITIONS

Avulsion The rapid abandonment and of a river channel and formation of a new channel.

Flood An inundation of dry land with water caused by weather phenomena and events that deliver more precipitation to a drainage basin than can be readily absorbed or stored within the basin. The NFIP defines a flood as a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties.

Floodplain The land area of a river valley that becomes inundated with water during a flood.

National Flood Insurance Program A federal program enabling property owners in participating communities to purchase insurance protection against losses from flooding. The NFIP is designed to provide insurance as an alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their content caused by floods. When a community chooses to participate in the NFIP, they agree to adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in Special Flood Hazard Areas. In exchange, the federal government agrees to make flood insurance available within the community as a financial protection against flood losses.

B. BACKGROUND INFORMATION

The natural hazard of most concern to Whatcom County, primarily due to its frequency, is flooding. Several types of flood hazards affect Whatcom County including:

a. Overbank flooding and erosion on the Lower Nooksack River downstream of Deming
b. Overbank flooding and erosion on the three main forks of the Nooksack River upstream of Deming (North, Middle, and South Forks)
c. Debris flows and debris floods on alluvial fans throughout the County (see the “Geologic Hazards” section for more information)
d. Coastal flooding (see the “Coastal Flooding” section for more information)

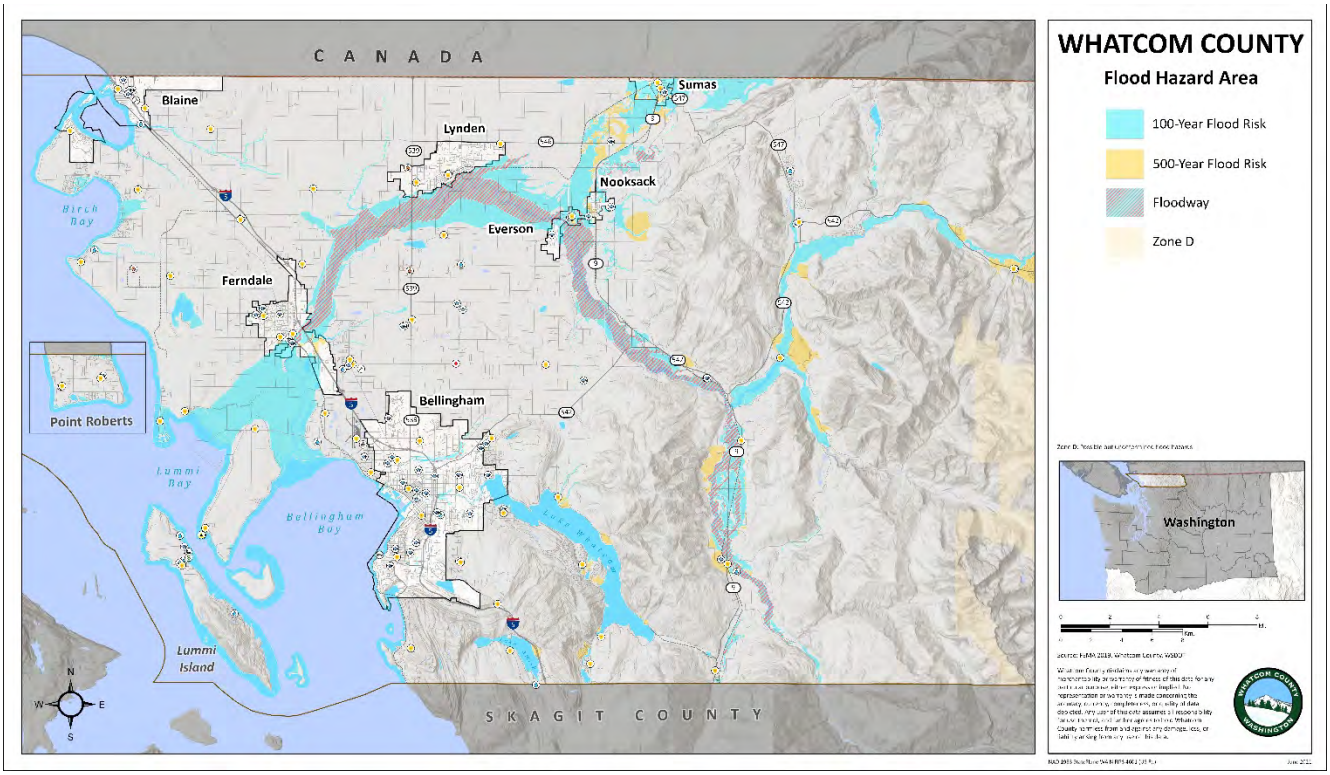
e. Tsunamis or tidal flooding associated with earthquakes (see the "Tsunamis" section for more information)

The communities located within Whatcom County that are currently participating in the NFIP include:

a. City of Bellingham (#530199)
b. City of Blaine (#530273)
c. City of Everson (#530200)
d. City of Ferndale (#530201)
e. City of Lynden (#530202)
f. City of Nooksack (#530203)
g. City of Sumas (#530204)
h. Lummi Indian Reservation (#530331)

Whatcom County (#530198) Whatcom County contains 63.6 square miles of floodplain area, which equals 3 percent of the entire land area. Whatcom County currently holds 994 flood insurance policies and has filed 307 claims through January 31, 2020. Due to privacy concerns, annual information regarding this number is no longer provided by FEMA. FEMA maintains information on repetitive flood loss properties (RFLs) within each community participating in the NFIP. RFLs are properties for which two or more NFIP losses of at least $1,000 each have been paid within any 10-year period since 1978. As of 2020, there were 17 RLP properties within Whatcom County and seven RPL properties that have been mitigated.

Whatcom County also participates in the NFIP Community Rating System (CRS), implemented in 1990 as a voluntary program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP standards. The CRS entry date for Whatcom County was October 1, 1996; since that time, Whatcom County has received enough points to be qualified as a credit class 6 (out of 10), meaning property owners in the floodplain receive a 20 percent discount on flood insurance premiums. Flood hazard areas in Whatcom County can be seen in the map below.



FEMA 2019 flood hazard data showing 100-year flooding, 500-year flooding, floodways, and flood zones. FEMA flood data includes both riverine and coastal flooding.

1. Lower Nooksack River

The primary flooding source affecting Whatcom County residents is the Lower Nooksack River, from Deming to Bellingham Bay. In 1999, the Whatcom County FCZD adopted the *Lower Nooksack River Comprehensive Flood Hazard Management Plan* (CFHMP), which serves as the primary source of information for this flooding summary. This plan is currently being updated through a multi-year collaborative process integrating flood needs with the needs of salmon and floodplain land uses. The results of this new planning process will be incorporated into this plan during a subsequent update.

The Nooksack River watershed is primarily located within the Cascade foothills at the base of the Cascade Mountain Range. The Lower Nooksack River begins at the confluence of the North, South, and Middle Forks and extends down to Bellingham Bay. The watershed encompasses approximately 825 square miles over an elevation range of 10,781 feet to sea level. The Cascade foothills receive more rainfall than the flatter, western lowlands of the County. This precipitation, combined with the steep slopes of the watershed in the foothills and size of the

upper watershed, contribute to the conditions that allow floodwater to quickly reach the flat lower river reaches. The devastating and frequent flooding in 1989 and 1990 prompted Whatcom County residents and government to find solutions to perennial flood problems. Because of severe damages occurring along the Lower Nooksack River floodplain, this area was the focus of initial planning efforts and development of the CFHMP.

The Lower Nooksack River is divided by river reach in the CFHMP as described and as shown in Table 2. The five reaches begin with Reach 1 at the mouth of the Nooksack and move upstream to Reach 5.

Table 2
River Reach Descriptions

	River Mile	River Channel		100-Year Floodplain	
		Length (miles)	Gradient (ft/mile)	Area (mi2)	Width (avg. miles)
Reach 1	0 to 6.0	6.0	1.8	13.8	2.8
Reach 2	6.0 to 15.3	9.3	2.3	8.3	1.1
Reach 3	15.3 to 23.6	8.3	4.9	12.0	1.9
Reach 4	23.6 to 26.6	13.0	21.3	7.5	1.3
Reach 5	---	13.2	4.5	21.5*	22.5**

***Notes:** * Drainage Area ** Average Creek Width*

Reach 1 includes the area from the mouth of the Nooksack River to Ferndale west to Haxton Way, including a portion of the Lummi Indian Reservation. Reach 1 is physiographically diverse and includes a complex delta estuary, a broad flat plain, and two large, shallow ponds, Tennant Lake and Clay (Brennan) Pond. Both sides of the river are diked, either directly along the existing river channel or set back a short distance from the bank. The banks are heavily riprapped, especially adjacent to the levee.

Reach 2 extends from the I-5 Bridge at Ferndale to the Guide Meridian Bridge, just southwest of Lynden. The river channel is characterized by looped meanders, and relatively small gravel bars. Natural topography along the river includes discontinuous natural levees formed by sediments deposited during flooding. Constructed levees confine the river to a narrow channel along much of Reach 2. A portion of the river in and upstream of Ferndale is not diked.

Reach 3 includes the portion of the Nooksack River between the Everson Bridge and the Guide Meridian Bridge and marks the transition from the braided, unstable channel upstream to the more stable, meandering river channel and broader floodplain that are

typical downstream.

each 4 is the uppermost reach in the CFHMP study area. It extends from the Everson Bridge to the confluence of the Middle, North, and South Forks at Deming. This reach is noticeably different than the lower reaches, primarily because of the steep slope of the active channel. Not only does the channel split into multiple paths at many locations, forming a braided channel, but over time it moves laterally across the floodplain.

Reach 5 is not actually a part of the Nooksack River mainstem, but is a flood overflow corridor originating at the Nooksack River, near Everson, and flowing north to the United States/Canada border. At the City of Everson, a low divide separates the Nooksack River basin from the Sumas River basin, where waters flow northward to the Fraser River in B.C. During large floods in the Nooksack, floodwaters flow along the corridor of Johnson Creek through the City of Sumas and over the international border into Abbottsford, B.C.

Flooding Causes

Many factors combine to cause flooding along the Lower Nooksack. River gradient and weather patterns are some of the more significant factors.

River Gradient that Affects Flooding – One of the most important characteristics of the Lower Nooksack River is the change in river gradient from Deming to Bellingham Bay. As mentioned previously, Reach 4 is steep and constantly migrating within a narrow floodplain. Within Reach 4, many abandoned side channels can accommodate floodwaters. In contrast, the lower reaches are flatter with wider floodplains. Side channels in Reaches 1, 2, and 3 have largely been filled and replaced with agricultural fields. Levees have been constructed along these reaches to protect fields, farmhouses, and roadways.

Weather Patterns that Cause Flooding -Heavy fall and winter rainfall in Whatcom County results from an effect called orographic lift. This heavy rainfall, along with the large area feeding into the Nooksack River and extreme slopes, results in large amounts of runoff that quickly reach the flat floodplains along Reaches 1, 2, and 3. Rainfall varies across the watershed and is significantly greater in the mountains. During the 1990 Veterans Day flood, approximately 14 inches of rain fell in the upper reaches of the watershed over 3 days, with snow melt adding an extra 2 inches. During the same storm, Bellingham only recorded 5 inches of rain.

The worst flooding tends to occur during the “Atmospheric River” weather pattern of the fall and winter. Atmospheric river fronts bring warm, wet air into the watershed, resulting in heavy rainfall. If snow has accumulated in the mountains when the warm rains begin, snowmelt can

increase runoff to the river. As the snowpack builds through winter, it can also act as a "sponge" during intense rainfalls, storing water and attenuating flood peaks. Runoff is most severe when preceding steady rains have saturated soils within the watershed. Together, the conditions of heavy rain, early snowpack, and saturated soils create the potential for severe flooding.

2. Upper Forks of Nooksack River

The North, Middle, and South Forks of the Nooksack River comprise the upper watershed for the Lower Nooksack River. The headwaters of the North and Middle Forks originate on the flanks of Mount Baker while the South Fork drains the Twin Sisters range, resulting in steep mountainous terrain in their upper basins. The lower portions of the forks include flatter valleys as the rivers drain off the Cascade Foothills and enter into broader valleys shaped in part by past glacial activity.

The North Fork of the Nooksack River generally experiences higher snowfall amounts, which can act to absorb some runoff associated with heavy rainfall and attenuate flood peaks. The South Fork has much of its upper basin at lower elevations than the North Fork and generally responds more quickly to a storm event. During weather patterns like the atmospheric rivers all three forks can experience significant flooding.

Due to the mountainous terrain in their upper watersheds, all three forks have significant sediment sources. As the sediment is routed through the systems, significant channel migration can occur, putting public infrastructure and private property at risk.

3. Coastal Flooding

High winds off the coast combined with high tides and low atmospheric pressures can result in coastal flooding along the western edge of Whatcom County. The main coastal communities impacted by coastal flooding are Sandy Point, Birch Bay, Point Roberts, and Lummi Peninsula. Damages can include structural damage to residences and seawalls as large debris is carried by waves hitting the shoreline, inundation damage to structures, and debris accumulation and flooding of roadways. In some areas where the shoreline is a bluff, coastal erosion and/or improper drainage can threaten the structural integrity of residential structures and the stability of the bluff itself. See the Coastal Flooding Section below.

C. RECENT HISTORY IN WHATCOM COUNTY

1. Lower Nooksack River

Table 3 lists the largest recorded Lower Nooksack River floods as recorded at the Deming/Cedarville and Ferndale stream gages.

Table 3. Largest Recorded Nooksack River Flood Events

Date	Deming Flow* (cfs)	Ferndale Flow (CFS)	Overflow in Everson causing Flood Damage
1/25/1935	39,600	---	Yes
10/25/1945	38,000	41,600	Yes
11/27/1949	36,500	27,500	Yes
2/10/1951	43,200	55,000	Yes
11/03/1955	38,500	35,000	Yes
1/30/1971	---	38,100	Yes
12/3/1975	40,300	46,700	Yes
12/15/1979	---	36,400	No
1/4/1984	---	41,500	Yes
11/23/1986	---	36,000	No
11/9/1989	36,500	47,800	Yes
11/10/1990	37,900	57,000	Yes
11/24/1990	35,100	56,600	Yes
10/17/2003	50,800	39,900	No
11/24/2004	53,200	42,300	No
11/6/2006	56,300 (Cedarville)	38,100	Yes
1/9/2009	50,700 (Cedarville)**	51,700**	Yes
12/12/2010	44,500 (Cedarville)	38,200	No
1/17/2011	42,600 (Cedarville)	36,300	No
11/17/2015	40,800 (Cedarville)	27,000	No
2/1/2020	37,400*** (Cedarville)	37,000	Yes

* The Deming gage is subject to significant bed instability during flood events. Peak flows reported for Deming are prone to error. In 2005, the Deming gage was replaced with the Cedarville gage, located 5.2 miles downstream.

** Hydraulic modeling and comparison of simulated results to observed conditions suggests that the actual flow passing the Deming gage was likely closer to 63,000 cfs during the 11/10/1990 flood, illustrating the potential error in the Deming gage record.

*** USGS flow data for the 2/1/2020flood event is provisional; hydraulic model calibration is ongoing and suggests that the flows at Cedarville may have been higher than reported.

2. Upper Forks of Nooksack River

Generally, the same weather patterns that cause flooding on the lower Nooksack River also result in flooding conditions on one or more of the three upper forks. These same weather patterns can cause landslides that can form temporary landslide dams when they enter tributaries to the forks. Floods much larger than might be expected for a stream of that size can result when the dams breach. These tributary floods may not be easily detected at a gauging station in the fork itself or downstream due to the relatively larger capacity of the fork floodplain.

D. VULNERABILITY ASSESSMENT

Understanding existing flood patterns, and the relationship between flooding and existing flood management structures, provides a basis for predicting circumstances of future flood events.

1. Lower Nooksack River

The following summary describes historic flooding patterns and problems of the Lower Nooksack River. Please note that right and left bank locations are designated facing downstream.

Reach 1 Flooding Patterns

Ferndale Area – The residential area on the right bank upstream of the Burlington Northern Railroad bridge experiences flooding during major events, as do commercial properties along Main Street on the left bank and a former golf course. Based on the results of recent modeling analyses, most of the right bank levee in Ferndale extending downstream from the Main Street bridge provides protection from floods as large as the 100-year event, except for a gap located adjacent to the two water treatment facilities operated by City of Ferndale and the PUD. Significant flood fighting efforts near the water treatment plants were necessary in 1990 to and 2009 to prevent floodwaters from overtopping Ferndale Road. The City has filled the gap in the levee with super sacks (large sand bags) as an interim measure until a more permanent solution can be implemented.

Right Bank Downstream of Ferndale – Flooding at Marine Drive and Ferndale Road is frequent, beginning with events of low magnitude. Levee breaks result in inundation of Haxton Way, cutting off access to the Lummi Peninsula and Lummi Island. Other sites of right bank flooding along the reach depend upon levee protection. Levee breaches downstream of Slater Road generally result in flooding between the Nooksack River and

Lummi (Red) River south of Slater Road.

Left Bank Downstream of Ferndale – Floodwaters overtop the left bank between Slater Road and Marine Drive annually; if overtopping is of a long enough duration, both roadways can be flooded. At slightly higher flows, as the river rises to the approximate 5-year flood level, floodwaters also overtop high ground and levees immediately downstream of Ferndale in Hovander Park. Floodwaters travel through Hovander Park toward Tennant Lake and continue south toward and over Slater Road.

Marietta – Marietta experiences the most frequent flooding of any residential area along the Nooksack River and is susceptible to tidal influences that contribute to flooding. A levee surrounds Marietta, but is low and in poor condition, making it susceptible to overtopping and breaching. In both 1990 and 2009, Marietta residences sustained significant flood damage and residents were evacuated.

Overflow to Lummi Bay – Floodwaters flowing west toward Lummi Bay are stopped by the seawall and accumulate despite the two sets of culverts that drain the seawall. Floodwaters can overwhelm the capacity of the seawall, leading to seawall breaches, and allowing saltwater to flow inland when floodwaters recede. A set of six 48–inch-diameter culverts near the Lummi (Red) River mouth draining the area south of the river were replaced with five 6-foot by 4-foot box culverts in 1998. Tide gates in the culverts prevent saltwater from flowing inland as the tide rises. Three 5-foot by 5-foot box culverts drain the area north of the river.

Reach 2 Flooding Patterns

Overflows from Reach 3 – Floodwaters enter Reach 2 from Reach 3 under the Guide Meridian through the main channel bridge and overflow bridges north and south of the river in the floodplain. Main channel and left bank overflows are constricted by high ground on the left bank and levees along River Road on the right bank. Left bank overflows encounter a short section of levee and the natural high ground close to the river bank very shortly after passing under the south overflow bridge. The levee and high ground push the left bank overflow waters back into the river and toward right bank levees. Numerous historical breaches in the River Road levee are attributed to this constriction.

Right bank overflows enter Reach 2 behind the River Road levees through the north overflow bridge. Overflows reach levees along Fishtrap Creek, which funnel floodwaters south, closer to the main river channel, and on toward Bertrand Creek. These flows can

be augmented by overflows through breaches in levees along River Road.

Fishtrap Creek – Flood overflows pass from Reach 3 to Reach 2 through the north overflow bridge under Guide Meridian. Floodwaters encounter levees along Fishtrap Creek, which extend from just below Guide Meridian approximately 1.8 miles downstream. The levees limit bank overflows, but do not contain floodwaters during large flood events. The levees along both Fishtrap and Bertrand Creeks are intended to protect agricultural lands from spring flood events, but are not meant to provide protection during large flood events.

Bertrand Creek – Floodwaters that pass Fishtrap Creek reach Bertrand Creek, which is lined with levees on both sides. The Bertrand Creek levees are approximately perpendicular to flood flows, which causes floodwater to back up onto farmlands upstream of the creek. As a result, high velocity flows cause overtopping and levee breaches during almost every flood event. In 2006, the levees along Bertrand Creek were lowered and set back to reduce the frequency of levee failures and to lower upstream flood levels.

Left Bank Overflow Corridor – Levee overtopping has historically occurred on the Vanderpol property immediately downstream of the high ground on the left bank; floodwaters follow a natural overflow corridor along the reach. Left bank levees offer varying levels of protection, and floodwaters historically have overtopped the levees at various locations. Approximately two miles upstream of the I-5 bridge, near Lattimore Road, higher topography along the left bank guides floodwaters back into the river channel. A short distance upstream, a levee on the Appel property blocks flow returning to the river and has experienced repeated overtopping and failure.

Right Bank Downstream of Bertrand Creek – Floodwaters that pass Bertrand Creek continue along the right bank corridor to approximately the I-5 corridor. Levees offer sporadic protection along the right bank for three miles downstream of Bertrand Creek, but no levees are in place for the last three miles of the reach. Random overtopping of levees and river banks is typical.

Ferndale Area – Residential and commercial urban development is encroaching into the 100-year floodplain, increasing the possibility of flood damage. Several multifamily units and a commercial building have been constructed on the west side of the rivers downstream of the Main Street Bridge. Other developments in this location includes a new Park (Star Park) and several new buildings associated with Ferndale's Water

Treatment Plant. To the west of the Main Street Bridge, several commercial buildings, including 2 fast-food restaurants have been constructed.

Reach 3 Flooding Patterns

Levees along both banks have been built and repaired over the years by a variety of public agencies and private property owners, with no coordination of design and sometimes limited maintenance, resulting in a levee system prone to unpredictable breaches and misdirection of flows from natural overflow corridors and floodwater storage areas. Roadway overtopping is common, and floodwaters often remain trapped in depressional areas long after the flood peak passes. Bank erosion has historically been a problem.

Overflows in the Upper Portion of Reach 3 – Natural overflows exist on both banks north of Nolte Road, immediately downstream of Everson. Right bank overflows travel north toward Mormon Ditch and Kamm Creek. During large floods, this flow continues downstream over Hannegan Road, past the Lynden waste water treatment plant, and through the Guide Meridian north overflow bridge. Left bank overflows travel south to Scott Ditch, then west, and return to the river through Scott Ditch or through the south overflow bridge at Guide Meridian.

Hampton/Timon Road Area – The right bank near Northwood Road is a natural overflow. Floodwaters flow north toward Mormon Ditch and Kamm Creek. Floodwaters from upstream overflow on both banks, inundating and damaging roadways in their path, including Timon Road, Slotemaker Road, and Hampton Road on the right bank; and Noon Road, Polinder Road, and Abbott Road on the left bank. Six residences located near the confluence of Kamm Creek along Hampton Road are impacted by right bank overflows as well as by backflows from the Nooksack River up Kamm Creek.

Polinder Road Area – Two farmable levees have been constructed to overtop on the left bank above Polinder Road:

a. North of the intersection of Polinder and Thiel Road on the Bedlington property
b. The river bend just east of Hannegan Road on the Polinder property

Floodwaters from both overflows travel southwest toward Scott Ditch and the south overflow bridge at Guide Meridian.

Scott Ditch – Scott Ditch serves as a conduit for flows leaving the Nooksack's left bank along most of Reach 3.

Lynden Wastewater Treatment Plant – The floodplain is constricted by natural

topography as well as structures built in the area west of Hannegan Road. Floodwaters that overtop Hannegan Road must flow either back into the river upstream of the treatment plant or around the north side of the treatment plant and over the plant access road. As floodwaters recede, water backed up between the treatment plant and Hannegan Road drains back to the river by way of a ditch that begins east of the plant, is conveyed through a box culvert under the plant access road, and in a 48-inch culvert through the right bank river levee. The 48-inch levee culvert is failing and is not equipped with a floodgate and water can back up through the culvert when the river rises. Efforts to replace this culvert with a new side-hinge flood gate and upstream habitat improvements are underway with construction planned for 2021.

BC Avenue Area – On the right bank downstream of the treatment plant, there was an overflow on the Stremler property south of BC Avenue in Lynden. The levee at this overflow was restored, strengthened, and raised by the USACE to prevent future overtopping after the 1990 floods.

Bylsma Road Area – There is an overflow on the left bank between Bylsma Road and the confluence of Scott Ditch and the river. Levees on the right bank opposite this overflow historically overtop.

Guide Meridian Overflow Bridges – The Guide Meridian was supported on piles to let floodwaters pass beneath, through the Nooksack River floodplain, until around 1950. Floodwaters are now conveyed through overflow bridges that convey a significant portion of Reach 3 overflows downstream to Reach 2. As floodwaters pass through these narrow openings, flow velocity increases, potentially threatening the structural integrity of the bridges.

Reach 4 Flooding Patterns

With the relatively narrow floodplain and unstable, rapidly migrating river channel in Reach 4, the primary flood hazards are bank erosion and the threat of avulsion.

The Deming Area – At Deming, the river channel has migrated across the floodplain in the last two decades. Aerial photos show that in 1975, the river flowed on the opposite side of the floodplain from the community. By 1986, the river had moved 600 feet across the floodplain to its present location. Recent Nooksack River flooding has threatened the Mount Baker School District bus maintenance and sewage treatment facilities, along with the Walton properties along Deming Road on the right bank. At-risk properties are protected by riprap armoring. Immediately downstream of the riprap

protection, erosion occurs on the left bank from deflected flows from the right bank riprap.

Mariotta Road Area Right Bank – An overflow was created during 1990 floods in the vicinity of Mariotta Road by overtopping and eroding the right bank, resulting in bypassing of the existing river bend. Approximately one-third of the river's flow followed this new channel. Floodwaters returned to the main channel approximately 0.5 mile from Mariotta Road. After the 1990 flood, 2,000 feet of bank was restored and new riprap was placed along the right bank to prevent a similar future overflow. A bottleneck immediately downstream of the overflow creates stress on the left bank at an area known as the "Clay Banks." By preventing right bank overflows, the new riprap increases the force of floodwaters on the left bank downstream. The bottleneck created by accumulated sediment on the Sande property, on the inside of the river bend in this area (right bank), increases the force of flow on the left bank. Floodwaters that overflow the right bank between Deming and Nugent's Corner generally follow low topography and swales toward Smith Creek.

Left Bank – The left bank across from Mariotta Road is a steep hillside of silty clay soil that has been increasingly eroding. Slides from this hill have added silt, clay, and other sediment to the river. As the river undercuts the slope, the land sinks and slides. Groundwater seepage along the face of the hillside may also be destabilizing the slope. As the bluff fails, material accumulates at the base of the slope and this material acts to stabilize the slope for a period of typically 5 to 7 years. During this period, the river erodes through the accumulated material at the base of the bluff and causes the bank to become oversteepened and significant bluff failures resume. In 2006, significant bluff failures occurred, causing owners of two houses at the top of the bluff to abandon them when bank failures encroached too close to the structures. Bluff failures on February 14, 2014 and the night of February 20-21, 2014 were large enough that landslide debris temporarily blocked the Nooksack River each time. The latter event caused the downstream Cedarville stream flow gage to fall from ~2250 cfs to 400 cfs in a matter of minutes. Flows at the gage resumed a few hours later as the river reoccupied old channels along the opposite bank and cut around and through the landslide deposits.

Nugent's Corner – Flood fighting efforts in 1990 directed floodwaters around the commercial area, following a system of natural channels, but floodwaters damaged some sections of the community's residential area.

Mount Baker Highway Bridge – The Mount Baker Highway bridge at Nugent's Corner is the only bridge over the river in Reach 4. A flood in 1989 washed out the left bank

approach to this bridge. Riprap was subsequently placed on the upstream side of the left bank bridge abutment to protect it. WSDOT replaced the bridge in approximately 2000.

Nugent's Corner to Everson – The river migrates across the floodplain between Nugent's Corner and Everson more than in any other river reach. Channel migration has resulted in erosion and loss of private property, primarily agricultural lands. Bank erosion is limited on the left bank, but the right bank has been heavily impacted by bank erosion. The channel capacity and natural terrain between Nugent's Corner and just upstream of Everson is high enough that floodwaters do not overtop the right bank along most of the section. During larger flood events, however, flood waters overtop the high ground divide, separating the Nooksack River and Sumas River basins, to flow toward Sumas, and sometimes into Canada.

Riverberry-Davis-Vandellen Properties – The Riverberry property includes a farm located approximately halfway between Everson and Nugent's Corner on the right bank. The river eroded between 30 and 40 acres of this site between 1985 and 1993, and an estimated additional 300 feet since that time. The river has meandered eastward approximately 250 linear feet (LF), eroding raspberry and pasture farmland. The continued erosion was diminishing the natural overbank high ground, which was the basin divide between the Nooksack and Sumas basins, increasing the frequency of overland flow and potential for channel avulsion into the Everson–Sumas Overflow Corridor.

In 1997, Whatcom County completed a pilot project to provide fish habitat and bank stabilization on the property. The Riverberry-Davis site, approximately 2,200 LF, incorporates four rock deflectors and four dolo-rock deflectors with woody debris placed between the structures. The Vandellen site, approximately 900 LF, incorporates large organic debris and timber pilings to construct 19 deflector structures.

Everson Overflow Area – The high ground along the right bank south of Everson Road near Massey Road and upstream to the Vandellen property is the area where much of the overflow to Everson originates. The elevation of the riverbank is the first hydraulic control affecting the amount of flow that leaves the Nooksack basin. Emmerson Road serves as a secondary control as some of the flow overtops the road and flows north while the rest of the flow is channeled back to the river by the levee constructed to protect Everson after the 1990 flood. In 2006, the revetment protecting the high ground divide east of Emmerson Road was reconstructed to prevent erosion of the high ground control.

Left Bank Overflow Corridor Opposite Everson – The river has historically overtopped a left bank levee immediately upstream of Everson. Floodwaters follow the low topography through agricultural areas for approximately 1 mile prior to flowing through a large arch culvert under Everson-Goshen Road (SR 544) and returning to the river.

Reach 5 Flooding Patterns

Floodwaters leave the river channel and overflow through Everson at three locations:

1. South (upstream) of Massey Road
2. Along Emerson Road between Massey Road and Everson
3. Approximately 1,500 feet upstream of the Everson Bridge

Floodwaters from the three overflow sites combine after crossing Massey and Emerson Roads and flow northward over Main Street in Everson and into the Johnson Creek basin. A railroad embankment prevents floodwaters from entering the Sumas River until they reach the vicinity of the City of Sumas. During small overflow events, floodwaters pass over fields and enter a drainage ditch that empties into Johnson Creek just north of Lindsay Road. During major events, floodwaters fill Johnson Creek's valley floor and continue to Sumas, typically flooding the downtown area with several feet of water.

Everson – All major Nooksack River floods cause flooding in Everson. Floodwaters generally flow into Everson from the south along Washington Street and from the overflow area to the east. After the 1990 flood, a 1,000-foot levee, referred to locally as Lagerway Dike, was constructed immediately south of Everson. The levee provides some flood protection but is not high enough to prevent Everson from being flooded during a large overflow.

Sumas – During major floods, flows top the divide between the Nooksack and Sumas watersheds and flow north in the floodplain along Johnson Creek, eventually reaching the city of Sumas. Floodwaters often cross the United States/Canada border within hours of an overflow occurring in Sumas.

Sumas Prairie/Abbotsford (B.C.) – After passing through Sumas, floodwaters cross the border into the District of Abbotsford and along the Sumas River, overtopping the Sumas River's left bank. Floodwaters have historically backed up from the Whatcom Road interchange of the TransCanada Highway and ponded in the western portion of Wet Sumas Prairie, with some floodwater ponding in the Lower Sumas River, Saar Creek, and Arnold Slough. A dike prevents flooding of the reclaimed Sumas Lake Bottom, a

prime agricultural area.

Avulsion Potential at Everson – It is possible that an avulsion would redirect all or a portion of the Nooksack River from its present path to a northward path along the Johnson Creek corridor. The Johnson Creek corridor drops an average of 6 feet per mile over its 10-mile course, a slope twice as steep as the 3-foot-per-mile drop of the Nooksack River. This steeper slope enhances the tendency toward an avulsion. Geologic evidence indicates the Nooksack River previously flowed north at Everson into the Sumas River and Frasier River Basins.

A study commissioned by the B.C. Ministry of Environment, Lands, and Parks predicts the Nooksack River's right bank would have to erode 820 feet at a critical location for an avulsion to occur, and estimates the likelihood of this is 20 percent during a 100-year flood, a statistical occurrence of once every 500 years.

2. Upper Forks of Nooksack River

North Fork – The Mount Baker Highway (SR 542) runs parallel to the North Fork Nooksack River for much of its length. Channel erosion threatens the highway at several locations; WSDOT has constructed several projects to protect the highway, most recently in 2015, and is considering options to relocate the highway at several other locations with chronic bank erosion or flooding problems. The Mount Baker Highway crosses the North Fork at two locations. Portions of the highway are also subject to inundation during significant flood events, primarily near Maple Falls.

County roads that have the potential to be threatened by the North Fork include Truck Road, Rutsatz Road, and North Fork Road. Emergency projects were implemented to protect Rutsatz Road in 2016 and Truck Road in 2018. The 2020 flood caused additional damage to Truck Road. Bridges cross the river along Mosquito Lake Road and SR 9, just upstream of its confluence with the South Fork. Channel erosion and overbank flooding also affect rural residential and agricultural properties along the river.

Several tributaries to the North Fork also have the potential to flood SR 542 including Glacier, Gallup, Cornell, Canyon, Boulder, and Maple Creeks. Flooding at Boulder Creek in the mid-1980s closed the highway for days, stranding hundreds of residents and skiers east of the road closure.

Middle Fork – While the Middle Fork generally runs parallel to Mosquito Lake Road, it is far

enough away along most of its length that it does not pose a threat to the roadway. In 2004, the river eroded close enough to the road at one location upstream of Porter Creek that the roadway was undermined. Whatcom County relocated a section of roadway away from the failing slope so that access could be maintained. The County also took measures to stabilize the bridge at Mosquito Lake Road where it crosses the Middle Fork.

The City of Bellingham's diversion dam for diverting water from the Middle Fork into Lake Whatcom is also located on the Middle Fork approximately 2.5 miles upstream from the Mosquito Lake Road Bridge. Other infrastructure and property impacted by flooding and erosion on the Middle Fork is primarily private developments associated with rural residential and agricultural properties.

Porter and Canyon Lake Creeks, tributaries to the Middle Fork, have also flooded Mosquito Lake Road where it crosses the lower portion of their alluvial fans. The flooding blocked local access and caused damage to the road and to the county bridges.

South Fork – Similar to the other two forks, the South Fork flows through rural residential and agricultural properties for most of its length. The river flows through the town of Acme where overbank flow can damage residential and commercial properties. The water tank for the town's water district is located in the floodplain in Acme. A project to reduce the potential for channel erosion just upstream of Acme was implemented in 2009 to improve fish habitat and limit channel migration.

SR #9 crosses the South Fork in Acme and is inundated by floodwaters both north and south of the bridge, severely limiting access to the South Fork valley during moderate to large flood events. SR #9 also is flooded by the South Fork further downstream south of VanZandt.

Mosquito Lake Road is also flooded by the South Fork at several locations near Acme during relatively frequent flood events. In 2007, the river channel eroded to within 20 feet of the roadway, and Whatcom County in conjunction with the FCZD extended an existing revetment to protect the roadway. Other County roads impacted by the South Fork are Strand Road and Potter Roads; both roadways become impassable during significant flood events. Whatcom County recently replaced the Potter Road Bridge over the South Fork due to structural deficiencies and widened the river opening.

E. MITIGATION STRATEGIES

1. Lower Nooksack River

The Lower Nooksack River CFHMP recognizes that both the short and long term implementation of structural and nonstructural elements and activities must be implemented for the recommended plan to be fully functional. Both operational effectiveness and cost effectiveness must be periodically reviewed and adjusted throughout the life of the plan. A comprehensive and collaborative effort is underway to update the 1999 CFHMP and integrate it with the needs of salmon and floodplain land uses. The results of this effort, known as the Floodplain Integrated Planning (FLIP) process, are not yet available for this plan update.

Over the last twenty years, the FCZD has worked with the diking districts and subzones to get many of the Nooksack River levees eligible for rehabilitation in the USACE's Public Law (PL) 84-99 Program. In late 2013, the FCZD initiated the development of a System-wide Improvement Framework (SWIF) to address the deficiencies identified by the USACE during their biennial inspections of the levees in the program. This process requires establishing an interagency coordination team (ICT) to guide development of the plan, and incorporating environmental considerations to address threatened and endangered species and tribal treaty rights. The ICT developed for the SWIF includes representatives from federal, state and local resource agencies, as well as representatives from the diking districts and agricultural community. The goal of the SWIF process is to reduce flood risk and improve habitat, while keeping the levees eligible in the USACE's rehabilitation program. The plan was completed in 2017; ongoing implementation of the SWIF will keep the levees currently rated as unacceptable by the USACE eligible for repair. While the SWIF process was focused somewhat narrowly on the levee system, many on the ICT wanted to look at the floodplain more broadly. This led to the current FLIP process to update the CFHMP. The current version of the CFHMP recommends the following actions as part of the overall approach for flood hazard management:

a. Hydraulic modeling and alternatives analysis
b. Engineering and design of capital improvement projects
c. Meander limit identification and adoption
d. Sediment management strategy development
e. Floodplain mapping and land use management in the floodplain
f. Land and easement acquisition program development

g. Flood preparedness and emergency response

Since adoption of the CFHMP, significant work has been completed in all of these program areas. These efforts are summarized below; for additional information, contact Whatcom County Public Works, River and Flood Division.

Hydraulic Modeling and Alternatives Analysis - A detailed hydraulic model has been developed and calibrated, and initial alternatives analysis of many of the specific projects identified in the CFHMP has been completed. The model has recently been updated to include 2006 bathymetric and Light Detection and Ranging (LiDAR) data and the updated model has been calibrated to the 2004, 2006, and 2009 floods. The model is currently being used to update the FEMA floodplain maps. A new two-dimensional model based on 2015 bathymetry and 2013 LiDAR is currently being calibrated to more recent events in 2015, 2017, 2018 and 2020. The updated model is being used in the FLIP process and in detailed project design.

Engineering and Design of Capital Improvement Projects - The hydraulic model has been used to perform preliminary hydraulic analysis and design for many of the projects identified in the CFHMP as described below. Some projects, like lowering the Bertrand Creek levees have already been constructed, and others are still in the planning or detailed design phases.

Meander Limit Identification and Adoption - Mapping of historic channel locations, erosion hazard zones, and avulsion hazards has been completed for the entire Lower Nooksack River. Identification of meander limits must be completed in conjunction with design of the flood control system through the hydraulic modeling and alternatives analysis. Some of this work has been initiated for upper Reach 4, between Deming and Nugents Corner as part of the SWIF planning process and for the rest of the lower mainstem as part of the FLIP process.

Sediment Management Strategy Development - A proposed approach for development of a sediment management strategy was developed and distributed to the agencies involved in permitting gravel removal from the river. Feedback from the agencies indicated that existing data was insufficient to support an analysis that would have a small enough error to allow them to support a gravel removal request. In 2006, a detailed bathymetric survey of the river was performed to provide baseline data for future comparisons to estimate the amount of aggradation that may be occurring throughout the river. A preliminary sediment budget using available data suggests aggradation rates that would enable measurement and quantification in a period of 10 to 20 years.

A cooperative study to evaluate the potential impacts of ongoing sedimentation was completed by the US Geological Survey in 2019. The report shows that local channel bed elevations at the USGS streamflow gages vary over time in the range of 1-3 feet. The gage data show long-term

trends in bed elevation changes on the order of 1 foot per decade that persist years to decades. These trends in persistent aggradation and incision appear to originate in the North Fork and translate downstream over decades. The pattern of incision and aggradation in the North Fork correlates with the regional climate, where persistent incision follows extended cold and wet periods, and persistent aggradation follows extended warm and dry periods (USGS, 2019).

Floodplain Mapping and Land Use Management in the Floodplain - New floodplain mapping has been developed through FEMA's Cooperating Technical Partners (CTP) program for most of the rivers and streams in the County. The study included detailed mapping for the South Fork Nooksack River, and approximate methods and remapping flood elevations on more recent topography for the North and Middle Forks and many of the smaller streams throughout the. This new mapping was officially adopted by FEMA for use in the NFIP in 2019. Much work was done on the Lower Nooksack River as part of the mapping study, though a change in how FEMA treats levees delayed completion of the mapping for the Lower Nooksack. In 2020 FEMA shared draft work maps for the lower Nooksack River with the affected communities and is working to refine the mapping to try to address community concerns before releasing the preliminary maps to the public.

Land and Easement Acquisition Program Development - A program for land acquisition as a component of flood hazard management was adopted by the FCZD Board of Supervisors in 2000. Numerous acquisitions have been completed under this program as hazard mitigation or other funding becomes available and opportunities with willing land owners arise. Areas targeted for acquisition include Marietta, and the high hazard portions of the alluvial fans associated with Canyon Creek and Jones Creek. Additional lands have been acquired for capital project implementation, wetland mitigation and floodplain preservation.

Flood Preparedness and Emergency Response - Annual flood preparedness activities continue to be performed by the various agencies involved in emergency response with overall coordination by Whatcom County DEM. These activities include annual flood meetings, training of sector observers, sandbag training, and sandbag pre-deployment throughout the County.

The CFHMP also outlines recommended projects and programs to implement along the various reaches of the Lower Nooksack River. Below are recommended mitigation strategies for the five reaches of the Lower Nooksack. While many of these recommendations have only been developed to a conceptual level and more detailed hydraulic analysis and design are needed before they can be fully implemented, others have been fully implemented. For more details on these projects, refer to the CFHMP, available from Whatcom County's River and Flood Division, Public Works Department.

Mitigation for Reach 1

Lummi River – The recommended improvement for the Lummi River (Red River) is not to increase flows to the river but to rehabilitate existing culverts at the diversion from the Nooksack River, including a gate or similar flow control structure and modifying downstream structures, if necessary. While this project would do little to reduce flooding, significant habitat benefit could be provided.

The property where the Lummi River diversion is located was recently acquired by the FCZD; restoration alternatives will be evaluated as part of the FLIP process.

Between the Bridges in Ferndale – The recommended improvement is to designate the properties on the right bank for flood proofing and/or property buyouts, and maintain open space at Vander Yacht Park and the golf course on the left bank. Implementation of this recommendation should include defining and stabilizing the overflow path, which could potentially overtop I-5.

The FLIP process will include a cumulative impacts analysis of future planned development within the Nooksack River floodplain in the City of Ferndale.

Left Bank Downstream of Ferndale – The CFHMP recommendation for this area is to maintain the overflows in Hovander Park and maintain the existing natural overflow corridor along the left bank. With this approach, agricultural levees downstream from the overflow area that are not continuous now could be made continuous as maintenance and reconstruction is called for. The rebuilt levees' crest elevations should be the same as those of right bank agricultural levees downstream of Ferndale, and they should be built to withstand overtopping. Computer modeling of this recommendation will be required.

Since the adoption of the CFHMP, the properties in the left overbank floodplain between Slater Road and Marine Drive have been acquired by the Washington Department of Fish and Wildlife (WDFW). The levee on the WDFW property is continuous and its crest is at a lower elevation than the right bank levee, but it does provide some flood protection to Slater Road, Marine Drive, and Marietta during smaller, more frequent flood events. Damage to the crest and backslope of the levee was repaired in 2009 and 2018 to maintain this level of protection as an interim measure until other recommended mitigation measures can be implemented for these areas. Significant flooding during the 2020 flood resulted in more damage to the levee and another repair project is being developed for implementation in 2022.

Slater Road Bridge Approach – The initial CFHMP recommendation for this area is to

maintain Slater Road at its current elevation to allow overtopping and temporary road closures during floods. Eliminating overtopping of Slater Road on the left bank during large floods would be of little benefit at times when overtopping on the right bank during large floods inundates the road on the other side of the river. This recommendation should be reconsidered as traffic demands change with time and if special financing were to become available.

Since the adoption of the CFHMP, the Lummi Nation has pursued mitigation grant funding to raise the left approach to the Slater Road bridge to provide access during a 100-year event. Whatcom County and Lummi Nation initiated a project using Pre-Disaster Mitigation grant funding, but the project has been delayed due to increased costs for construction.

Marietta Area – The recommended improvement for the Marietta area is to designate all flood-prone properties in the community for buyout, so that owners would have the option to sell and relocate should federal purchase funds be made available after a future flood. In the interim, property owners are encouraged to flood proof their structures.

Since the CFHMP was adopted, the Whatcom County FCZD has acquired numerous properties within Marietta using a combination of local, state, and federal funds. The 2009 flood event caused extensive damage to residential properties, and a number of these acquisitions were completed after that flood event. Currently, over to half of the properties within Marietta are in public ownership and three additional properties were recently purchased under the Hazard Mitigation Grant Program.

Right Bank Downstream of Ferndale – The recommended improvement is a setback levee to provide 100-year flood protection and manage overflows to Lummi Bay. This improvement will require discussions with affected property owners. Existing agricultural levees along the right bank will remain overtoppable, but a right-bank overflow corridor will be in place, necessitating flood easements, flood proofing, and/or property buyouts in the corridor. Haxton Way will not have to be raised and the Lummi Seawall will not have to be rehabilitated.

Several alternative levee alignments were evaluated during the SWIF planning process and additional work is being performed under the FLIP process to try to determine a preferred alignment.

Treatment Plant and Ferndale, South of the Bridges – This improvement is to provide 100-year flood protection along the right bank downstream of Main Street by raising the

existing levee and Ferndale Road, and to connect the Ferndale Road levee to the recommended new levee downstream. This project will resolve several levee deficiencies noted during the USACE inspections and was identified as a high priority for implementation in the SWIF plan.

Funding for detailed design is underway using grant funding through DOE's Floodplains by Design (FbD) Program.

Marine Drive Bridge Approach – The bridge approach will be maintained at its current elevation to allow overtopping and temporary road closure during floods. Lowering the roadway will not be necessary with the recommended setback levee on the right bank to manage overflows to Lummi Bay.

Haxton Way – Implementation of the recommended right bank setback levee would minimize the occurrence of Haxton Way inundation, making the general raising of Haxton Way unnecessary. However, until the right bank cutoff levee recommendation is accepted and fully implemented, levee overtopping and levee breaches will likely continue. Under these circumstances, the raising of the lowest sections of Haxton Way as an interim action is considered appropriate.

Since the CFHMP was adopted, Diking District #1 has widened and added material to the backslope of much of the levee so it is less prone to failure during overtopping events. In addition, the hydraulic model indicates that most of the levee is high enough to prevent overtopping for events as large as the 100-year flood. These factors reduce the need for interim actions at Haxton Way.

Lummi Bay Seawall – The right bank setback levee will minimize inundation of the Lummi Bay seawall, so no significant capital improvements are recommended for the seawall. Continued maintenance of the existing structure and culverts and tidegates is recommended.

Mitigation for Reach 2

Ferndale Urban Area – Flood dynamics in the Ferndale urban area should be analyzed in detail, including an evaluation of the relationship between urbanization, flood storage and conveyance, and the potential for I-5 overtopping. Evaluation of an overflow path in the event of I-5 overtopping should also be included.

This work is being completed as part of the ongoing FLIP process.

River Road Area – A right-bank overflow area should be designated and the remaining

levee along River Road should be strengthened.

Fishtrap Creek – The possibility of lowering a segment of the levees to provide a wider flow path for overflows from the Nooksack River should be explored with local property owners. This approach will also require regular sediment removal from the creek in order to maintain channel capacity and/or reduction of sediment inflow from the creek's upper watershed.

Bertrand Creek – New levee profiles should be established along the creek and the levees should be designed to be overtoppable. Since adoption of the CFHMP, the levees along Bertand Creek were lowered and set back from the creek along most of the length within the Nooksack River floodplain. Flood and conservation easements were acquired over the lands between the old and new levee alignments. While these levees typically failed during every significant flood, during the January 2009 flood event, the levees overtopped for a long duration with only minimal damage to the levee system.

Guide Meridian & I-5 – A left bank overflow corridor should be designated between Guide Meridian and I-5.

Mitigation for Reach 3

Detailed Hydraulic Analysis – A program is recommended that includes strategically linking the river channel with the agricultural floodplain. The goal is to limit random bank/levee overtopping, random levee failure, and sudden development of off channel flood flow paths. This would be accomplished by distributing those flows that exceed channel capacity over the floodplain, thereby reducing levee and bank stress. Seven overflow locations would be analyzed under this program, as follows:

1. Right bank south of Slotemaker Road
2. Left bank near the west end of Nolte Road
3. Bend in the right bank south of Northwood Road
4. Left bank near the intersection of Polinder and Thiel Roads
5. Left bank in the bend upstream of the Polinder/Hannegan intersection
6. Right bank downstream of the Lynden treatment plant
7. Left bank northwest of Bylsma Road, upstream of where Scott Ditch enters the river

Since adoption of the CFHMP, initial hydraulic modeling and alternatives analysis has

been performed. This work suggests that creating an overflow at the last site near Blysma Road may not be necessary, because it may reduce the effectiveness of the other overflows and redistribute flows between the overflow corridors. Additional analysis will be conducted with the updated hydraulic model during the FLIP process update to optimize the overflow locations, lengths, and elevations.

Strengthening of Roadway Sections – Strengthening of roadway sections should be performed along overflow corridors, as appropriate. Designating overflow locations will maintain the historical pattern of overtopping some roadways in the floodplain. The designated roadway areas are as follows:

- Slotemaker Road
- Timon Road
- Hampton Road
- Noon Road
- Thiel Road
- Polinder Road
- Hannegan Road

Guide Meridian Overflow Bridges – This improvement, in the short term, is to provide protection against erosion and scour through armoring. If the roadway is rebuilt in the future, opportunities for lengthening the bridges and/or creating additional openings should be investigated at that time.

Since the CFHMP was developed, WSDOT completed a widening project for the Guide Meridian that included the segment that crosses the Nooksack River floodplain. Whatcom County staff worked with WSDOT to refine the design of the overflow corridor openings to ensure no rise in flood elevations and provide additional capacity to accommodate overflows identified in the CFHMP. As a result, the newly constructed overflow bridges are of greater capacity and box culverts were added in each overflow corridor.

Mitigation for Reach 4

Limiting of Channel Migration – Reasonable limits for channel migration and the prevention of a right bank avulsion are recommended with three levels of priority:

1. Immediate action to move the channel away from limits mapped as part of the CFHMP
2. Future action when the channel is moving toward the meander limits
3. Long-term, ongoing future action to move the channel toward the middle of the corridor along Reach

This action is called for at the following sites:

- In Deming near the Mount Baker High School
- Southwest of Williams Road, downstream from Deming
- West of Mariotta Road
- The property west of Hopewell Road
- The property just south of Massey Road and west of Cole Road

Deming Right Bank Areas at High Risk of Avulsion -- The adopted CFHMP identifies three projects, for this portion of the reach as discussed below. Through the SWIF planning process, several alternative levee alignments were evaluated; additional work is needed during the FLIP process and the relevance of these projects will be revisited in that work.

1. New protection should be added downstream of Deming and the existing protection at the high school should be shortened
2. Existing bank protection south of Williams Road should be ensured to provide avulsion protection
3. New protection should be added between the protection projects already in place on the Sande property and west of Marietta Road

Mariotta Road – At Mariotta Road, 300 feet should be removed from the downstream end of the existing riprap protection, the remaining riprap should be tied into the right bank, and gravel should be removed from the bar on the right bank of Sande property. The remaining riprap should be retrofitted to reduce vulnerability to scour and increased fish habitat should be considered. Additional work on the left bank downstream of the clay banks may be warranted.

Nugent's Corner – Low levees should be constructed on the upstream and downstream

sides of the Mount Baker Highway Bridge. This improvement to Nugent's Corner should be given a lower priority than projects to prevent avulsion elsewhere in Reach 4.

Levees near Nugent's Corner – The existing overtopping levee upstream of Everson (on the left bank) should be maintained and strengthened, if necessary.

Several recent repairs to this levee (known as the Twin View Levee) have been completed in the past five years.

Mitigation for Reach 5

Everson Bridge – The stand of timber at the upstream end of the overflow on the river's right bank, approximately 1 mile upstream from the Everson Bridge, should be maintained. Additionally, an overtopping levee on the left bank in the same area should be retrofitted and maintained.

Nooksack River and Johnson Creek Watersheds – Maintenance of the divide between the Nooksack and Johnson Creek watershed involves structurally maintaining the divide with an aggressive alternative, a rock trench, as well as discussions with property owners to ensure local farming activities do not involve fields along the divide and changing ground elevation. The second measure is to provide continuous hard protection along the entire length of the overflow from the Nooksack River to the Johnson Creek corridor.

Since the CFHMP was adopted, 1,200 feet of the revetment along the riverbank at the Everson overflow near Massey Road was reconstructed. Prior to this project, the high ground divide was being eroded by the river. Emergency projects were constructed in 2003, 2005, and 2006 to curb this erosion until a more extensive project could be constructed in the summer of 2006.

Recent flooding including during the 2020 flood has caused bank instability damage downstream of the Trans Mountain pipeline crossing. Efforts are underway to develop a project to address this new damage.

2. Upper Forks of Nooksack River

Comprehensive flood hazard management plans have not been developed for any of the three upper forks. The FLIP process will include recommendations to address flood issues for the upper forks as part of the final plan. Some studies to support development of comprehensive

flood plans have been performed including the following:

a. Mapping of historic channel locations, erosion hazard zones, and avulsion hazards for all three forks
b. Development of a detailed hydraulic model for the South Fork Nooksack River
c. Detailed floodplain studies to develop new floodplain mapping for the South Fork Nooksack River
d. Updated approximate floodplain mapping for the North and Middle Forks using updated topographic data and historic channel migration mapping

While the FLIP process is underway, ongoing mitigation efforts will primarily consist of repair of existing flood control structures to protect existing infrastructure and implementation of the County's emergency preparedness, NFIP, and early flood warning programs.

3. Other Areas

Areas other than Nooksack River floodplains have been vulnerable to floods or isolation by flood waters in the past. This often relates to the presence of alluvial fans or smaller streams that can cause localized flooding, including in urban areas. Examples include the following areas:

- Austin Creek and Sudden Valley
- Smith Creek and North Shore Road
- Hillside Road
- Blue Canyon
- Iowa Heights
- Henderson Road
- Mount Baker Highway Communities, as discussed above
- Whatcom Creek and Iowa Street
- Squalicum Creek and Meridian Street and Roeder Avenue
- Double Ditch Creek and Double Ditch Road at Lynden

Residents of Whatcom County should understand the flood potential of areas in which they elect to live. It is important to remember that dangers associated with flooding do not end

when the rain stops. Electrocution, structural collapse, hazardous materials leaks, and fire are secondary hazards associated with flooding and flood cleanup.

COSTAL FLOODING (Including Storm Surge)

A. DEFINITIONS

Coastal Flooding An inundation of dry land with water caused by weather phenomena and events that push coastal waters onto the shore at levels that are above Mean High High Water due to the effects of wind, surge and atmospheric pressure. As coastal flood is generally a temporary condition that recedes when the tide begins to ebb.

Coastal Floodplain The land area of a coastal area that becomes inundated with water during coastal flooding.

National Flood Insurance Program A federal program enabling property owners in participating communities to purchase insurance protection against losses from flooding. The NFIP is designed to provide insurance as an alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their content caused by floods. When a community chooses to participate in the NFIP, they agree to adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in Special Flood Hazard Areas. In exchange, the federal government agrees to make flood insurance available within the community as a financial protection against flood losses.

B. BACKGROUND INFORMATION

A **coastal flood**, or the inundation of land areas along the coast, is caused by higher than average high tide and worsened by heavy rainfall and onshore winds. **Storm surge** is an abnormal rise in water level in coastal areas, over and above the regular astronomical tide, caused by forces generated from a severe storm's wind, waves, and low atmospheric pressure. Storm surge is dangerous, because it is capable of flooding large coastal areas. Extreme flooding can occur in coastal areas particularly when storm surge coincides with normal high tide.

High winds off the coast combined with high tides and low atmospheric pressures can result in coastal flooding along the western edge of Whatcom County. The main coastal communities impacted by coastal flooding are Sandy Point, Birch Bay, Point Roberts, and Lummi Peninsula. Damages can include structural damage to residences and seawalls as large debris is carried by waves hitting the shoreline, inundation damage to structures, and debris accumulation and flooding of roadways. In some areas where the shoreline is a bluff, coastal erosion and/or

improper drainage can threaten the structural integrity of residential structures and the stability of the bluff itself.

In Whatcom County many areas are subject to coastal flooding, principally Sandy Point, Birch Bay, Point Roberts, Lummi Island and the Lummi Peninsula.

C. RECENT HISTORY IN WHATCOM COUNTY

Recent significant coastal flooding events are summarized as follows:

October 12, 1962 (Columbus Day) The inclusion of the infamous "Columbus Day Storm" is primarily due to it being the wind storm for which virtually all other Pacific Northwest wind storms are compared. Although actual tidal information is not available, extreme low pressure and south/southeasterly winds of nearly 100 miles per hour likely created significantly higher than predicted sea levels and waves large enough to result in some coastal flooding. However, reports of the timing of the strongest winds during the storm indicate that they coincided closely with a low tide in the area. Further, any coastal flooding would have been moderated by the fact that the predicted high tides were at least 1 foot lower than high tides generally predicted during mid-winter months. The largely undeveloped state of southerly and southeasterly shores of Sandy Point, Birch Bay Village area, Point Roberts, Lummi Island, Lummi Peninsula, Eliza Island, etc. would have also minimized any property damage due to coastal flooding. Newspaper articles about the storm largely focused on damage and problems on land and water due to the wind with no mention of coastal flooding.

March 30, 1975 (Easter Sunday) Extremely strong northwesterly wind coincided with a predicted 6:21 a.m. high tide of 8.98 feet mean lower low water (MLLW), causing coastal flooding, especially along the west shore of Sandy Point. The northwesterly/westerly facing shoreline of Birch Bay was also likely impacted. Many homes and property along Sucia Drive suffered damage of varying degrees.

December 16, 1982 Strong westerly and southwesterly wind coincided with low pressure to create a record high tide of 12.93 feet MLLW (Cherry Point) that was 2.90

feet above the predicted level of 10.03 feet MLLW. Significant coastal flooding and damage, including low-lying inland areas, occurred in the Birch Bay, Sandy Point, and Gooseberry Point areas. Legoe Bay Road on Lummi Island and roads and property along the south shore of Point Roberts were also flooded.

December 4, 1993 Strong westerly wind of 45 to 50 miles per hour (mph) with gusts to 68 mph reportedly coincided with high tide and low pressure to create coastal flooding along the westerly facing shorelines of Sandy Point and Birch Bay. Newspaper accounts reported minor damage to homes as well as water and debris on Sucia Drive and Birch Bay Drive. Actual tidal levels are not available, but at Cherry Point high tide was predicted at 9:36 a.m. to be 9.97 feet MLLW; the actual height was likely significantly higher.

December 15, 2000 Reported 70 mph northwesterly winds caused coastal flooding along the westerly shores of Sandy Point and Birch Bay as a rising tide approached a predicted 9:21 a.m. high tide (Cherry Point) of 10.64 feet MLLW. Several dozen homes and property along Sucia Drive were especially hard hit, suffering damage of varying degrees. Most of the damage occurred as much as two or more hours prior to the predicted high tide when the winds were strongest out of the northwest and the tide level was rising between the 8 to 10 foot MLLW range. The wind had eased and shifted to northeast (off-shore) by the time of high tide.

December 14, 2001 Almost exactly one year after the December 15, 2000 event, very similar coastal flooding and damage occurred at Sandy Point and Birch Bay. Strong northwesterly winds closely coincided with an observed 6:12 a.m. Cherry Point high tide of 10.58 feet MLLW. The observed tidal levels were 0.5 to 1 foot higher than predicted during the period of strongest winds due to low pressure. Damages were less extensive than the previous year because the County's Division of Emergency Management contacted homeowners prior to the event to warn them of the upcoming potential for coastal flooding. Property owners were able to take protective measures to reduce property damage.

February 4, 2006 Strong southeasterly wind coincided with extreme low pressure to create a 9:06 a.m. high tide of 12.34 feet MLLW that was 2.44 feet higher than the predicted 9.90 feet. Significant coastal flooding occurred in virtually all vulnerable coastal areas, including Sandy Point, Gooseberry Point, along the northerly shore of Birch Bay, the southeasterly shore of the Lummi Peninsula (Lummi Shore Road area), and the southerly shore and the Maple Beach/Bay View Drive areas of Point Roberts.

December 17, 2012 Strong westerly winds coincided with a low pressure system (+/-980 mb), resulting in a 9:00 am high tide of 11.94 feet (MLLW) that was 1.4 feet higher than the predicted 10.53 feet (MLLW) at Cherry Point. Moderate flooding and damage occurred along westerly facing shorelines, primarily at Birch Bay, Neptune Beach/Sandy Point, and Gooseberry Point areas. Water overtopped and deposited woody debris and seaweed along much of Birch Bay Drive resulting in temporary closure of much of the road from the State Park to the Cottonwood Beach area. Flooding occurred around and in many homes in the area with damage largely limited to water issues, although some structural damage likely occurred to buildings along the shoreline that were exposed to waves and large woody debris. Sucia Drive and several homes were also flooded in the vicinity of 4783 Sucia Drive. It is noteworthy that much of the flooding/damage occurred as much as 2 hours prior to high tide when the Cherry Point water level was only at about 10-11 feet (MLLW) due to strong northwest/westerly wind and resulting waves that had subsided significantly by the time of highest tide at 9:00 am.

December 2019 Strong westerly winds coincided with a low-pressure system (+/-980 mb), resulting in a 1300 high tide of 13.4 feet (MLLW) that was 2.5 feet higher than the predicted 10.9 feet (MLLW) at Cherry Point. Significant flooding and damage occurred along westerly facing shorelines, primarily in Birch Bay, Blaine and Point Roberts. Water overtopped and deposited woody debris and seaweed along much of Birch Bay Drive resulting in temporary closure of much of the road from the State Park to the Cottonwood Beach area. This flooding also largely undercut and destroyed the southbound lanes of Birch Bay Drive resulting in a nearly one-year closure of the road

to one lane. Flooding occurred around and in many homes in the area with damage largely limited to water issues, although some structural damage likely occurred to buildings along the shoreline that were exposed to waves and large woody debris. It is noteworthy that much of the flooding/damage occurred as much as 2 hours prior to high tide when the Cherry Point water level was only at about 10-11 feet (MLLW) due to strong northwest/westerly wind and resulting waves that had subsided significantly by the time of highest tide at 1500.

D. VULNERABILITY ASSESSMENT

Sandy Point – Virtually the entire Sandy Point area, including the shoreline in the Neptune Beach area, is subject to coastal flooding, primarily due to a combination of high tidal levels and wind-driven waves from east through northwest. Homes and property along the shoreline are especially vulnerable to damage from wind-driven water and large debris. Homes and property on the interior of the peninsula are generally only subject to water damage due to flooding from high tide levels and wash over the shoreline properties. Virtually all roads within the peninsula, including the main access roads of Sucia Drive and Saltspring Drive, are subject to flooding. The Sandy Point Fire Hall on the east side of Sucia Drive south of Thetis Way is also subject to flooding.

Birch Bay – Virtually the entire non-bluff shoreline area of Birch Bay is subject to extensive coastal flooding, primarily due to a combination of high tidal levels and wind-driven waves from southwest through northwest. Homes and other residential structures, businesses, and properties in low areas along and near the shoreline are especially vulnerable to damage from wind-driven water and large debris. For the most part, residential structures and properties in low areas landward of shoreline properties in the Birch Bay Village development and along and including Birch Bay Drive and Birch Point Road are only subject to water damage due to flooding from high tide levels and wash over the shoreline roads and properties. Flood waters between Alderson Road and the low area of the Sea Links development can extend almost 1 mile inland to Blaine Road. High tidal levels, waves, and storm surge can also restrict the outflow of Terrell Creek, resulting in flooding of residential structures, properties, and roads in low areas adjacent to or in the vicinity of Terrell Creek, such as the Birch Bay Park and Leisure Park development areas. Land and structures along the shoreline and in the low areas of Birch Bay State Park along Terrell Creek are also subject to coastal flooding. Most of the bluff areas along the shoreline are subject to slope instability due to erosion from high tidal levels and wind-driven waves.

Point Roberts – The entire shoreline area of Point Roberts is subject to coastal flooding, especially in the non-bluff areas, primarily due to a combination of high tidal levels and wind-driven waves from the northwest through northeast. Residential and business structures and properties along low-lying shoreline areas along the westerly, southerly, and easterly shore are especially vulnerable to damage from wind-driven water and large debris. Generally, residential structures, properties, and roads in low areas landward of shoreline properties along Marine Drive and Edwards Drive are not prone to significant flooding due to the Point Roberts Dike (Point Roberts Diking District is non-active) and detention of upland drainage in the canal in the vicinity of and around the Point Roberts Marina. However, residential structures, businesses, and properties adjacent to and along Bay View Drive in the Maple Beach area are vulnerable to damage from wind-driven waves, splash, and debris over the seawall. Structures and properties in low areas landward of the properties fronting Bay View Drive are generally only subject to water damage from coastal flooding. A portion of Whatcom County's Lighthouse Marine Park is subject to coastal flooding. Most of the bluff areas along the shoreline are subject to slope instability due to erosion from high tidal levels and wind-driven waves.

Lummi Peninsula – The entire shoreline area of the Lummi Peninsula is subject to coastal flooding, especially in the non-bluff areas, primarily due to a combination of high tidal levels and wind-driven waves from the northwest through southeast. Low-lying residential and business structures and properties along the shoreline in the Gooseberry Point area are especially vulnerable to damage from wind-driven water and large debris. For the most part, residential structures, properties, and roads in low areas landward of shoreline properties in the Gooseberry Point and Hermosa Beach areas, including Haxton Way, Lummi View Drive, and Lummi Shore Road, are only subject to water damage due to flooding from high tide levels and wash over the shoreline roads and properties. Most of the bluff areas along the shoreline are subject to slope instability due to erosion from high tidal levels and wind-driven waves.

Lummi Island – The two low areas on Lummi Island that are particularly vulnerable to damage from coastal flooding are Lummi Point and the Legoe Bay Road area immediately east of Village Point. Virtually the entire low area of Lummi Point has many residential structures and properties that are subject to flooding and damage from a combination of high tidal levels and waves from a southerly or northerly direction. The Legoe Bay Road area has residential and other structures and properties that are subject to flooding due to high tidal levels in combination with wind-driven waves from a southerly direction. The portion of Legoe Bay Road close to the shoreline in the low area is vulnerable to debris deposition and damage from erosion. Most of the non-rocky bluff areas along the westerly and easterly shorelines of Lummi Island shoreline are subject to slope instability due to erosion from high tidal levels and wind-driven waves.

E. MITIGATION STRATEGIES

In recent years, the level of development activity in areas prone to coastal flooding increased significantly. Whatcom County initiated a study to develop new floodplain mapping for several coastal areas in 2000. In 2004 and 2007, new mapping developed by the County with assistance from FEMA's CTP program was finalized for Sandy Point and Birch Bay. FEMA has developed new County-wide coastal floodplain maps. Other mitigation options for coastal areas could include working with homeowners to elevate and/or flood-proof structures or voluntary acquisition if these approaches are cost-effective and funding becomes available.

In 2019 and 2020 the Birch Bay Drive and Pedestrian Facility was installed along a 1 ½ mile stretch of Birch Bay Drive, which effectively created a 14' elevated berm and cost approximately $12 million. This area was heavily impacted in previous storms. These types of structures could be considered for other shoreline areas in Whatcom County.

GEOLOGIC HAZARDS

A. DEFINITIONS

Alluvial Fans Lobate, or fan-shaped, gently sloping deposits of stream-deposited sediment (alluvium) located where a steep-gradient stream or canyon issues onto a broader, low-gradient valley floor, plain, or lake. The term alluvial fan encompasses debris flow fans, composite fans, and fan deltas.

Landslide A term that includes a wide range of ground movement, such as rock falls, deep-seated failure of slopes, and shallow debris avalanches and flows.

Liquefaction The loss of intergranular strength in saturated, loosely-packed sediment due to elevated pore pressures typically generated by seismic shaking during large magnitude earthquakes. Liquefaction can result in a loss of foundation bearing support and significant building damage, as well as lateral spreading, sand boils, and excessive ground settlement with associated disruption of utilities, roadway systems, and infrastructure.

Seismic Hazard Refers to areas subject to severe risk of earthquake damage, such as those areas underlain by sediments susceptible to liquefaction. Almost all of the lower Nooksack River floodplain is categorized as seismically hazardous, as are areas underlain by peat soils (see the "Earthquakes" section for more information regarding seismic hazards).

B. BACKGROUND INFORMATION

Due to their presence in Whatcom County, as well as data availability, three geologic hazards were identified and analyzed as part of this Plan:

1. Alluvial Fans – All alluvial fan areas were classified as hazardous.
2. Coal Mines – Any areas on top of a historical coal mine were determined to be hazardous.
3. Landslides – Risk areas were determined based on slope gradient (specifically slope gradients greater than 15 degrees), underlying geology and soil saturation potential. Although slope gradients not a complete predictor of stability, it was a primary for determination, recognizing shallow rapid landslides tend to be triggered in the 33-35% plus range.

1. Alluvial Fans

Alluvial fans form where there is a sharp decrease in stream gradient and a loss of channel confinement, which results in decreased stream velocity and rapid sediment deposition; generally, where a stream or canyon issues onto a valley floor, plain, or lake. Active mass wasting processes in upland areas, including landslides and erosion, function as the primary catalyst for the natural introduction of fine to coarse grained sediment, soil material, and woody debris to stream channels in the Pacific Northwest. Sediment and debris generated by mass wasting are introduced to stream channels, which may then be routed, either en masse by channelized landslide processes such as debris flows or floods, or incrementally via fluvial sediment transport processes. Stream bed aggradation on the alluvial fan surface due to fluvial, as well as episodic debris flow/flood deposition on low-gradient fan surfaces results in a continued potential for avulsion, or channel-switching, which, over long periods of time, creates the lobate, or fan-shaped morphology commonly observed in plan view for alluvial fans. These processes function continually on the small-scale, but extreme events occur episodically and contribute significantly to alluvial fan formation, as well as pose significant hazards to proximal development.

The majority of alluvial fans have been mapped in Whatcom County by the Washington Geological Survey. Alluvial fans can be expected to be present wherever a stream exits a steeper hillside or mountain and enters a broader valley floor such as the Nooksack River valley or a body of water such as Lake Whatcom, Lake Samish, Silver Lake, or Reed and Cain Lakes. The alluvial fans in Whatcom County are formed both by ongoing transport of fine- to coarse-grained sediment and woody debris by normal stream flow as well as periodic sediment-laden floods and debris flows. These latter two are generally triggered by landslides that enter the channel from the adjoining hillside. The landslide deposits then either continue moving down the channel, bulking with water to create a debris flow, or form a temporary landslide dam. A landslide dam can block stream flow and then fail catastrophically, releasing compounded sediment and water. Both sediment-laden floods and debris flows consist of a mixture of water, sediment, and debris that is routed through the steep stream channel during an event. The location and extent of alluvial fans in Whatcom County was greatly improved by the publication of the Whatcom County Landslide Inventory by the Washington State DNR Geological Survey in 2019. In addition to mapping deep-seated landslides, the inventory identified nearly 2,500 alluvial fans in Whatcom County using bare-earth imagery derived from high-resolution lidar data obtained in 2017.

Debris flows contain a higher proportion of sediment relative to water and can be particularly damaging due to the ability to scour and grow in sized as sediment and woody debris stored in

the channel is incorporated. This can produce a sediment volume at the fan that is many orders of magnitude larger than the initial landslide that triggered the event. When a debris flow reaches an alluvial fan, the debris may be quickly deposited within the existing stream channel leading to a channel avulsion, the sudden changing of stream course to a new channel. Both sediment-laden flood and debris flow material may run-out some distance from the head of the alluvial fan before fully depositing and may not follow a defined channel when doing so. In some instances, run-out has exceeded the previously mapped alluvial fan extent, which may, in part, be due to land clearing practices prevalent in river valleys. Examples of this are the debris flows that initiated on the west face of the Van Zandt Dike during the January 2009 flood event that ran out more than 600 feet from the base of the hillside, crossing private land and a county road before entering the South Fork floodplain. Potential run-out is not included on county geological hazard maps, which are primarily based on a coarse-scale geologic mapping efforts that did not specifically address alluvial fan hazards, and could be greatly improved by detailed assessment conducted by a qualified professional. In early 2021 the Washington State Legislature passed and funded Washington State Bill “SB5088-Landslide Hazard Mapping and Inventory”, that will improve understanding of landslide and other geological hazards in Whatcom County. As noted above, the Washington Geological Survey published an updated deep-seated landslide and alluvial fan mapping product in 2020 (WGS Report of Investigations 42, February 2020).

2. Coal Mines

According to the *NW Source*, William H. Prattle, one of Bellingham's earliest settlers, responded to Native American tales of local coal outcroppings by opening a marginally successful coal mine in the settlement called Unionville in 1853. The same year, San Francisco investors opened the Sehome Mine, adjacent to the Whatcom settlement, and it became one of the two largest employers in the area until the mine was flooded in 1878. Coal mining ceased until the Bellingham Bay Company opened the largest mine in the state in the city's north end in 1918; it operated until 1951, when decreased demand led to its closure. Refer to Figure 2 for locations of the Bellingham area’s primary historical mines.

Figure 2 shows the Bellingham area's historic mine locations.

In a January 2003 report titled "Preliminary Assessment of Bellingham Mines," the U.S. Environmental Protection Agency (EPA) assessed possible environmental problems related to 11 mines in and around Bellingham. Two other mines were inventoried, but not assessed, because their exact location was unknown. This report showed that hazardous substances were potentially present and could pose a threat to public health or the environment.

Along with the potential for toxic contamination from these historical mines, these sites pose a risk for ground failure and subsidence in downtown Bellingham and in the Birchwood neighborhood.

3. Landslides

Landslides occur along the hillsides and shorelines of Washington due to the area's steep mountainous terrain, miles of coastal bluffs, complex geology, high precipitation rate, both as rain and snow, abundance of unconsolidated glacial sediments, and tectonically active setting

astride the Cascadia Subduction Zone. Unstable landforms and landslide failure mechanisms have been recognized for decades, but that information has not always been widely known or used outside the geologic community. As the population of Washington grows, increasing pressures to develop in landslide-prone areas, or in landslide run-out zones, make basic knowledge about landslide hazards on the part of the general public more important.

A number of factors control landslide type and initiation. These include topography, underlying geology, soils, weather patterns and individual storms, surface- and groundwater, wave action, and human actions including rerouting of drainage by development, de-vegetation, and modification of existing topography. Typically, a landslide occurs when several factors converge and the forces allowing the hill to stay put are overcome by those influencing a move downhill driven by gravity. The following map shows the existing landslide hazards in Whatcom County.

A simplistic view of landslides divides them into two categories: shallow landslides where the depth of failure corresponds roughly to the rooting depth of mature forest vegetation; and deep-seated landslides where the failure plane may be 10's to 100's of feet deep. For shallow landslides, the presence of a healthy root network can effectively increase the forces holding the slope in place, while root strength is not an important factor for deep-seated landslides. Many slides on Puget Sound occur in a geologic setting that places permeable sand and gravel above less permeable layers of silt and clay, or bedrock. Water seeps downward through the upper materials and accumulates on the top of the underlying units, forming a zone of elevated pore pressure, which effectively acts to counter the normal force resisting slope failure. Gravity works more effectively on steeper slopes, such as the bluffs that surround Puget Sound, but more gradual slopes may also be vulnerable. Most slides in northwest Washington occur during or immediately after heavy rains. Shallow landslides often result from individual storms that provide significant precipitation over a matter of days. Deep-seated slides often respond to prolonged wet periods from January through March, and in some cases to multi-year climatic trends. This may correspond to an elevation of the water table. As water tables rise, slopes become less stable. In addition, wave action can erode the beach or the toe of a bluff, cutting into the slope, triggering or setting the stage for future slides. Human actions, most notably those that affect drainage patterns or groundwater, can trigger landslides. Clearing vegetation, poor drainage practices, and onsite septic systems can all add to the potential for landslides.

C. RECENT HISTORY IN WHATCOM COUNTY

1. Alluvial Fans

The last several decades have seen meteorological conditions and land use activities combine to produce increasingly frequent and severe consequences from debris and flooding events associated with streams in Whatcom County, due to increased platting and building on alluvial fans**.** This has also resulted in an increased awareness of the risks associated with alluvial fans, and several measures have been taken by the County to address the problem. Several studies have been prepared that examine the risks associated with a number of alluvial fans. These studies focus on fans with recent damage or with significant development and document the history of the alluvial fan assessed and the associated risks to human life and property and public infrastructure located on that fan. However, they do not provide an inclusive examination of all fans that are present on the landscape. Such an inventory is challenging because the fans can range from hundreds of acres in size to less than one acre. Many of those small fans have a single home on them so while the relative risk may be less, it is no less consequential to the current or future owners.

A study was conducted in 1983 in response to a storm in January of that year, where a number of debris flow events generated from failed forest roads and concave hillsides on the slopes of Stewart and Lookout Mountains caused major damage to property, roads, and bridges on alluvial fans in Lake Whatcom, the South Fork Nooksack River Valley[1] and the Austin Creek alluvial fan at Sudden Valley. The resulting report summarized the causes of these events, recommended mitigation measures, and designated hazards zones surrounding the streams that were examined.

Another report, *Alluvial Fan Hazard Areas*, issued by Whatcom County's Planning and Development Services Department in August 1992, presents an inventory and compilation of the major alluvial areas recognized at that time. Although this was an extensive study, many smaller alluvial fans were not assessed. The Washington Geological Survey completed a comprehensive inventory of Whatcom County alluvial fans using lidar imagery in 2020. The GIS shapefiles with alluvial fan locations were downloaded to the County GIS system and are available to county departments for their use and are available to the public through WDNR/WGS.

6 Weden and Associates, 1983. Alluvial Fans and Deltas Flood Hazard Areas. Report prepared for Whatcom County, 98 pages.

In January 2009, significant rainfall amounts combined with frozen ground conditions and snowmelt resulted in debris flows and landslides in several alluvial fan areas including Stewart Mountain into Lake Whatcom and South Fork Valley, the Van Zandt Dike, Sumas Mountain, Slide Mountain, Red Mountain, and Lake Samish Mountains. The debris flows generate by this storm impacted homes, farms, and public roadways. No injuries were reported, but some homes were rendered uninhabitable. Early reports indicated that more than 100 landslides were triggered by this landslide event in Whatcom County alone, with many more landslides slides likely to be found pending further investigation and coordinated reporting. The slides generated by this storm event were documented by Washington Department of Natural Resources geologists in a series of 9 site reports and a summary report (Powell et al. January 2010, Reconnaissance Study of Landslides Related to the January 2009 Storm in the Acme Watershed).

Smith and McCauley Creeks, located near Deming within Reach 4 of the Nooksack River floodplain (refer to the "Flooding" section Background Information or Mitigation Strategies), are other examples of relatively small alluvial fan areas. The Smith and McCauley Creek alluvial fans are shaped by both fluvial (stream flow driven) and debris flow events; this is typical of alluvial fans in Whatcom County. Stream avulsions, a sudden shift in channel location as one channel is abandoned and the stream shifts to a new path, have occurred during past events and are a fundamental mechanism responsible for creating the alluvial fan landform. Any residences and farm buildings on the alluvial fan are at risk. The McCauley Creek Flood Control District has constructed sediment traps on both these systems to try to reduce the risk to downstream properties.

The Whatcom County Flood Control District has performed detailed studies on four additional fans; a brief history of flooding on these fans follows.

Canyon Creek – A large debris flood event occurred on Canyon Creek in November 1989, destroying one residence. Two smaller debris flood events in November 1990 destroyed three additional residences and several hundred feet of Canyon View Drive, a County road within the Glacier Springs development. The deposits from each event indicate that sediment transport likely ranged from clearwater flood, to sediment laden flood, to true debris flow during the course of each storm event; these are referred to here as debris flood events for simplicity. Bank armor was installed along the west bank adjacent to the Glacier Springs development in summer 1990; this was destroyed or buried by the November 1990 events. A levee and flow deflection structures were constructed using FEMA funding in 1994; in November 1995, a predominantly clearwater flood damaged the recently-constructed project. Since 2000, acquisition of most of the highest risk properties on the fan has proceeded to reduce the risk to

life and property (see the "Mitigation" section). The acquisitions have allowed the County to remove the old levee and replace it with an 1850 feet long setback revetment that reconnects the creek to its floodplain where 23 engineered log jams have been installed to slow bank erosion and restore critical habitats for salmon, steelhead, and bulltrout.

Jones Creek – Significant debris flows occurred on the Jones Creek fan during January 1983 and January 2009. The 1983 debris flow destroyed a private log bridge at Galbraith Road and flattened approximately 4 acres of mature trees. The Turkington Road Bridge is a constriction that gets blocked by debris and sediment on top of the bridge deck and in the channel upstream. Debris depositing in the channel between Galbraith and Turkington Roads reduces channel capacity and results in water and sediment overflowing the right bank (looking downstream) and flowing down slope towards the town of Acme. This occurred during the 1983, 1990, and 2009 events. A small debris flow also occurred in 2004, but the event was not big enough to fill in the channel and cause overland flow. An active deep-seated landslide, the "Darrington Slide", located approximately 4000' upstream from Turkington Road constricts the Jones Creek channel and creates a partial dam and small impoundment of water upstream of the slide. The USGS installed a stream stage gage at Turkington Road to detect sudden drops in streamflow if the Darrington Slide were to move rapidly, form a larger landslide dam, and cut off streamflow temporarily while the dammed area fills with water and increases the potential for a landslide dam failure. The gage sends a warning to the Acme Fire District who then sends responders to check the creek at Turkington Road and to the landslide area to verify if landslide dam conditions are present so that an appropriate response can be instituted to protect the community members living in Acme if necessary. The County is working on a debris flow mitigation project to reduce risk through a combination of acquisition of high risk properties and construction of a berm designed to redirect debris flows and other events to an unpopulated portion of the alluvial fan.

Swift Creek – A significant debris flow event occurred in 1971 on Swift Creek. A large volume (estimated at 100,000 to 150,000 cubic yards) of sediment was delivered to the fan causing significant aggradation of the channel. Swift Creek flowed out of its bank to the north across South Pass Road towards Breckinridge Creek. Since then, Swift Creek has experienced extensive ongoing sedimentation of the stream channel originating from a very large, deep-seated landslide upstream on Sumas Mountain. This has resulted in the streambed becoming perched above adjacent properties in some locations. The County is currently working with state and federal agencies on a plan to manage on-going and future sedimentation on the Swift Creek alluvial fan and downstream reaches. This work is complicated by the presence of naturally occurring asbestos in the sediment originating from the landslide which necessitates additional precautions.

Glacier-Gallop Creeks- The Glacier Creek and Gallop Creek alluvial fans merge into a combined alluvial fan at the community of Glacier. A number of reports have been prepared over the years that document flood or debris flood impacts dating back as far as the 1930's. Several large floods of note have occurred including large ones in 1962 and 1963 and in 1989 and 1990 which threatened or caused damage to the highway bridge and other structures. A west bank levee on Glacier Creek was installed following the 1962 event to protect the west SR 542 abutment and the community of Glacier. This same levee was breached/overtopped during the November 1989 event sending Glacier Creek flow into the community where it combined with Gallop Creek floodwaters. State highway crews dug sediment from under both the Gallup and Glacier Creek bridges during the 1989 even to maintain flow under the bridge even as water raised high enough to splash onto the Glacier Bridge deck. Roads and homes in the Mt. Baker Rim development during were damaged during the 1989 and 1990 floods. The Glacier left (west) bank levee which was damaged again by several high water events over the past decade.

This brief history only provides examples of recent alluvial fan activity and is not meant to be exhaustive.

2. Coal Mines

The City of Bellingham abandoned underground mines that stretch from State Street to Sehome Hill and from Connecticut Street northwest to McLeod Road present significant hazards, mostly related to mine subsidence and collapse. Subsidence refers to a relatively slow settling of the overlying ground. Collapse of a mine roof can cause a sinkhole to form, creating a hazard. The Sehome mine workings under downtown Bellingham are relatively shallow and are thought to pose a greater sinkhole hazard than the Birchwood mine farther to the northwest, although a small sinkhole formed in the Birchwood neighborhood in the late 1980's or early 1990's.

3. Landslides

The susceptibility of Whatcom County to landslides is apparent from the examples provided by the numerous landslides listed in Table 4.

Table 4. Major Whatcom County Landslides Beginning With the Great Depression

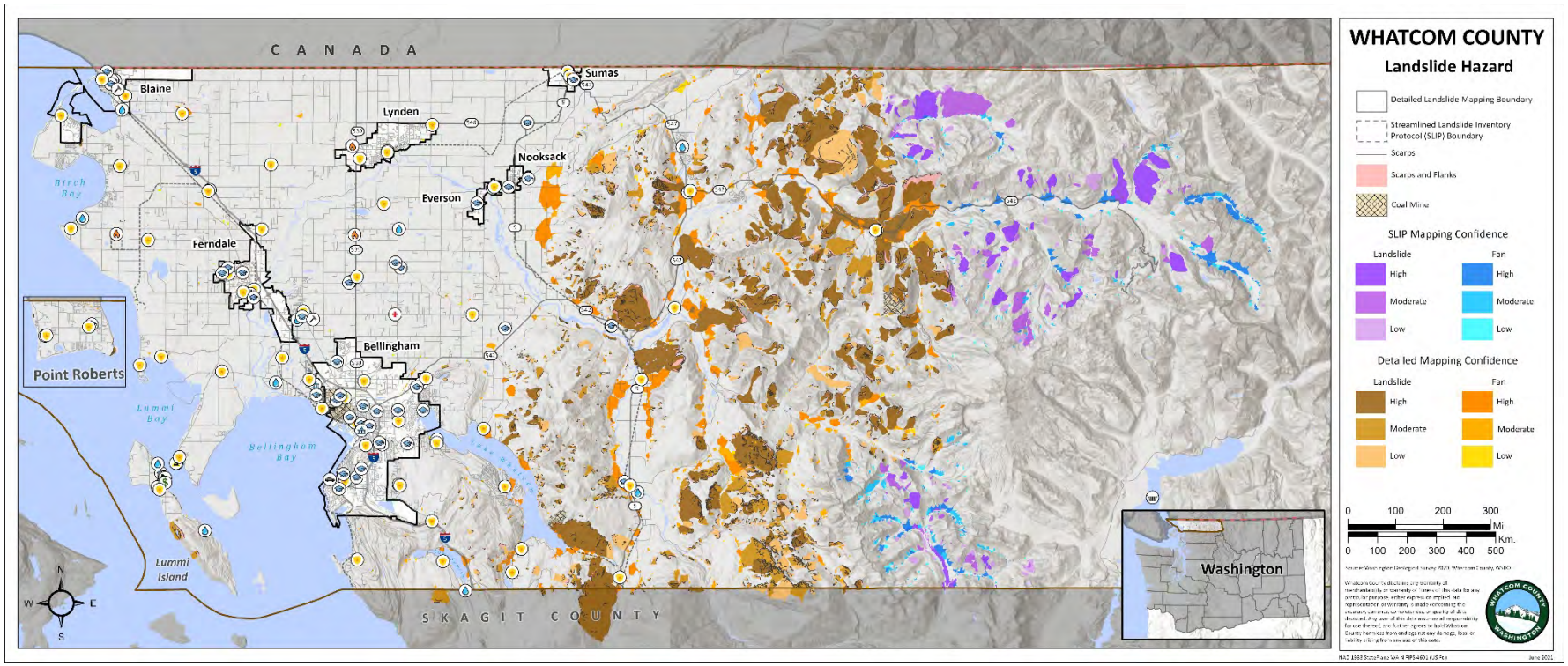
Dates	Description
Great Depression Era	Cutting trees caused a very large Sehome Hill landslide toward Western Washington University.
October 1975	Following a heavy downpour, the State Street Boulevard hillside turned into wet mud and swept two cars over the 25-foot bank. 100 yards of mud slid onto the boulevard.
January 1983	A debris flood accompanied by landslides into Lake Whatcom took homes, cars, people, and pets into the lake and caused major flooding.
January 1983	A huge boulder rolled onto railroad tracks near Larrabee State Park, derailed 12 cars of a 66-car northbound Burlington Northern freight train, and tumbled the lead engine into the Bay.
1996	Landslides at Point Roberts destroyed several beachside vacation homes.
February 1997	Ground movement on Sumas Mountain resulted in the rupture of a 26-inch natural gas pipeline that subsequently exploded.
January 2009	In the storm-related Racehorse Creek Slide, a large rock avalanche in Chuckanut Formation moved approximately 650,000 cubic yards down Slide Mountain into Racehorse Creek.
January 2009	More than 100 storm-related landslides, primarily shallow, were triggered by a rain-on-snow event on top of potentially frozen ground.
May 31,2013	A landslide off the north valley wall near the terminus of the Easton Glacier on Mount Baker initiated a debris flow that traveled ~3.5 miles down the Middle Fork Nooksack River. Fine grained sediment from this and 2 smaller events in June 2013 raised turbidity in the river to levels that required downstream municipal water intakes be shut down to avoid damage to the water treatment systems.
Ongoing; exacerbated	Continued landslide activity in glacial deposits at the “Clay Bank” on the south side of the Nooksack River 1.75 miles upstream from the SR

Dates	Description
activity January & February 2014, reactivation of 2006 slide area	542 Bridge at Cedarville temporarily dammed the river. Erosion of the slide deposits increased downstream turbidity. The 2014 landslides shifted the main flow towards the opposite bank where the main flow is now entrained along the levee. This has contributed to a reactivation and retreat of the 2006 slide area.
Ongoing	Rock slides occur onto I-5, south of Bellingham.
Ongoing	123,000 cubic yards of dirt and rock is carried from Sumas Mountain each year and deposited into Swift Creek. This debris and dirt are threatening several hundred acres of farmland near Everson and impacts multiple county roads.

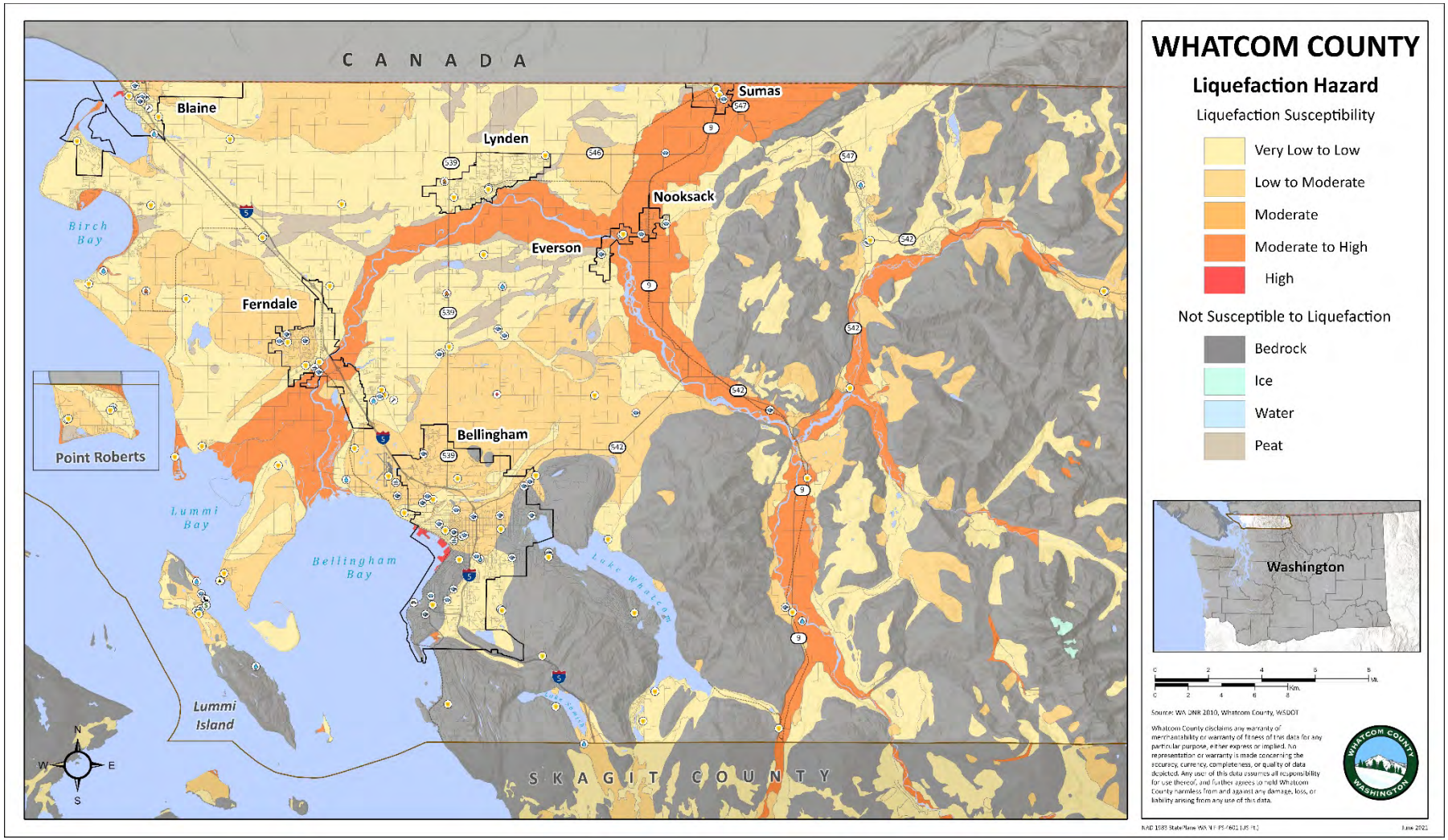
Hundreds of landslides have also been mapped in the forested upper watershed during watershed analysis and watershed restoration planning. Most of these landslides originated in forest land, but many routed to and deposited on lands where development, infrastructure, or agriculture occur. The location of deep-seated landslides in Whatcom County was greatly improved by the publication of the Whatcom County Landslide Inventory by the Washington State DNR Geological Survey in 2019. The Washington Geological Survey has recently completed mapping of large, deep-seated landslides throughout Whatcom County (WGS 2020) which expands on the existing mapping and is available through GIS.

4. Seismic Hazards

A history of seismic hazards is described in further detail in the “Earthquakes” section of this Plan.



Washington Geological Survey (WGS) 2020 Washington landslide inventory data compiled following streamline landslide mapping protocol (SLIP). SLIP was developed by the WGS's Landslide Hazards Program to help geologists rapidly map landslide landforms from lidar. This data shows both detailed mapping and SLIP landslide data. Landslides and alluvial fans are most prevalent in the Cascade foothills of eastern Whatcom County, on Lummi Island, and the southern end of Lake Whatcom. Coal mine areas, also shown on the map, are present in northwest Bellingham and south of Glacier.



Washington Department of Natural Resources (WA DNR) 2010 liquefaction susceptibility data. This feature class is part of a geodatabase that contains statewide ground response data for Washington State.

D. VULNERABILITY ASSESSMENT

1. Alluvial Fans

Detailed studies have examined specific alluvial fans in Whatcom County. The 1992 report, *Alluvial Fan Hazard Areas,* inventoried many of the alluvial fans that pose a risk to human life or property. It should be noted, characteristics of alluvial fan hazards identified in the report apply to all alluvial fans in Whatcom County whether or not the fan is mapped. More extensive alluvial fan mapping was done by Washington Geological Survey (2020) which captures the fans reported on in 1992 plus many smaller or less developed fans. The degree of risk depends on the specifics of an individual fan including the potential for upstream landslides to trigger and route through the stream channel to the fan and the nature and extent of development on the alluvial fan. An individual risk assessment should be performed by a qualified professional in the absence of specific information that has been prepared, to current risk assessment standards. Table 5 lists alluvial fans identified in the 1992 report (table also updated in 2010), as well as developments at risk.

Table 5. Alluvial Fan Inventory in Whatcom County

Alluvial Fan	Size	Developments/Structures at Risk
Lake Whatcom Watershed		
Austin Creek Fan	150 acres	Sudden Valley golf course, homes, private and County roads
Lake Louise 2 Fan	approximately 5 acres	Approximately 20 houses, driveways, three development roads, a path around the lake, and Lake Whatcom Boulevard
Albrecht's Fan	2.5 acres	County Rd., Lake Whatcom Blvd., the private bridge to the Albrecht residence, and the older buildings on the property
Wildwood Fan	16 acres	Wildwood has a very high population density during the summer months and provides trailer and boat storage during the rest of the year; at least 40 trailers, a general store, cabins, and Lake Whatcom Boulevard are at risk
South Blue Canyon Creek Fan	Data not available	The Blue Canyon Complex and approximately 11 homes; future development is planned, which will eliminate existing trees and further increase the risk in this area
Middle Blue Canyon Creek Fan	Data not available	Limited residences and a picnic area
North Blue Canyon Creek Fan	Data not available	Limited residences

Alluvial Fan	Size	Developments/Structures at Risk
Smith Creek Fan	107 acres	Residences and a bridge, which is located at the apex of the fan
Olsen Creek Fan	137 acres	30 homes
Carpenter Creek Fan	16.5 acres	15 buildings, including the local fire hall, and two County roads
Samish River and Lake Samish Watershed		
Barnes Creek Fan	Data not available	Residences and four roads: Interstate 5, East Lake Samish Rd., Old State Route 99, and Manley Rd.
Kinney Creek Fan	74 acres	Multiple residences on north shore of Lake Samish; fan impacted by January 2009 storm event, which damaged and closed North Lake Samish Drive
Reed Lake 2 Reed Lake 3 Reed Lake 4	620 acres	Approximately 30 homes, a clubhouse, and numerous roads in the Reed Lake development
North Fork, Nooksack River		
Glacier Creek Fan	Data not available	Town of Glacier, the Mount Baker Rim Development, a U.S. Forest Service Ranger Station, multiple restaurants, lodgings, approximately 45 houses and outbuildings, and Mount Baker Highway (SR 542)
Gallop Creek Fan	Data not available	Town of Glacier, 25 houses, restaurants, lodgings, the Glacier post office, county road/logging access road and bridge, and Mount Baker Highway; note that WSDOT has removed a lodge and cabins as part of a risk reduction project at Gallop Creek bridge
Cornell Creek Fan	90 acres	Approximately five houses, Mount Baker Highway, Cornell Creek Road, and a large wetland that may be salmon habitat
Canyon Creek Fan	210 acres	Glacier Springs Development and Mount Baker Highway. Note that acquisitions have removed development potential on ~30 lots and the former Logs Resort all in high alluvial fan risk zones. The 1994 levee that was at risk has been removed and replaced by a setback structure.
Boulder Creek Fan	126 acres	25 buildings of the Baptist camp, three roads, and Mount Baker Highway
Coal Creek Fan	Data not available	Small community located at the mouth of Coal Creek and Mount Baker Highway
Racehorse Creek Fan	246 acres	Five residences, several barns, a county road, a private access road, and a county bridge, all near Welcome, Washington
Bell Creek Fan	Data not available	Agricultural lands, Mount Baker Highway, eight residences, and two secondary roads
Middle Fork, Nooksack River		
Canyon Lake Creek	312 acres	Multiple residences, Mosquito Lake Road, Canyon Lake

Alluvial Fan	Size	Developments/Structures at Risk
Fan		Road, and three private roads; note that Kenney Creek fan is largely in the North Fork Nooksack River but there is overflow from Canyon Lake to Kenney during floods
Kenney Creek Fan	188 acres	
Filbert Creek Fan	49 acres	
Porter Creek	95 acres	Residences, Mosquito Lake Road, the bridge at Porter Creek, and a private road
South Fork Nooksack River		
Falls/Todd Creek	Data not available	Multiple residences, Hillside Drive, and agricultural lands
Terhorst Creek	94 acres	Residences, Hillside Drive, a county road, outbuildings
Sygitowicz Creek Fan	163 acres	Residences, a county bridge, and a county road
Radonski Creek Fan	Data not available	Two farms, residences, and Hillside Drive
Hardscrabble Creek Fan	45 acres	Residences, several barns and outbuildings, a County road, and a County bridge (New bridge placed fall 2009 and repaired in winter 2009/2010)
McCarty Creek Fan	162 acres	Turkington Road county bridge and agricultural land
Jones Creek Fan	376 acres	Town of Acme, Turkington Road, State Highway 9, elementary school, fire hall, and church
Middle Nooksack River (Flood Reach 4)		
Smith Creek Fan	Data not available	Residences, True Log Homes, Smith Creek Hydro projects, Mount Baker Vineyards, Mount Baker Highway, and Burlington Northern Railway
McCauley Creek Fan	Data not available	Residences, farm buildings, and Mount Baker Highway
Sumas River		
Swift Creek	Data not available	Residences, Great Western Lumber & Mill, and Mount Baker Mushroom Farm

Note: Information obtained from "Alluvial Fan Hazard Areas", Whatcom County PDS

2. Coal Mines

Infrastructure constructed over abandoned shallow underground coal mines is highly susceptible to collapse. Risk of collapse decreases with depth of mine workings below ground surface, particularly during seismic events. These mines stretch from State Street to Sehome Hill and from Connecticut Street northwest to McLeod Road. Ground failure and subsidence in downtown Bellingham could result in damage to infrastructure and possibly injury and death.

3. Landslides

As population density increases and houses and roads are built below or on steeper slopes and mountainsides to obtain marketable views, landslide hazards become an increasingly serious

threat to life and property. Residential development along slopes such as Chuckanut Mountain, Stewart Mountain, Lookout Mountain, and other hillsides throughout the County are subject to slides. These slides take lives, destroy homes and businesses, undermine bridges, derail railroad cars, cover fish habitat and oyster beds, interrupt transportation infrastructure, and damage utilities. Forest fires, clear-cutting of trees, land clearing for housing developments, rearrangement of drainage patterns by roadside ditches and cross drains, lack of proper cross drain spacing, sizing, construction, maintenance, and non-road related stormwater runoff can all contribute to or trigger landslides.

Due to the many factors that contribute to landslide potential widespread identification of all hazard areas is not possible. However, slope stability assessment methodologies are well established and can accurately assess landslide potential for an individual building site or development. This type of assessment should be used to inform land-use decisions, direct project siting, and establish criteria for structural designs to mitigate landslide risk, all of which is mandated by the Whatcom County Critical Areas Ordinance.

Examples of possible landslide areas and possible damages in Whatcom County include the following:

- Chuckanut Mountain and Chuckanut Drive; residential areas on steep slopes such as Sudden Valley; and along the foot of Steward, Sumas, and Red Mountains and the Van Zandt Dike; near Lake Samish and Cain and Reed Lakes; eastern Mount Baker Highway; and parts of Highway 9
- Unstable bluffs on Lummi Island, Lummi Peninsula, Point Roberts, Cherry Point, Point Whitehorn, and Birch Bay
- Western Washington University below Sehome Hill; The Sehome Hill Arboretum has had slides in the past – the growth of some tree trunks shows evidence of slow movement downhill above the university
- Slopes overlooking Hale Passage, Bellingham Bay, Boundary Bay, and Strait of Georgia
- Eldridge Avenue and Edgemoor homes overlooking Bellingham Bay
- Mount Baker – Landslides may be caused by melting snow, or steam resulting in a lahar (mudflow off a volcano); a lahar could possibly cause floods of the Nooksack River and massive mudslides into Baker Lake which could over-top, or break, Baker Lake Dam (see previous discussion in the “Earthquake” Section); glacier retreat removes support for unconsolidated sediment which can landslide and route as debris flows, similar to, but smaller than, lahars.

- Sumas Mountain and the Swift Creek landslide the deposits, which imperil County roads and private property and which increase flooding and distribution of asbestos-containing sediment

E. MITIGATION STRATEGIES

For alluvial fans and landslides, mitigation measures recommended by various studies are listed below. In general, the following steps should be implemented to reduce risk of the four geologic hazards—alluvial fans, coal mines, landslides, and seismic hazards—affecting Whatcom County:

1. Limit, and if possible, eliminate new development in high-risk areas. If possible, direct new development to portions of the subject parcel beyond the area of potential affect.
2. If new development is to be permitted, a qualified professional should assess the risks and recommend how to mitigate new construction to address the specific geological hazard.
3. Educate existing property owners at risk to help minimize the risk of the local hazards.
4. If cost effective, buyout high risk properties.
5. As a last-case resort, consider engineering solutions to manage the specific geologic hazard, if proven effective.

1. Alluvial Fans

To help reduce the impact of debris events, the *Alluvial Fan Hazard Areas* report mentioned above, outlines preliminary mitigation actions to be considered when developing on or near an active fan. Mitigation alternatives are also identified in both the *Canyon Creek and Jones Creek Alluvial Fan Risk Assessments*. Those recommendations are based on detailed analysis specific to those fans, but offer risk mitigation alternatives that can be applicable to most alluvial fans. Specific mitigations should be developed by a qualified professional and presented in a manner that is structured, reproducible, and defensible and should utilize all available alluvial fan mapping when considering a specific site.

1. Limit, and if possible, eliminate new development in high-risk areas.
2. If new development is to be permitted, a qualified professional should assess the risks and recommend how to mitigate new construction to address the specific geological hazard.

3. Educate existing property owners at risk to help minimize the risk of the local hazards.
4. If cost effective, buyout high risk properties.
5. As a last resort, consider engineering solutions to manage the specific geologic hazard, if proven effective.
6. Avoid road crossings that obstruct debris passages in debris flow source areas, in the stream network that routes material to an alluvial fan, or on an alluvial fan itself.
7. Locate and orient roads carefully- Road beds can act as levees or potential avulsion channels depending on their locations and orientation, especially those roads oriented parallel to flow.

The report also details primary and secondary measures to consider in alluvial fan mitigation strategies:

Primary Measures

Mapping and avoidance – The impact zone of debris flows and sediment laden floods must first be delineated by careful hazard mapping. In general, areas of historic or prehistoric flows, scoured channels and headwaters, and initiation points of landslides or debris flows constitute debris flow hazard zones. Appropriate zoning regulations or building restrictions can limit development in these areas. Low intensity development land use, such as agriculture or park lands, may be appropriate.

Precipitation thresholds – Precipitation thresholds are often suggested as a method to predict debris flow occurrence. Antecedent rainfall and snow melt must be factored in to increase the accuracy of event prediction. Church and Miles (1987) state that simple precipitation thresholds cannot be used to predict debris flow events. However, by analyzing approaching storm events and tying this to the characteristics (geology, soil type and thickness, vegetative cover, hydrologic maturity, slope and landform) for areas of known debris flow activity, warnings for potential debris flows may be issued. This would assist those monitoring hazardous areas during storm events. The Washington Geological Survey has a coarse scale shallow landslide warning tool that incorporates a precipitation threshold model in use and available through their website at: https://www.dnr.wa.gov/slhfm.Ideally this model would be further refined as more detailed input data are made available specific to Whatcom County. The USGS maintains a monitoring network in the Seattle area to evaluate landslide potential at: https://www.usgs.gov/natural-hazards/landslide-hazards/science/seattle-area-washington?qt-science_center_objects=0#qt-science_center_objects. This information can be used as a general guide to potential Whatcom County conditions.

Warning systems – Warning systems should include advance warning measures, warnings of an event in progress or of an event that has just passed. Existing warning systems that have proven valuable are those used on highways and railways to warn of coming debris flow such as a trip wire and transmitter located in a debris flow path upstream of the infrastructure. The problem with these systems is false alarms could be frequent because these systems are easily damaged. Whatcom County collaborates with USGS in using a landslide dam warning system on Jones Creek which uses rapid drops in stream stage at Turkington Road to issue a warning to the fire district. Once warned, district personnel are dispatched to check on the status of an existing landslide dam upstream or for other channel obstructions.

Secondary Measures

Forest practices –Poor forest practices can initiate landslides by destabilizing soils on slopes from the loss of root strength after the trees are cut, by road placement that destabilize a slope, and by increasing the average pore water pressure in soils through changes in slope hydrology caused by roads, cross drains, landings, and skid trails. State of Washington Forest Practice Rules have been dramatically revised since the mid-1980's to address these issues and reduce the potential for forest practices to increase landslide potential on forest lands. In addition, road maintenance and abandonment plans are required for forest landowners and guide how roads are maintained while active and how they are abandoned once they are no longer needed.

Slope modifications – Slopes in potential sediment source areas can be stabilized to reduce their failure potential. Slope height can be limited, the slope angle decreased, drainage installed, and fill compacted. Drainage systems for the slopes must have culverts sized large enough to carry debris and water.

Do not develop on areas subject to sediment laden flooding, debris flow routing, or run out such as on an alluvial fan.

Specific mitigation measures were identified for the three fans studied in detail, as described below**.**

Mitigation Strategy for Canyon Creek

The following measures were recommended to reduce the risk associated with the Canyon Creek fan:

1. Advise property owners and residents on the fan of the hazard and the study results
2. Distribute the alluvial fan risk assessment study to other agencies involved in natural resources management

3. Proceed with acquisition of highest risk properties on the fan
4. Implement site-specific land use regulations using the detailed risk mapping included in the report
5. Consider removing the lower two-thirds of the levee constructed in 1994 (which would route any overflow behind the levee away from the creek) and using the riprap to reinforce the right bank adjacent to Canyon View Drive
6. Consider other mitigation options identified in the report with referral to appropriate agencies; these options include regulation of future logging, event warning system, regional advance warning system, and monitoring of the landslides in the upper basin and the Canyon Creek channel

Since completion of the study, the following progress has been made in implementing some of these recommendations:

1. Several community meetings have been held to increase public awareness of the hazard and to involve the community in the development of mitigation measures. In addition, the report was provided to the Glacier Springs Community Association, who has it available for download on their website.
2. The report was distributed to the other agencies involved in resource management. Extensive coordination has occurred with WSDOT as it relates to protection of Mt. Baker Highway.
3. Three residences and 26 undeveloped lots along the active fan margin, and The Logs Resort were acquired through an integrated hazard mitigation and salmon recovery project by the FCZD and the Whatcom Land Trust.
4. The detailed mapping in the report is now being used for administering the County's critical areas ordinance related to new development on the fan.
5. A portion of the lower levee was removed and the ground surface in the fan was re–graded in 2009 to direct any overflow that might get behind the levee back towards Canyon Creek rather than towards Mount Baker Highway. The riprap removed from the levee face was stockpiled in an area near the highway to enable future use.
6. 1850' of the 2000' of levee remaining after the 2009 project was removed in 2013 and an 1800' armored setback structure was constructed 200' to the west along Canyon View Drive and paralleling the historic floodplain area to the south. The historic floodplain was recreated and a total of 23 engineered log jams were installed in 2013 and 2014 to reduce bank erosion and to provide instream and riparian habitat

restoration. Since 2014 vegetation planted post-construction has become increasingly well-established along the right bank and flood plain and will provide increased protection to the downstream residences in the future.

7. Coordination with the National Weather Service and WDNR continues to occur regarding development of a regional hydroclimatic threshold for an advance warning system for the Puget Sound Region.

Mitigation Strategy for Jones Creek

The following measures were recommended to reduce the risk associated with the Jones Creek fan:

1. Advise property owners and residents on the fan of the hazard and the study results
2. Distribute the debris flow study to other agencies involved in natural resources management
3. Consider acquisition of all properties within Zone 1, the highest risk area, and possibly within Zone 2, the next at-risk area
4. Consider constructing a deflection berm extending from the fan apex to below Turkington Road
5. In conjunction with the deflection berm, consider a channel realignment that diverts the creek to the north
6. Consider implementation of other measures identified in the report with referral to appropriate agencies; these measures include:
   - Improved regulation of land use and logging activities
   - Landslide monitoring
   - Creek channel inspections
   - Removal of the berm along the creek downstream of Turkington Road
   - Abandonment of the Turkington Road bridge and upgrade of the Hudson Road and railway; an alternative to road relocation is to increase the capacity of the Turkington Road bridge at its current location

Since completion of the study, the following progress has been made in implementing some of these recommendations:

1. Significant public outreach has occurred in the Acme community. The small debris flow

in 2004 prompted the County to host several community meetings to inform residents on the fan of the hazard and they types of conditions that could trigger an event. Additional meetings have been hosted by the Acme/Van Zandt Fire District (#16) since fall 2008.

2. The report was distributed to natural resource agencies as well as to the Acme Fire District. The Fire District initiated development of a detailed emergency response plan to address debris flows on Jones Creek late in 2008. They were able to implement portions of the draft plan in January 2009. Since then they have conducted additional planning and drills to improve their response.
3. Two residential properties in hazard Zone 1 near Turkington Road have been acquired by the FCZD.
4. Preliminary design work to evaluate alternative alignments and a planning-level cost estimate for a deflection berm has been completed.
5. Evaluation of alternative access routes for Turkington Road were evaluated .
6. Detailed design of deflection is currently underway
7. Acquisition of additional properties needed to construct a deflection berm is currently underway
8. The detailed mapping in the report is now being used for administering the County's critical areas ordinance related to new development on the fan.
9. The local community members and Fire District representatives have been informally monitoring the landslide and the creek since the January 2009 event.
10. In 2014 Fire District #16 and the Mt. Baker School District have conducted Landslide evacuation/ shelter in place drills.
11. Annual Winter Storm/ Disaster Readiness Town Hall meetings were started in 2014 with County Public Works, Whatcom County Sheriff's Office Division of Emergency Management and Fire District #16.
12. In 2012 four members of Fire District #16, were trained by Whatcom County Sheriff's Office Division of Emergency Management to use the reverse 911 messaging system for the Acme area.

Mitigation Strategy for Swift Creek

In addition to the types of hazards most often associated with alluvial fans, the sediment within Swift Creek contains elevated levels of naturally occurring asbestos and heavy metals. This has

added additional health and safety issues and added to the complexity of dealing with sedimentation problems along Swift Creek. The following measures are completed to reduce the risk associated with the Swift Creek fan:

a. February 15, 2013 Whatcom County published the Draft Environmental Impact Statement for the Swift Creek Sediment Management Action Plan (SCSMAP).

b. June 12, 2013 Whatcom County published the Final Environmental Impact Statement for the SCSMAP.

c. July 23, 2013 the Whatcom County Council adopted the SCSMAP by resolution #2013-026. The following chapters are included in the SCSMAP:

    1. Chapter 1 includes a description of the Swift Creek setting and background, as well as a description of Whatcom County's approach and response to Swift Creek management to date. This chapter also includes goals and objectives that informed development of active (project) and passive (program) strategies recommended in the Plan.

    2. Chapter 2 outlines relevant laws, regulations, rules, plans, and policies that provide the framework for Swift Creek management. The regulatory outline provides general applicability; specifics as to regulatory approach would be developed in conjunction with implementation of recommended strategies. The approach included in the SCSMAP is intended to encourage cooperative and consistent Swift Creek sediment management among agencies and jurisdictions involved in the Swift Creek problem.

    3. Chapter 3 describes the watershed in detail and includes conditions assessments for each identified watershed issue. An overall list of problems that result from watershed conditions is provided. This problem list, which identifies areas of high risk for overbank flooding, avulsion, and sediment accumulation, provides the basis for future direction and management strategies.

    4. Chapter 4 includes active and passive management strategies identified as feasible in development of the SCSMAP. Strategies were developed to target high risk areas and protect public health and welfare, public infrastructure, and the environment. Some identified strategies meet the goals of the plan through direct application of public works projects (active management strategies), while others include development of programs (passive management strategies) to address the major Swift Creek issues.

    5. Chapter 5 provides the final recommendations identified and discussed in the

SCSMAP.

6. Chapter 6 addresses the costs of implementing the strategies identified in Chapter 4. Costs are provided as planning level estimates only. Active strategy planning level cost estimates include the estimated cost for on-site development. Passive strategy estimates are based on the project number of full time equivalents in terms of Whatcom County staff to develop and implement an identified program.
7. Chapter 7 provides a set of guidelines for project-level plan implementation, along with a prioritization protocol. The prioritization protocol developed for this plan will be utilized for all projects developed under the umbrella strategies included in Chapter 4.

d. December 6, 2019 the Washington State Department of Ecology and Whatcom County (together with the Whatcom County Flood Control District) entered into a Consent Decree. The mutual objective of the Consent Decree is to implement a cooperative program of actions to limit potential future impacts on human health and the environment from naturally occurring asbestos (NOA)-bearing material generated from the Sumas Mountain landslide, both as that material exists today in the Swift Creek/Sumas River floodplain and as it will continue to be generated and transported as sediment from the landslide toward the floodplain in the future.
e. Since 2019 Whatcom County has completed several elements of the plan, including:
    i. Purchasing properties for the construction of the debris flow levee, sediment traps, sediment basins, first repository and wetland mitigation site.
    ii. Completed designs for the debris flow levee, sediment traps, and repository (including the wetland mitigation site).
    iii. Completed the design and construction of the Oat Coles setback levee and access road improvements and setback levee mitigation in the form of wetland mitigation.
    iv. Continued monitoring, dredging, and armoring the lower reach section of the stream to prevent the sediment material from entering and destroying adjacent valuable habitat.
    v. Completed scoping the Supplemental EIS for the repository site.
f. Future projects include:
    i. Completion of the Draft and Final Supplemental EIS for the repository site.

ii. Development of the repository site.

iii. Construction of the debris flow levee.

iv. Construction of the sediment traps.

v. Williams Pipeline crossing control structures.

vi. Development and construction of the sediment basins.

vii. Development and construction of the wetland mitigation site.

viii. Continued monitoring, dredging, and armoring the lower reach.

Mitigation Strategy for Glacier-Gallup Creeks

The SWIF process included recommendations to address the deficiencies on the Glacier Levee on the left bank of Glacier Creek. The SWIF plan recommends working in collaboration with WSDOT to implement their preferred alternative to address the chronic environmental deficiencies associated with sedimentation at their bridges over SR 542. WSDOT's preferred alternative includes constructing a bridge with openings that span across both creeks and the channel migration zone in between them. They acquired the Glacier Creek Motel that was between the creeks downstream of the highway and constructed a new Gallup Creek bridge in 2010.

While WSDOT still has plans to construct the additional spans east of Gallup Creek, the timing of funding for project implementation is uncertain. Once the bridge project is complete, the Glacier Creek Levee will be in the middle of the channel migration zone and no longer needed to protect the roadway. The FCZD recently initiated a project to better assess the hazards associated with the creeks and evaluate options to relocate the Glacier Creek Levee to enable restoration of alluvial fan processes while mitigating hazards in the town of Glacier.

2. Coal Mines

Coal mines in Whatcom County are not considered a major concern.

3. Landslides

Washington is one of seven states listed by FEMA as being especially vulnerable to severe land stability problems. An increasing population and demand for "view" property, with the concomitant removal of trees to attain the view, increases the risk of landslides in residential areas. Buildings on steep slopes and bluffs are at risk in seasons of heavy rains or prolonged wet spells.

Landslide, mudflow and debris flow problems are often complicated by land management decisions. By studying the effects of landslides in slide-prone regions, plans for the future can be made and the public may be educated to prevent development in vulnerable areas. Applying established ordinances where geological hazards have been identified will prevent some landslide losses. However, Whatcom County already has many areas above or below unstable slopes with established houses and businesses. Prevention of landslide damage is best achieved through careful identification and avoidance of unstable landforms and landslide run-out zones. For areas where development may occur near unstable slopes an appropriate mitigation plan prepared by a qualified professional and that is tailored to the site conditions and the type or types of mass wasting that may occur is necessary to manage landslide risks.

The primary mitigation strategy to employ in areas at danger of landslides or landslide run-out is to limit or eliminate development in any high risk areas. Employing public buyouts of especially high risk areas should be considered. If new development is to occur, the Washington State Department of Ecology has outlined the following recommendations and information to improve public preparedness. This information was developed for coastal bluffs, but provides good guidance for many situations where the stability of a slope may be an issue.

1. Do research – Learn about the geology and the history of your property. Talk to local officials, your neighbors, or visit the local library. Review geologic or slope stability maps of your area.
2. Get advice – Talk with a licensed geologist or geological engineer before buying a potentially unstable site or building your home. Although waterfront lots can be attractive sites, they often have severe natural limitations. They may also be subject to strict environmental and safety regulations.
3. Leave a safe setback – Build a prudent distance from the top or bottom of steep slopes. Avoid sites that are too small to allow a safe setback from the slope. Allow adequate room for drainfields and driveways. Local setback requirements should be viewed as absolute minimums. Consider how far landslide material may run out once it reaches the bottom of the hill or the alluvial fan. Resist the urge to trade safety for a view.
4. Keep plants – Maintain existing mature vegetation, above, on, and below steep slopes. Trees, especially native conifers, shrubs, and groundcovers help anchor soils and absorb excess water. Get expert advice identifying and removing weeds.
5. Maintain drainage – Collect runoff from roofs and improved areas and convey water away from the steep slope or to the beach in a carefully designed pipe system. Regularly inspect and maintain drainage systems.

SEVERE STORMS

A. DEFINITIONS

Blizzard A blizzard means that the following conditions are expected to prevail for a period of 3 hours or longer:

- Sustained wind or frequent gusts to 35 miles an hour or greater; and
- Considerable falling and/or blowing snow (i.e., reducing visibility frequently to less than ¼ mile)

Freezing Rain Rain that falls as a liquid but freezes into glaze upon contact with the ground.

Funnel Cloud A condensation funnel extending from the base of a towering cumulus or cumulonimbus, associated with a rotating column of air that is not in contact with the ground (and hence different from a tornado). A condensation funnel is a tornado, not a funnel cloud, if either a) it is in contact with the ground or b) a debris cloud of dust whirl is visible beneath it.

Gale An extratropical low or an area of sustained surface winds of 34 (39 mph) to 47 knots (54 mph).

High Wind Sustained wind speeds of 40 mph or greater lasting for 1 hour or longer, or winds of 58 mph or greater for any duration.

Severe Local Storm A convective storm that usually covers a relatively small geographic area, or moves in a narrow path, and is sufficiently intense to threaten life and/or property. Examples include severe thunderstorms with large hail, damaging wind, or tornadoes. Although cloud-to-ground lightning is not a criteria for severe local storms, it is acknowledged to be highly dangerous and a leading cause of deaths, injuries, and damage from thunderstorms. A thunderstorm need not be severe to generate frequent cloud-to-ground lightning. Additionally, excessive localized convective rains are not classified as severe storms but often are the product of severe local storms. Such rainfall may result in related phenomena (flash floods) that threaten life and property.

Storm Surge An abnormal rise in sea level accompanying a hurricane or other intense storm, whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the cyclone. Storm surge is usually estimated by subtracting the normal or

astronomic tide from the observed storm tide.

Flooding Any high flow, overflow, or inundation by water which causes or threatens damage

Thunderstorm A local storm produced by a cumulonimbus cloud and accompanied by lightning and thunder.

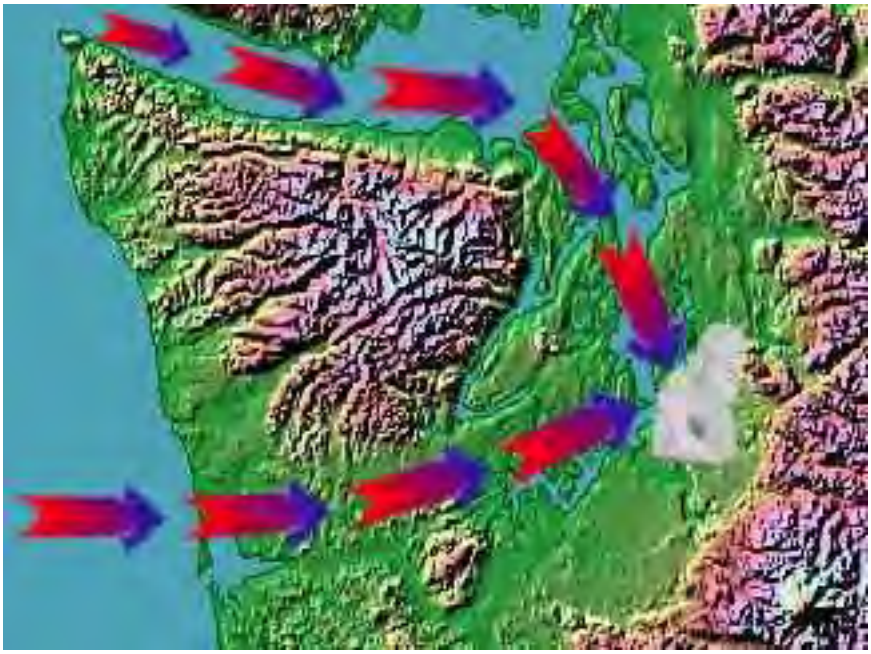
Tornado A violently rotating column of air, usually pendant to a cumulonimbus, with circulation reaching the ground. It nearly always starts as a funnel cloud and may be accompanied by a loud roaring noise. On a local scale, it is the most destructive of all atmospheric phenomena.

Waterspout In general, a tornado occurring over water. Specifically, it normally refers to a small, relatively weak rotating column of air over water beneath a Cumulonimbus or towering cumulus cloud. Waterspouts are most common over tropical or subtropical waters.

NOTE: All definitions taken from National Weather Service Glossary accessed by internet @ https://w1.weather.gov/glossary/

B. BACKGROUND INFORMATION

Severe storm weather comes in many forms, the most common for Whatcom County being heavy rain and wind during the winter months. Several wind storms have occurred in late summer with trees still retaining their full complement of leaves resulting in toppled trees and broken branches interrupting power to tens of thousands. Whatcom County experiences blizzards periodically, though not as commonly as unfrozen or partially frozen precipitation. Two types of winds primarily affect Western Washington: westerlies and easterlies. Westerly wind storms originate from the Pacific Ocean and are caused by pressure differences between deep oceanic storms and adjacent upland areas. This wind pattern is typical for fall and winter.



Westerly winds in Washington figure courtesy of http://www.islandnet.com

Easterly winds are caused by high pressure systems in eastern Washington, causing strong winds to form west of the Cascade mountain range that occur in late summer and early fall.

Easterly winds in Washington figure courtesy of http://www.pep-c.org

C. RECENT HISTORY IN WHATCOM COUNTY

Recent severe storm events in Whatcom County include the following:

February 2020 Significant rain led to Nooksack River overtopping bank in numerous locations. Beginning with overtopping the bank in Everson, water flowed north through Everson and Nooksack continuing north along the Sumas River and Johnson Creek damaging numerous homes and businesses in Sumas. Farther downstream, Marietta residents were evacuated due to rising water.

December 2018 Strong wind storm brought significant waves to Birch Bay and Point Robert resulting in downed trees and powerlines and significant erosion to Birch Bay Drive. Additionally, several businesses were impacted by high water level and surge.

December 2017 Ice storm knocked out power in Sumas and surrounding area for days after accumulated ice snapped numerous power poles blocking roads and preventing power crews from completing rapid repairs.

December 2008 Heavy rainfall over most of Western Washington, causing record levels and flooding for five major rivers including the Nooksack.

December 2000 The Sandy Point storm that caused severe damage to Sandy Point beachfront homes ($750,000) was a combination of gale force northwest winds, extreme high tides, and low pressure.

Winter 1998-1999 Record snowfall, up to 1,140 inches of snow fell on Mount Baker Ski Area, the most ever recorded in the United States.

Winter 1996-1997 Up to 3 feet of snow dropped by a holiday storm. Wind, snow, flooding, and freezing resulted in landslides, avalanches, road closures, and power outages throughout Whatcom County.

Winter 1990-1991 Six major storms (two floods, two Arctic windstorms, and two heavy snowstorms, along with bouts of freezing rain and silver thaw) across Whatcom County resulted in power losses to nearly 100,000 residents. The Lummi Island ferry service was cut off. Damages to Whatcom County were up to $30 million, not including private property damage and economic losses.

November 1989 Severe storm resulting in a wind-chill factor estimated at between 50 and 70 degrees below zero with wind gusts up to 104 miles per hour.

Up to 16,000 residents lost power, resulting in school closure, damaged crops, and frozen milk in pumping equipment at local dairies.

January 1969 Severe storm froze stretches of the Nooksack River. Snow blocked portions of the Guide Meridian with a snowdrift on Pangborn Road measuring up to 25 feet high and 300 feet wide.

October 12, 1962 The famous Columbus Day storm brought winds up to 98 miles per hour.

March 1951 Severe storm dumped 23 inches of snow over 4 days. Temperatures plunged down to 10 degrees.

January 1950 Repeated snow storms hit Whatcom County for more than 1 month beginning on New Year's Day. Temperatures hit zero with winds of up to 75 miles per hour. Winds destroyed five planes and damaged 29 others at Bellingham International Airport.

February 1916 Seventeen inches of snow fell in Bellingham for the first week, followed by 42 inches of rain over a 2-week stretch. Snowdrifts up to 30 feet in height were found throughout the County.

February 1893 A blizzard consisting of snow and hail hit Whatcom County with up to 80 mile per hour winds and temperatures hitting 13 degrees below zero.

D. VULNERABILITY ASSESSMENT

Whatcom County is highly vulnerable to severe storms. According to the Washington State Emergency Management Division, Whatcom County lies in an area of Washington vulnerable to high winds.[2] The Washington State Hazard Mitigation Plan identifies Western Washington to be most susceptible to inclement weather during the following time periods[3]:

- Primary flood season – November through February

[2] Accessed on July 9, 2014 on the Emergency Management Department website at: http://www.emd.wa.gov/plans/documents/SevereStormNov2007Tab5.7.pdf

[3] Washington Military Department Emergency Management Division, 2014. *Washington State Hazard Mitigation Plan*. Approved by the Federal Emergency Management Agency Region 10 Office 2014.

- Windstorm season – October through March
- Snow season – November through mid-March

Severe storms can result in costly hazards, due primarily to their frequent occurrence and ability to disrupt lifelines such as arteries of transportation and above-ground electric lines. Because the worst storms typically occur during winter, loss of power/heating can be dangerous, especially for homes with children or elderly residents. Severe weather also poses additional risks resulting from tree fall to both structures and humans.

Whatcom County's location and geography leave it susceptible to heavy storm activity. Coastal systems move in relatively easily and release most of their moisture, being blocked by the Cascade Mountain Range. Multiple marinas along the shoreline of Whatcom County are vulnerable to storm action and represent a high loss potential for the area. The County's limited routes of transportation mean that inclement or severe weather can slow both intrastate and interstate commerce. Additionally, Fraser outflows from north of the border bring very cold temperatures and strong northeast winds. This cold air frequently clashes with the warmer moist flowing north leading to freezing rain, significant snowfall and in some cases, blizzard conditions.

Additionally, Fraser outflows from north of the border bring very cold temperatures and strong northeast winds. This cold air frequently clashes with the warmer moist flowing north leading to freezing rain, significant snowfall and in some cases, blizzard conditions.

E. MITIGATION STRATEGIES

The National Weather Service continues to refine weather forecasting. In addition, when significant weather systems are forecast for Washington and Whatcom County, weather forecasters conduct daily virtual briefings to ensure the most current conditions are promulgated to response agencies. The Whatcom County Sheriff's Office Division of Emergency Management website contains real-time data for severe storm events and other hazards and can be accessed at https://www.whatcomcounty.us/201/Emergency-Management . The website also contains educational tools to inform residents of potential hazards, such as severe storms, and how to prepare for them.

Whatcom County has been awarded the "Storm Ready Certification" by the by the National Oceanic and Atmospheric Administration National Weather Service for its, monitoring, communication, and warning efforts.

TSUNAMIS

A. DEFINITIONS

Tsunami A series of traveling waves of extremely long length generated by earthquakes occurring below or near the ocean floor. Underwater volcanic eruptions and landslides can also generate tsunamis.

B. BACKGROUND INFORMATION

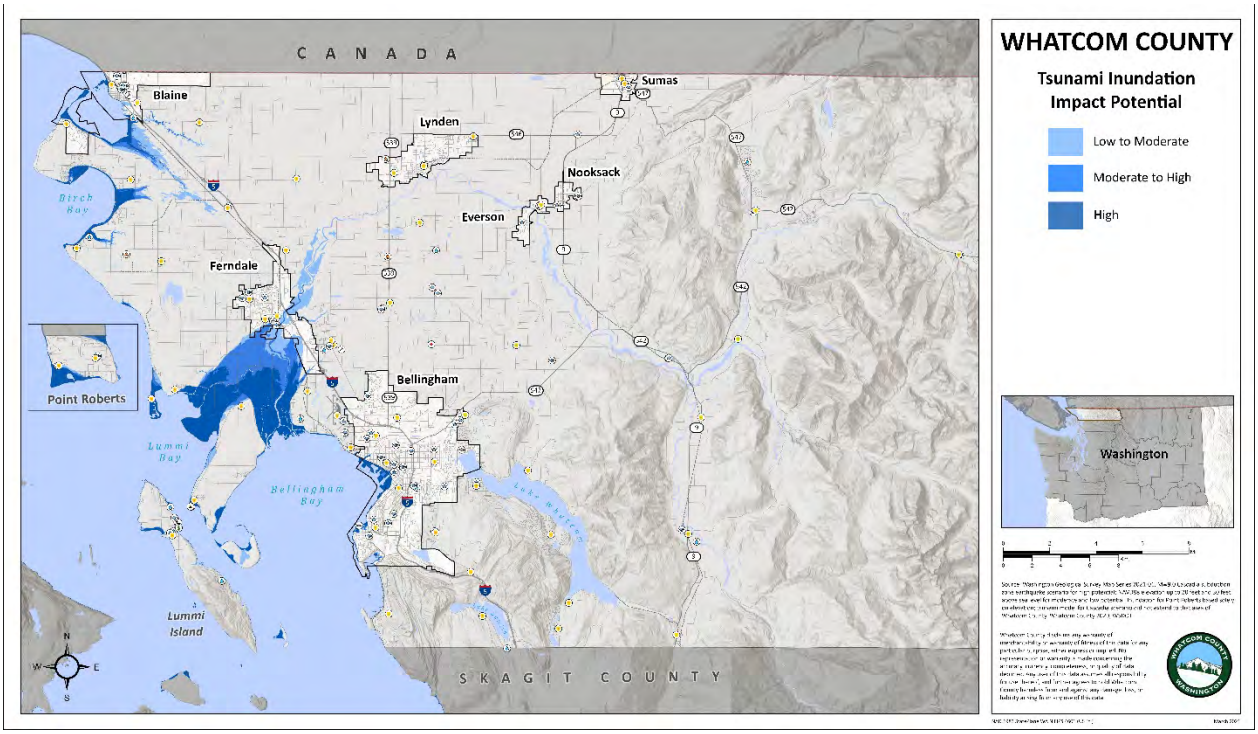
Sudden movement of the Earth's crust during an earthquake may displace water and generate an energy wave called a tsunami. In the deep ocean, a tsunami's length from wave crest to wave crest may be 100 miles or more but with a visible wave height of only a few feet or less. They may not be felt aboard ships nor can they be seen from the air in the open ocean. Large Pacific Ocean tsunamis typically have wave crest-to-crest distances of 60 miles and can travel about 600 miles per hour in the open ocean. A tsunami can traverse the entire 12,000 to 14,000 miles of the Pacific Ocean in 10 to 25 hours, striking any land in its way with great force. Tsunamis can cause great destruction and loss of life within minutes of origination. For example, the first tsunami waves from the 2004 Indian Ocean Earthquake reached Sumatra's shores within 15 minutes of the earthquake and those of Somalia seven hours later.

On the Pacific Coast, from southern British Columbia to northern California, people and property are at varied risks both from distantly and locally generated tsunamis. Recent studies indicate about a dozen very large earthquakes (with magnitudes of 8 or more) have occurred in the CSZ west of Washington. Computer models indicate that tsunami waves generated by these local events might range from 5 to 55 feet in height and could affect the entire coastal region.

In April 2021, the Washington State Department of Natural Resources (DNR) completed new tsunami inundation maps for the state, including a new tsunami inundation map for North Puget Sound and parts of the Strait of Georgia. The new tsunami inundation map for the North Puget Sound shows postulated inundation areas and modeled inundation depth from a Mw 9.0 Cascadia subduction zone megathrust earthquake scenario. Inundation depths vary, based not only on the tsunami wave height but how these waves may "stack up" or "funnel" into bays, rivers, and stream estuaries. The bay on the north side of Portage Island is expected to experience about 14.5 feet of inundation, with higher levels of inundation at the mouth of the Nooksack River. If this tsunami inundation occurs during high tide, it could create inundation of over 20 feet above mean sea level (NAVD88) in some locations of the Whatcom county.

Notably, the DNR tsunami inundation map is for a single scenario event and does not fully model all coastline inundation. DNR only infers, but does not fully model, inundation along much of Whatcom County's coastline and does not model any inundation for the Point Roberts area. Furthermore, other scenarios may pose a tsunami or seiche risk to Whatcom county. These include earthquake-triggered collapses of the Fraser River mouth or tidal flats at the mouth of the Nooksack River. Earthquakes or other events could cause large-scale landslides along the marine headlands of Lummi Island, displacing water in Bellingham Bay and potentially causing a local seiche with little warning time before it inundates shorelines in Bellingham Bay. Smaller earthquakes may also occur on crustal faults in Whatcom County and these faults may extend out into coastal waters. Little or no research has been completed on these scenarios and whether they may produce tsunami inundation larger than the Cascadia subduction zone scenario.

Given the incomplete nature of tsunami modeling in Whatcom County, this Natural Hazards Plan takes a conservative approach, as shown in the Tsunami Inundation Hazard map below. In additional to planning for the Cascadia subduction scenario, shown as high tsunami inundation impact potential in the map, the map also shows areas outside of this scenario inundation but under 30 feet above mean sea level (NAVD88). Areas up to 20 feet above mean sea level (NAVD88) are shown in medium blue and labeled as moderate to high tsunami inundation impact potential. Areas up to 30 feet above sea level are shown in light blue and labeled as low to moderate tsunami inundation impact potential. (Areas above 40 feet of elevation should be considered as completely above tsunami inundation impact.) These areas outside of the DNR model, but labeled as having some potential for tsunami inundation impact are meant to help address the lack of complete tsunami modeling in the county. They are also meant to help address secondary impacts, such as debris pushed ahead of tsunami inundation, ground subsidence, or even debris fires that can ignite in and near tsunami inundation areas. Future changes to coastal morphology and continued sea level rise may also lead to tsunami inundation impacts in areas outside of the DNR modeling of the Cascadia subduction zone earthquake inundation in the future.



Map of Whatcom County tsunami inundation impact potential. The high impact potential zone is based upon Washington Geological Survey Map Series 2021-01, Mw9.0 Cascadia subduction zone earthquake scenario occurring at mean high tide. The moderate to high and the low to moderate impact potential areas are based upon elevation of up to 20 feet and 30 feet, respectively, above mean sea level (NAVD88). Inundation for Point Roberts is based solely on elevation; tsunami model for the Cascadia subduction zone scenario did not extend to Point Roberts.

C. RECENT HISTORY IN WHATCOM COUNTY

Recent research on subduction zone earthquakes off the Washington, Oregon, and northern California coastlines and resulting tsunamis (Atwater 1992; Atwater et al. 1995) has led to concern that locally generated tsunamis will leave little time for response. Numerous workers have found geologic evidence of tsunami deposits attributed to the CSZ in at least 59 localities from northern California to southern Vancouver Island (Peters et al. 2003). While most of these are on the outer coast, inferred tsunami deposits have been identified as far east as Discovery Bay, just west of Port Townsend (Williams et al. 2002) on the west shore of Whidbey Island (Williams and Hutchison 2000). Heaton and Snavely (1985) report Makah stories may reflect a tsunami washing through Waatch Prairie near Cape Flattery, Washington, and Ludwin (2002) has found additional stories from native peoples up and down the coast that appear to

corroborate this and also include apparent references to associated strong ground shaking. Additionally, correlation of the timing of the last CSZ earthquake by high-resolution dendrochronology (Jacoby et al. 1997; Yamaguchi et al. 1997) to Japanese historical records of a distant-sourced tsunami (Satake et al. 1996) demonstrate that it almost certainly came from the CSZ. This tsunami may have lasted as much as 20 hours in Japan and caused a shipwreck about 100 km north Tokyo in A.D. 1700 (Atwater and Satake 2003). The frequency of occurrence of CSZ earthquakes ranges from a few centuries to a millennium, averaging about 600 years (Atwater and Hemphill-Haley 1997). It is believed the last earthquake on the CSZ was about magnitude (M) 9 (Satake et al. 1996, 2003). It is not known, however, if that is a characteristic magnitude for this fault. Evidence gleaned from syntheses of global subduction zone attributes and local tsunami deposits suggests that great earthquakes have occurred in the Pacific Northwest perhaps as recently as 300 years ago.

Tsunamis may also be generated by movement on faults located within Puget Sound. This is discussed in further detail under the Vulnerability Assessment portion of this section.

Tsunamis are a threat to life and property and to anyone living near the ocean. In 1995, in response to tsunami threat, Congress directed NOAA to develop a plan to protect the West Coast from locally generated tsunamis. A panel of representatives from NOAA, FEMA, the USGS, and the five Pacific coast states wrote the plan and submitted it to Congress, which created the National Tsunami Hazard Mitigation Program (NTHMP) in October 1996. The NTHMP was designed to reduce the impact of tsunamis through warning guidance, hazard assessment, and mitigation. A key component of the hazard assessment for tsunamis is delineation of areas subject to tsunami inundation. Since local tsunami waves may reach nearby coastal communities within minutes of the earthquake, there will be little or no time to issue formal warnings; evacuation areas and routes will need to be planned well in advance.

Spatial data used to assess tsunami hazards in Whatcom County was developed by the Center for the Tsunami Inundation Mapping Efforts (TIME) at NOAA's Pacific Marine Environmental Laboratory in Seattle. The data and maps were produced using computer models of earthquake-generated tsunamis from nearby seismic sources, and analyzed to determine the risks of a CSZ earthquake.

TIME’s tsunami inundation maps are based on a computer model of waves generated by a scenario earthquake. The earthquake scenario adopted for that study was developed by Priest et al. (1997) and designated Scenario 1A (also see Myers et al. 1999). It was one of a number of scenarios they compared to paleoseismic data and found to be the best fit for the A.D. 1700 event. This scenario has been the basis for tsunami inundation modeling for the other maps produced by the NTHMP in both Oregon and Washington based on a CSZ event. The land

surface along the coast is modeled to subside during ground shaking by about 1.0 to 2.0 meters (Fig. 1), which is consistent with some paleoseismologic investigations and also matches thermal constraints of Hyndman and Wang (1993). This earthquake is a magnitude 9.1 event, with a rupture length of 1,050 km and a rupture width of 70 km. Satake et al. (2003) have recently calculated a very similar magnitude and rupture dimension from an inversion of tsunami wave data from the 1700 event. The model used is the finite difference model of Titov and Synolakis (1998), also known as the Method of Splitting Tsunami (MOST) model (Titov and González 1997). It uses a grid of topographic and bathymetric elevations and calculates a wave elevation and velocity at each grid point at specified time intervals to simulate the generation, propagation, and inundation of tsunamis down the Strait of Juan de Fuca and into the Bellingham Bay area.

Based on new seismic research demonstrating the potential for increased seafloor displacement during a subduction zone earthquake with a recurrence interval of ~2500 years, the Washington Geological Survey published updated tsunami hazard modeling in June 2018 (Eungard, 2018). The model demonstrates the potential for increased inundation depth and current velocities to impact the shoreline and other low-lying areas of Whatcom County. Increased inundation depths of 5 to 18 feet above mean high water are possible, as are current velocities exceeding 20 knots. Due to the low recurrence interval of the defined seismic event the results of the model are intended to inform the design of critical infrastructure and are not currently being used in the regulation of residential or commercial development.

D. VULNERABILITY ASSESSMENT

TIME Results – The computed tsunami inundation model emphasized three depth ranges: 0 to 0.5 m, 0.5 to 2 m, and greater than 2 m. These depth ranges were chosen because they are approximately knee-high or less, knee-high to head-high, and more than head-high and so approximately represent the degree of hazard for life safety. The greatest amount of tsunami flooding is expected to occur in the floodplain of the Lummi (Red) and Nooksack Rivers up to their confluence near Ferndale and then be confined to the relatively narrow floodplain of the Nooksack. Sandy Point Shores is expected to be flooded to a depth of a few feet. Elsewhere, tsunami flooding is expected only in the immediate vicinity of the shoreline where evacuation to higher ground would be an easy matter if sufficient warning is given.

The inundation data also emphasized current velocities:

1. Less than 1.5 m/s (approximately 3 mph), which is the current speed at which it would be difficult to stand
2. Between 1.5 and 5 m/s

3. Greater than 5 m/s which is a modest running pace; within zones with this designation, computed velocities locally exceed 20 m/s (approximately 40 mph) in confined channels

Tide gauge records at five locations in the bay show fluctuations of water surface elevation and also the time history of the waves. The initial water disturbance is a trough of about 1 meter at 2 hours after the earthquake followed by a crest at between 2.5 and 3 hours after the earthquake. At around 4 hours after the earthquake, a deeper trough occurs and reaches about 3 meters near the Port of Bellingham. A trough this large, if it occurred at low tide, could cause a significant grounding hazard for ships in the harbor. This is visually displayed in Figure 3, which shows an animation of the tsunami troughs and crests in and around Bellingham Bay.

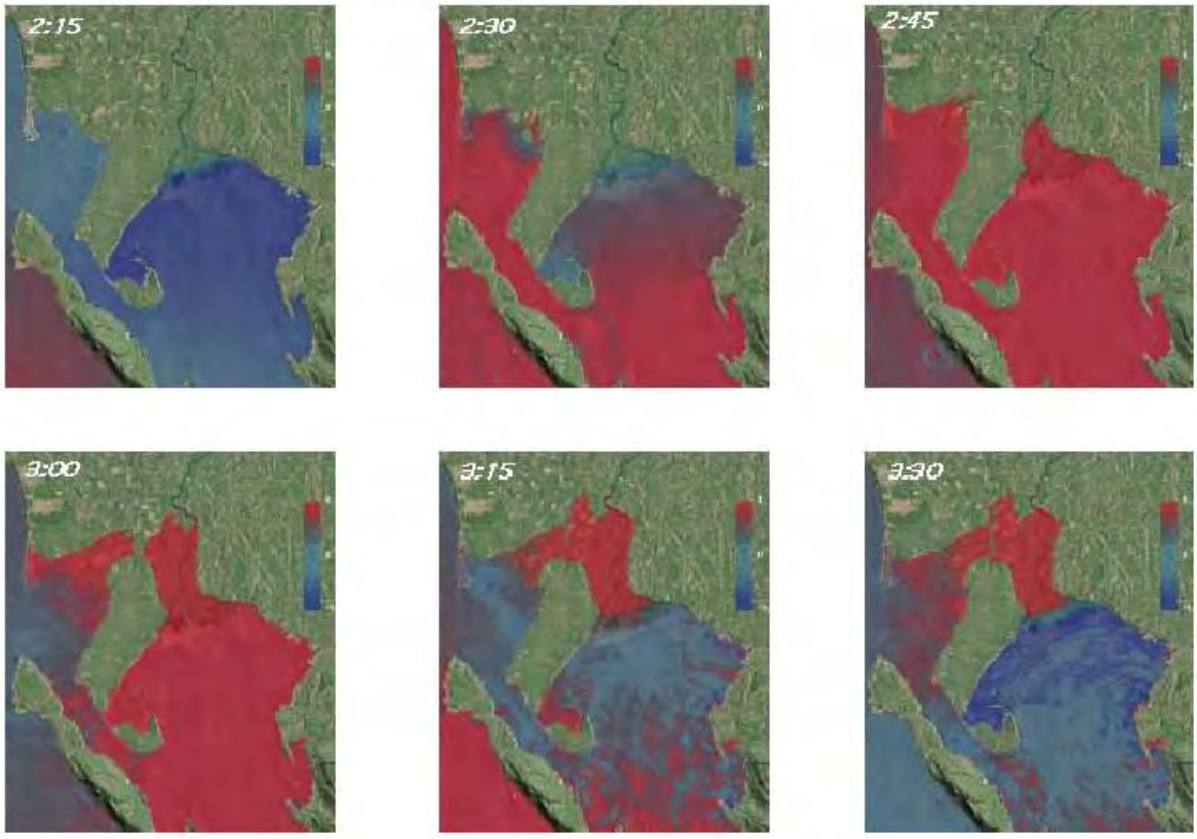


Figure 3 – Screen shots of animation of a tsunami arriving in Bellingham area, lasting about 3:30 hours. Red areas are crests, blue are troughs. (Picture obtained from the NOAA T.I.M.E. Center)

These models do not include potential tsunamis from landslides, including failure of the Nooksack River delta front, or nearby crustal faults, which are generally not well enough understood to be modeled. Apparently locally generated tsunami deposits have been found on Whidbey Island (Williams and Hutchinson 2000; Atwater and Moore 1992); in Discovery Bay, southwest of Port Townsend (Williams et al. 2002); in the Snohomish delta near Everett

(Bourgeois and Johnson 2001): and at West Point near Seattle (Atwater and Moore 1992). Gonzalez (2003) summarizes the evidence for tsunamis generated within the Puget Lowland by local earthquakes and landslides and estimates their probabilities.

When an earthquake that might generate a Pacific Coast tsunami is detected, the Alaska Tsunami Warning Center calculates the danger to the northeast Pacific Coast and notifies the communities at risk. Those warnings may give people a few hours to prepare and evacuate (depending on the distance to the earthquake).

If the earthquake occurs off our coast, however, there may be no time to send out hazard warnings. The first waves could arrive within minutes of the earthquake. The only tsunami warning might be the earthquake itself.

E. MITIGATION STRATEGIES

In order to plan for hazards, citizens need to know what to expect. In the last few years, there have been significant advances in understanding the earthquakes that have occurred on the CSZ and the tsunamis that struck the Pacific Coast. This information is the foundation for planning efforts. Because tsunami events provide little warning, one of the keys to mitigating tsunamis to effectively educate the population at risk about the hazards they face:

1. Hold public meetings to educate the public about the hazard they face. Provide handouts, evacuation maps, and a description of the warning system (typically the Emergency Alert System) that will be used to warn residents. Distribute hazard and evacuation maps to all interested parties, such as public safety agencies, citizen groups, etc.
2. Establish evacuation plans for all affected communities to effectively remove all people from the hazard area in the event of a tsunami warning. This includes identifying all facilities that may need extra assistance in evacuating (nursing homes, day cares, etc.). The evacuation plan should also address the timeline for a full evacuation, as well as a division of labor to identify which agencies will do which actions.
3. Establish requirements that existing critical facilities must be reviewed for susceptibility to tsunamis. These facilities should be reviewed to determine what kind of mitigation action should be taken for each facility.
4. Post Tsunami signs that show the existence of the hazard area, and the way to the

nearest evacuation route.

5. New critical facilities constructed in the tsunami hazard zone must be elevated above the hazard area, armored in place, or built outside the hazard area if at all possible. The 2018 model, demonstrating increased inundation potential, published by the Washington Geologic Survey, should be used to inform the siting and mitigation measures employed during permitting of critical facilities.
6. Early warning systems should be evaluated to see if an automated system can be put into place to provide automated early warning in the event a tsunami occurs.
7. Develop Tsunami Resistant Com munities, according to NOAA's Strategic Implementation Plan for Tsunami Mitigation Projects. These communities would be outfitted with the knowledge and tools outlined above to deal with a tsunami event.

Five All Hazard Alert Broadcast (AHAB) Warning Systems have been added to the five already placed along the shoreline to provide warning of tsunami waves. New locations include:

- Birch Bay Park
- Blaine (Water Treatment Plant)
- Port of Bellingham (South Harbor Loop)
- Birch Bay Village Marina
- Fairhaven (Port of Bellingham)

Three additional AHAB systems are planned for 2021

- Lummi Nation
- Birch Bay State Park
- Semiahmoo Marina

These sirens are being added due to population growth in these areas and increased tsunami risk. Also in 2020, Whatcom County started the TsunamiReady certification process with NOAA and also started the process of evaluating the risk areas and evacuation routes that had been identified in 2015 as newer modeling suggests that the identified evacuation routes will likely not survive even a moderate earthquake due to liquefaction. In 2019, Whatcom County completed and issued the Whatcom County Tsunami Action Plan which details response actions. Whatcom County is also now part of the State of Washington Inner Coast Working

Group.

-Whatcom County will continue to explore options for defining conservative estimates of tsunami inundation potential in areas not currently addressed by available tsunami modeling. When new modeling data becomes available from the Washington State Geological Survey addressing tsunami potential for the entire County, this information can be used to refine or replace conservative estimates. The identification of safe evacuation areas is critical to the development of preparedness plans for individual and communities. Access to safe evacuation areas should be served by multiple evacuation routes in the event that secondary seismic impacts such as landslides, liquefaction, or lateral spreading damage or destroy one or more options for accessing high ground.

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VOLCANOES

A. DEFINITIONS

Blast Zone The area immediately surrounding a volcano, up to several tens of kilometers, that is destroyed by a volcano's blast.

Lava Flow A stream of molten rock that pours or oozes from an erupting vent.

Lahar A mudflow or debris flow that originates from the slope of a volcano; pyroclastic flows can generate lahars by rapidly melting snow and ice.

Pyroclastic Flows High-density mixtures of hot, dry rock fragments and hot gases that move away from the vent that erupted them at high speeds.

Tephra General term for fragments of volcanic material, regardless of size, that are blasted into the air by explosions or carried up upward by hot gases in eruption columns or lava fountains.

Volcano A vent in the earth's crust through which magma (molten rock), rock fragments, associated gases, and ashes erupt, and also the cone built by effusive and explosive eruptions.

B. BACKGROUND INFORMATION

The Cascade Range (Cascades) extends more than 1,000 miles, forming an arc-shaped band extending from Southern B.C. to Northern California. The Cascades roughly parallels the Pacific coastline, and at least 17 major volcanic centers. Whatcom County's eastern boundary follows the crest of the Cascade Range.

The central and southern Cascades are made up of a band of thousands of much older, smaller, short-lived volcanoes that have built a platform of lava and volcanic debris. Rising above this volcanic platform are a few large younger volcanoes that dominate the landscape. The North Cascades, including Whatcom County, present younger (Quaternary) volcanoes overlying much older metamorphosed basement rock.

The Cascades volcanoes define the Pacific Northwest section of the "Ring of Fire," a fiery array of volcanoes that rim the Pacific Ocean. These volcanoes can be seen to the left in figure 4. Many of these volcanoes have erupted in the recent past and will most likely be active again in the future. Given an average rate of two eruptions per century during the past 12,000 years,

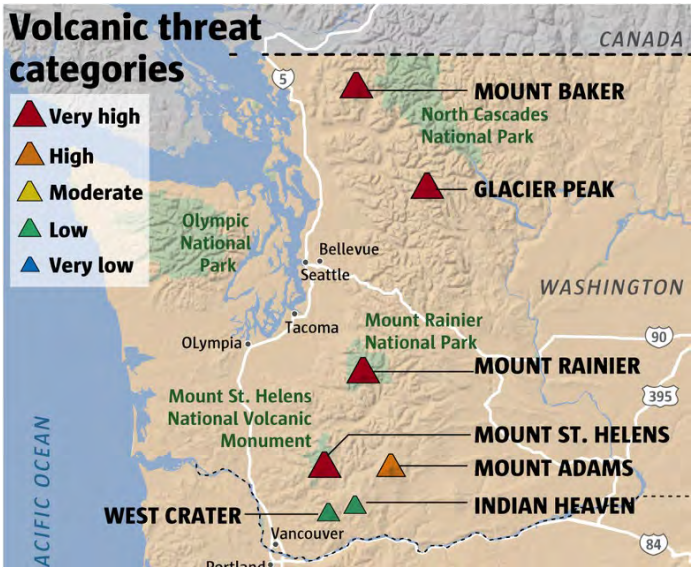


Figure 4. Washington Volcanoes and threat showing Mt. Baker as a major volcanic threat in Whatcom County. (Source: ESRI, USGS; created by Mark Nowlin/Seattle Times)

these disasters are not part of our everyday experience. The largest of the volcanoes in Washington State are Mount Baker, Glacier Peak, Mount Rainier, Mount Saint Helens, and Mount Adams. Eruptions from Mount Baker, located in the central portion of Whatcom County, and Glacier Peak, in Snohomish County, would severely impact Whatcom County. Mount Baker and Glacier Peak have erupted in the historic past and will likely erupt again in the foreseeable future. Due to the topography of the region and the location of drainage basins and river systems, eruptions on Mount Baker could severely impact large portions of Whatcom County. A Mount Baker eruption would generate lahars, pyroclastic flows, tephra or ash fall, and lava flows that would decimate affected areas, as shown in the map below. Glacier Peak, which is in Snohomish County, is of concern due to its geographic proximity to the County. Ash fall from an eruption at Glacier Peak could significantly impact Whatcom County.

Photo of Mt. Baker in Whatcom County

Mount Baker, seen to the left, (3,285 meters; 10,778 feet) is an ice-clad volcano in the North Cascades of Washington State about 50 kilometers (31 miles) due east of the city of Bellingham. After Mount Rainier, it is the most heavily glaciated of the Cascades volcanoes: the volume of snow and ice on Mount Baker (about 1.8 cubic kilometers; 0.43 cubic miles) is greater than that of all the other Cascades volcanoes (except Rainier) combined. Isolated ridges of lava and hydrothermally altered rock, especially in the area of Sherman Crater, are exposed between glaciers on the upper flanks of the volcano; the lower flanks are steep and heavily vegetated. The volcano rests on a foundation of non-volcanic rocks in a region that is largely non-volcanic in origin.

C. RECENT HISTORY IN WHATCOM COUNTY

Eruptions in the Cascades have occurred at an average rate of 1 to 2 per Qwest during the past 4,000 years, and future eruptions are certain. Seven volcanoes in the Cascades have erupted within the past 225 years (see Table 6).

Table 6. History of Major Volcanic Eruptions in the Cascade Mountain Range in the Past 225 Years

Volcano	Eruption Type	Eruptions in the Past 225 Years	Recent Activity
Mount Baker	Ash, lava	1?	1792, 1843 to 1865, 1870?, 1880, and 1975 steam emission
Glacier Peak	Ash	1+?	Before 1800 (1750?)
Mount Rainier	Ash, lava	1?	Tephra between 1830 and 1854
Mount St. Helens	Ash, lava, Dome	2 eruptive periods	1980 to present
Indian Heaven Volcanic Field	Lava, scoria	None	8,000 years ago?
Mount Adams	Lava, ash	None	3,500 years ago
Mount Hood, Oregon	Ash, dome	2+?	1865, major eruption in the late 1700s

***Note**: Information obtained from WDNR*

Four of the eruptions listed in Table 6 would have caused considerable property damage and loss of life if they had occurred post-development of Whatcom County without warning and the next eruption in the Cascades could affect hundreds of thousands of people. The most recent volcanic eruptions within the Cascade Range occurred at Mount Saint Helens in Washington (1980 to 1986; 2004 to 2008) and at Lassen Peak in California (1914 to 1917).

We know from geological evidence that Mount Baker has produced numerous volcanic events in the past that, were they to occur today, would place Whatcom County communities at considerable risk. Volcanic hazards from Mount Baker result from a variety of different eruptive phenomena such as lahars, ash fall, tephra fall, and pyroclastic flows. Figure 5 displays a model of the inner workings and hazards associated with volcanoes.

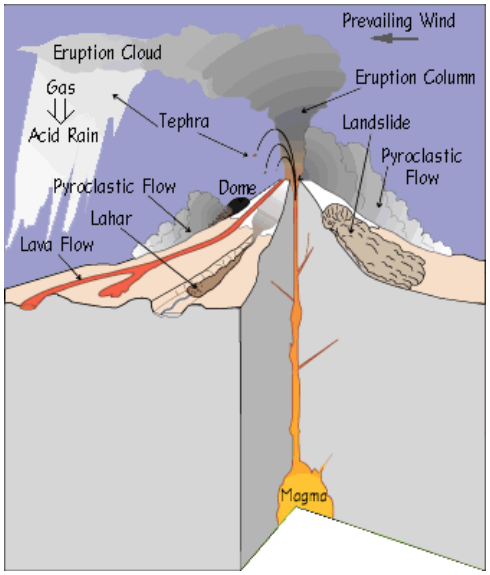


Figure 5 – Effects of a Volcano Eruption
(Diagram courtesy of USGS Cascade Volcano Observatory)

Geologic evidence in the Mount Baker area reveals a flank collapse near the summit on the west flank of the mountain that transformed into a lahar, estimated to have been approximately 300 feet deep in the upper reaches of the Middle Fork of the Nooksack River and up to 25 feet deep 30 miles downstream. This lahar may have reached Bellingham Bay. A hydrovolcanic (water coming into contact with magma) explosion occurred near the site of present-day Sherman Crater, triggering a second collapse of the flank just east of the Roman Wall. This collapse also became a lahar that spilled into tributaries of the Baker River.

Finally, an eruption cloud deposited several inches of ash as far as 20 miles downwind to the northeast. Geologic evidence shows lahars large enough to reach Baker Lake have occurred at various times in the past. Historical activity at Mount Baker includes several explosions during the mid-19th century, which were witnessed from the Bellingham area.

Sherman Crater (located just south of the summit) probably originated with a large hydrovolcanic explosion. In 1843, explorers reported a widespread layer of newly fallen rock fragments and several rivers south of the volcano were clogged with ash. A short time later, two collapses of the east side of Sherman Crater produced two lahars, the first and larger of which flowed into the natural Baker Lake, raising its water level at least 10 feet.

In 1975, increased fumarolic activity in the Sherman Crater area caused concern an eruption might be imminent. Additional monitoring equipment was installed and several geophysical surveys were conducted to try to detect the movement of magma. The level of the present-day

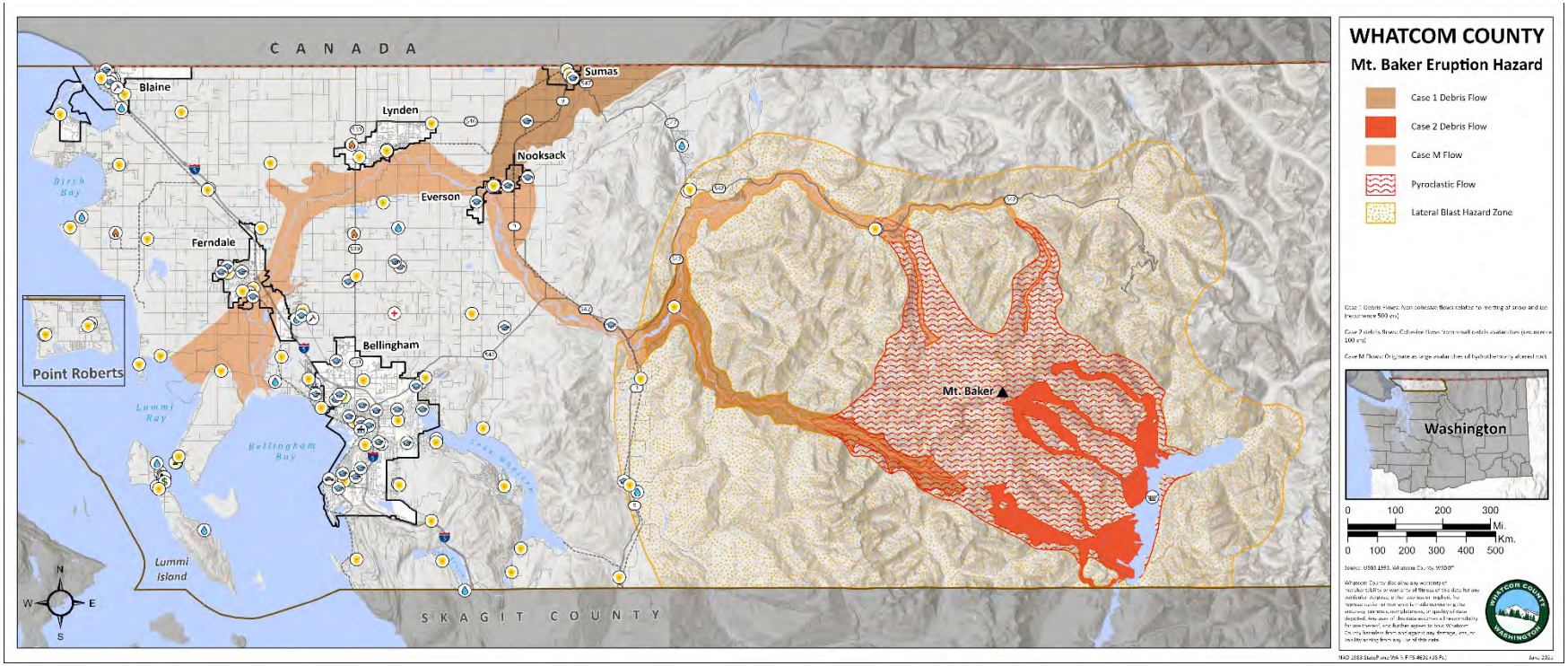
Baker Lake reservoir (located to the east and south of the mountain) was lowered and people were restricted from the area due to concerns that an eruption-induced debris avalanche or debris flow might enter Baker Lake and displace enough water to either cause a wave to overtop the Upper Baker Dam or cause complete failure of the dam. However, few anomalies other than the increased heat flow were recorded during the surveys nor were any other precursory activities observed to indicate magma was moving up into the volcano. This volcanic activity gradually declined over the next 2 years but stabilized at a higher level than before 1975. Several small lahars formed from material ejected onto the surrounding glaciers and acidic water was discharged into Baker Lake for many months.

D. VULNERABILITY ASSESSMENT

Lahars are the primary threat from volcanic activity at Mount Baker. Originating from melted snow and ice, lahars could create torrents of ash, rock, and water. Flank collapses may also create volcanic landslides that may form into lahars. Lahars resulting from flank collapses can also be triggered by earthquakes, gravity, or increases in hydrovolcanic activity. Debris flows can remain hazardous for many years if the deposited material remobilizes from heavy rains.

Most cohesive debris flows will be small to moderate in volume and will originate as debris avalanches of altered volcanic rock, most likely from the Sherman Crater, Avalanche Gorge, or the Dorr Fumarole area. Small volume debris flows will pose little risk to most people, but moderate volume debris flows could travel beyond the flanks of the volcano.

The probability of either Mount Baker erupting, collapsing, or causing slides is low. However, volcanic activity from either mountain could result in massive destruction of property and probable loss of lives in or near the floods, lahars, earthquakes, landslides, and ash fall.



Hazards from Future Activity of Mount Baker, WA (1995) data shows different volcanic flows. Case M flows originate as large avalanches of hydrothermally altered rock. Case 1 debris flows are non-cohesive flows related to melting of snow and ice, with a recurrence of 500 years. Case 2 debris flows are cohesive flows from small debris avalanches, with a recurrence of 100 years.

Examples of hazards and "worst-case scenarios" in Whatcom County, including adjacent counties and Canadian Provinces, as follows:

1. Small to moderate collapse in the area of Sherman Crater may produce lahars flowing into Baker Lake and result in the following:
   - Raised level of Baker Lake
   - Baker Lake Dam failure
   - Flooding of the entire Skagit floodplain to Puget Sound
2. Large flank collapses or pyroclastic flows could result in the following:
   - Inundation of Skagit River Valley by displacement of water in reservoirs by lahars
   - North Fork, Middle Fork, and Nooksack River to Bellingham Bay could be inundated, and enough debris flow could be deposited in the stretch of river between Lynden and Everson to raise the riverbed enough to spill into the Sumas River or to divert the Nooksack River into the Sumas River Basin (such an event is considered high consequence but low probability)
   - Floodwaters could extend from Sumas into Huntingdon and Abbotsford, B.C.
   - Flooding all the way to Bellingham Bay
3. Hospitals: Bellingham's Saint Joseph Hospital and the Outpatient Center would be isolated from other communities
4. Transportation Routes: I-5 flooded at Nooksack and/or Skagit Rivers; Highway 9 flooded at Deming and Sedro Woolley (Skagit County); Mount Baker Highway (SR 542) flooded
5. Ash fall: will depend on direction of the wind (prevailing winds are toward the East); the ash may cause reduced visibility or darkness; air filters and oil filters in automobiles and emergency vehicles become clogged
6. Airports: All local airports may be impacted by ash fall
7. Railroad tracks, power lines, radio towers, highways, campgrounds, natural gas pipelines, and water supplies in these more remote areas may be inundated
8. Forest fires from ash and volcanic eruption may be expected

9. Earthquakes may occur
10. Lightning and thunderstorms often accompany volcanic eruptions
11. City of Bellingham's Middle Fork water supply diversion dam, tunnel, and pipeline to Lake Whatcom possibly buried and/or destroyed
12. Large numbers of farm animals, people, fish, and wildlife may be required to be relocated (temporarily or permanently), injured, or, if warning and guidance are not followed, killed.Those most vulnerable initially would be those nearest the pyroclastic, lahar, and lava flows, or heavy ash and rock fall during the eruption. Those people in this recreational area of forests and wildlife may be impossible to locate and rescue. Baker Lake and its dams are vulnerable and, if impacted, could cause extensive loss of property and lives downstream in Skagit County.

Photo of a lahar and damaged buildings.

Lahars flowing down and flooding the Nooksack, Baker, and Skagit Rivers may provide very little warning for evacuation to nearby populations. The potential destruction of a town in shown in the image above. Earthquakes accompanying an eruption may cause bridge or road damage and trigger landslides. Fine ash fall, even if only an inch thick, may make asphalt road surfaces slippery, causing traffic congestion on steep slopes or accidents at corners and junctions. Even a minor eruption or large flank collapse of Mount Baker could impact some populations physically, psychologically, and economically.

Secondary Volcanic Hazards

1. Flooding:
    a. Baker Lake and Lake Shannon – possibly dams destroyed
    b. Nooksack River from origins to Bellingham Bay
    c. Skagit River from Baker River junction throughout Skagit River Valley to Puget Sound
2. Transportation: severe disruption

3. Water lines, water reservoirs: contaminated or broken and depleted
4. Communication: landlines down, wireless phones overwhelmed
5. Electric power: some or all power lost from Mount Vernon to Lynden and possibly further in all directions
6. Gas and fuel pipelines: possibly broken
7. Toxic waste, sewer, and household chemicals in flood areas

E. MITIGATION STRATEGIES

Generally, technology and tell-tale signs of eruptions from volcanoes allow experts to predict volcanic activity, such as the predictions of the 1980 Mount Saint Helen's eruption that saved many lives. However, the magnitude and timing of volcanic activities cannot be precisely predicted, giving the public little to no warning to prepare for a volcano emergency. Because of this, the best way to mitigate against volcanoes is to educate and raise awareness of affected citizens. In 2013 Whatcom Division of Emergency Management, United States Geological Survey, and the Washington State Emergency Management Division participated in the US/ Columbia Volcanic Exchange. Best practices concepts were brought back from the participants, and a focused effort led to a completion of a public information campaign for the Northern Cascade volcanos.

The original hazard publication for Mt. Baker was published by the United States Geological Survey in 1997. An updated hazard publication is currently being produced by the USGS and will provide improved estimates of potential hazards. Estimates of lahar inundation depth, extent, and velocity will be modeled using modern techniques and will allow the development of improved evacuation routes and volcanic hazard management plans. Upon publication by the USGS, all existing volcanic emergency response plans should be updated to reflect the improved understanding of potential hazards.

In 2018 the Whatcom County Department of Emergency Management conducted the Mount Baker Volcano Exercise. This 5-day exercise was designed to simulate the likely sequence of events to be experienced during a multi-month volcanic event at Mount Baker, culminating in an eruption, emergency response, and post-event recovery. Representatives from the USGS Cascades Volcano Observatory devised the scenario as a likely analog to probable events at Mount Baker, and multiple agencies participated in a coordinated response. The purpose of the exercise was to test the ability of the current volcanic emergency plan to respond to the simulated event by evaluating the participants responses to the following six functional areas:

Small Communities, Interagency Response and Coordination, Elected Officials, Command, Control, Coordination & Communication, Search and Rescue, and Recovery. Lessons learned from the exercise have been or will be incorporated in future iterations of the Whatcom County DEM volcanic emergency response plan.

WILDLAND FIRES

A. DEFINITIONS

Structure Fire A fire of natural or human-caused origin that results in the uncontrolled destruction of homes, businesses, and other structures in populated, urban or suburban areas.

Wildland fire Fire of natural or human-caused origin that results in the uncontrolled destruction of forests, field crops and grasslands.

Wildland Urban interface A fire of natural of human-caused origin that occurs in, or near, forest or grassland areas, where isolated homes, subdivisions, and small communities are also located.

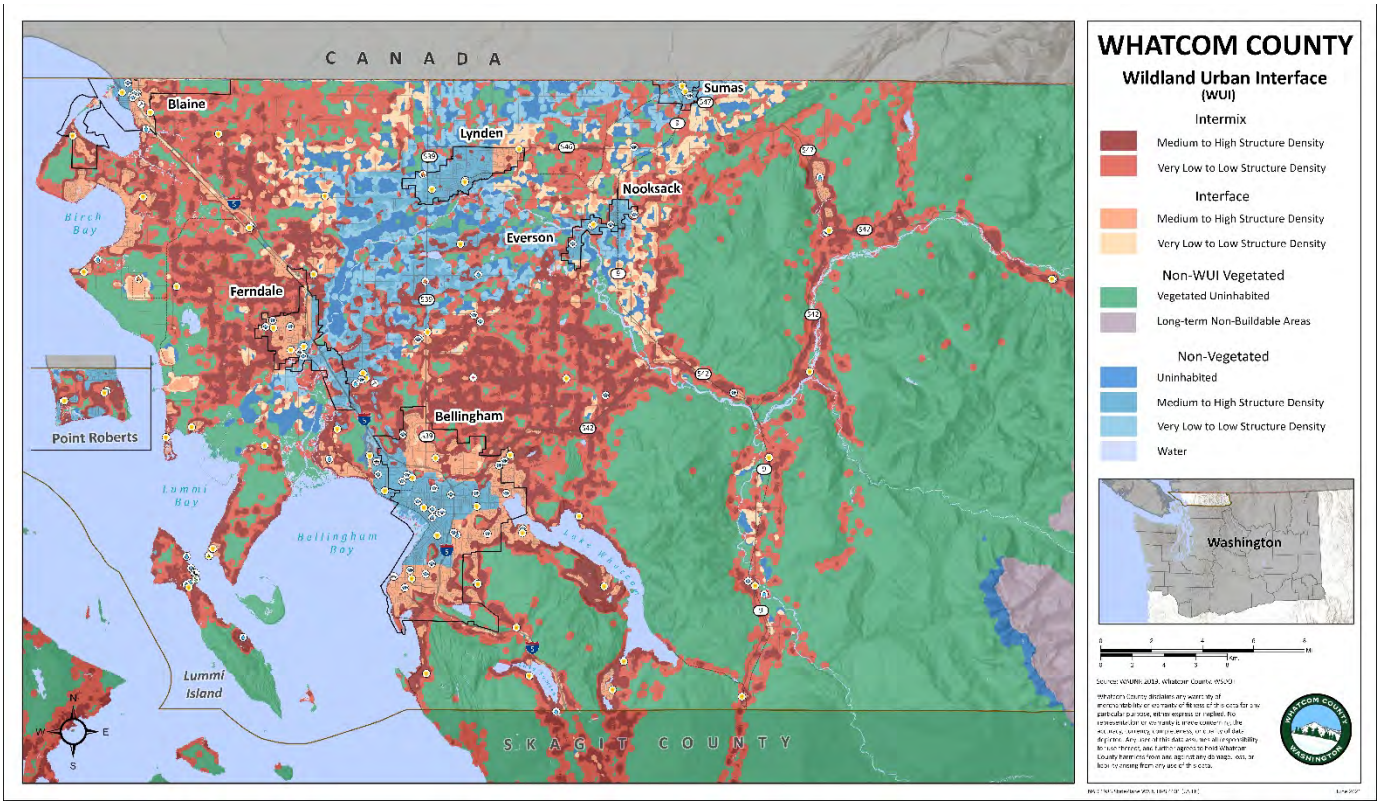
B. BACKGROUND INFORMATION

Image of a Wildland Fire.

Wildland fire is a serious and growing hazard over much of the United States, posing a great threat to life and property, particularly when it moves from forest or rangeland into developed areas. An image of a wildland fire can be seen to the left. However, wildland fire is also a natural process, and its suppression is now recognized to have created a larger fire hazard, as live and dead vegetation accumulates in areas where fire has been excluded. In addition, the absence of fire has altered or disrupted the cycle of natural plant succession and wildlife habitat in many areas. Consequently, United States land management agencies are committed to finding ways, such as prescribed burning, to reintroduce fire into natural ecosystems, while recognizing that firefighting and suppression are still important. USGS conducts fire-related research to meet the varied needs of the fire management community and to understand the role of fire in the landscape; this research includes fire management support, studies of post-fire effects, and a wide range of studies on fire history and ecology. Whatcom County's evolution over the years has resulted in greater numbers of residents either living in or immediately adjacent to wildlands.

Whatcom County's population has grown from 81,293 in 1970 to over 229,000 in 2019. While most of the growth has occurred in Whatcom County's cities, a significant number of homes

and businesses have been built in a wildland interface or intermix fashion. The following Wildland-Urban Interface map demonstrates the density of these population centers. Large tracts of forest either abut or surround communities increasing the risk that an uncontrolled wildland fire will result in significant or even catastrophic loss. With few roads for ingress or egress, certain areas could be cutoff rather quickly.



Washington Department of Natural Resources (WA DNR) 2019 mapped data of Washington's Wildland Urban Interface (WUI). The WUI displays areas of WA where structures and wildland overlap with specific structure densities.

C. RECENT HISTORY IN WHATCOM COUNTY

In terms of acres burned, 2020 ranked second to the record-setting 2015 fire season when over one million acres of land burned in Washington. In 2020, over seven hundred thousand acres of Washington land was charred by wildfire. During this same period, Whatcom County experienced several wildfires, the most notable one being the Goodell Fire in 2015. This fire started on August 10th by lightning and burned for the next several weeks consuming over 8,000 acres of timber and brush in rocky, mountainous terrain. Transmission lines from several hydroelectric power plants running alongside the Skagit River were threatened and evacuation of Seattle City Light staff were evacuated from Diablo and Newhalem. Campers in the area

were also evacuated and the North Cascades National Park was closed as was a 90 mile stretch of Highway 20 connecting several communities on the east and west side of the Cascades. In April 2020, an 80-acre fire (Porter Creek Fire) burned for several days near Deming. A number of smaller wildfires have also burned in Whatcom County and threatened homes and other structures.

In some cases, two or more fires merged together, overwhelming resources and creating fires so large and complex that some were not fully extinguished until cooler, damp autumn weather moved into the region.

Changing Conditions

Changing weather patterns are creating conditions that leave western Washington's environment more conducive to wildfire. Figure 6 is a graphic showing these condition changes. Increasing temperatures, less rain falling in the summer, and earlier snow melt are resulting in drier fuels and forests in our area. Drought conditions lead to dry and dead fuels which mean our forests are becoming increasingly more flammable and homes in the wildland-urban areas are more at risk.

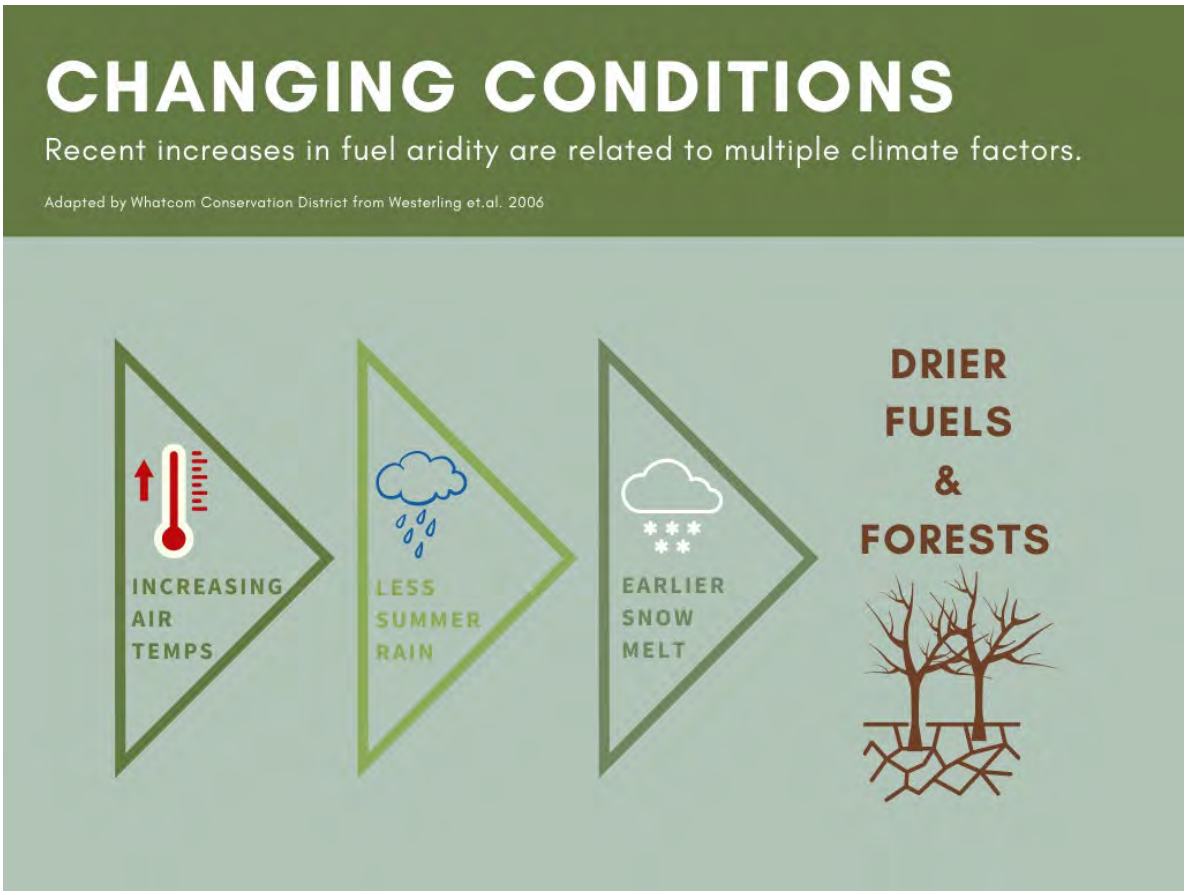


Figure 6 showing how changing yearly weather conditions leads to an increased risk of fire.

D. VULNERABILITY ASSESSMENT

The Washington Department of Natural Resources no longer uses the "Risk Assessment and Mitigation Strategies" tool which aided development of this wildfire section. The new modeling software-"Wildfire Prevention Spatial Assessment and Planning Strategies (WPSAPS)-is currently being developed by the Interagency Workgroup but has not yet been finalized or available for release in a draft form. Whatcom County will revisit and update this section during the annual review process when the new model is released. The revised section will be forwarded to the Washington State Hazard Mitigation Officer and FEMA at that time. In the meantime, the Risk Assessment and Mitigation Strategies (RAMS) remains the most authoritative source for developing wildfire hazard and associated mitigation strategies for Whatcom County.

Should a large wildland or wildland-urban interface fire occur in Whatcom County, the effects of such an event would not be limited to loss of property, valuable timber, wildlife and habitat, or recreational areas. The loss of large amounts of timber on steep slopes would increase the risk of landslides and mudslides during the winter months and the depositing of large amounts of mud and debris in streams and river channels could threaten valuable fish habitat for many years. In addition, the loss of timber would severely impact the watershed of the Skagit River and could drastically increase the vulnerability to flooding for many years.

WDNR, Northwest Region, has conducted a region-wide wildland fire hazard assessment utilizing the following method:

1. Risk Assessment and Mitigation Strategies (RAMS) was developed for fire managers to be an all-inclusive approach to analyzing wildland fire and related risks. It considers the effects of fire on unit ecosystems by taking a coordinated approach to planning at a landscape level. The steps involved in this process include the following:
    a. Identification of spatial compartments for assessment purposes:
        i. Whatcom County (county # 37) was subdivided into three risk assessment compartments based on Industrial Fire Precaution Level (IFPL) Shutdown Zones. Zone 653 represents the islands and tidal lowlands; Zone 656 represents the interior lowlands (roughly the Interstate 5 corridor); and Zone 658 represents the uplands to the Cascade Crest (roughly 1,500 feet elevation and above). Whatcom County risk assessment compartments are numbered using the county number (37) combined with the shutdown zone number. Using this scheme, the three risk assessment compartments within Whatcom County are numbered 37653, 37656 and

37658.

b. Assessment of significant issues within each compartment, which are related to:

i. Fuels Hazards – The assessment of fuel hazards deals with identifying areas of like fire behavior based on fuel and topography. Given a normal fire season, how intense (as measured by flame length) would a fire burn? Under average fire season conditions, fire intensity is largely a product of fuel and topography.

ii. Protection Capability – Determining fire protection capability for the purpose of this assessment involves estimating the actual response times for initial attack forces and how complex the actual suppression action may be once they arrive because of access, fuel profile, existence of natural or human-made barriers to fire spread, presence of structures, and predicted fire behavior.

1. Initial Attack Capability – actual time of first suppression resource
2. Suppression Complexity – access, fuel conditions, structure density, and so forth

iii. Ignition Risk – Ignition risk evaluation will be completed for each compartment. Ignition risks are defined as those human activities or natural events which have the potential to result in an ignition. Wherever there are concentrations of people or activity, the potential for a human-caused ignition exists. After assessing the risks within an area, it is helpful to look at historical fires to validate the risk assessment. Historical fires alone, however, are not an accurate reflection of the risks within a given area. The objective of this effort is to determine the degree of risk within given areas.

1. Compartment Ignition Risk is based on:

a. Population Density

b. Power Lines – distribution as well as transmission Industrial Operations – timber sale, construction project, fire use, mining, and so forth Recreation – dispersed, developed, OHV, hunting, fishing Flammables Other – fireworks, children, shooting, incendiary, cultural, power equipment Railroads

c. Transportation Systems – state, federal, public access

d. Commercial Development – camps, resorts, businesses, schools

iv. Fire History – Fire history will be completed for each compartment to reflect:

1. Fire location
2. Cause
3. Average annual acres burned
4. Average annual number of fire by cause

v. Catastrophic Fire Potential – An evaluation of fire history reflects the potential for an event to occur. An example is if large damaging fires occur every 20 years and it has been 18 years since the last occurrence, this would reflect a priority for fire prevention management actions.

1. Evaluate large fire history
2. What are the odds of a stand replacement type fire occurrence in that compartment? Unlikely Possible Likely

vi. Values – Values are defined as natural or developed areas where loss or destruction by fire would be unacceptable. The value elements include:

- Recreation – undeveloped/developed
- Administrative sites
- Wildlife/Fisheries – habitat existing
- Range Use
- Watershed
- Timber/Woodland
- Plantations
- Private Property
- Cultural Resources
- Special Interest Areas
- Visual Resources

- Threatened and Endangered Species
- Soils
- Airshed
- Other Necessary Elements

This evaluation process provides the basis for determining the *Whatcom County Wildland-Urban Interface Fire Risk Assessment Compartments* map. Additional information regarding the results of this process can be found in Appendix D, which contains excerpts from the RAMS Assessment.

RAMS risk assessment compartments were further broken down to identify Wildland-Urban Interface Hazards. Using 2010 Census data, individual areas were identified in the Wildland-Urban Interface and assessed using the National Fire Protection Association (NFPA) 299, Wildfire Hazard Assessment. The results of this assessment are depicted in the *Whatcom County Wildland-Urban Interface: Fire Risk Assessment* map, below. RAMS risk assessment is currently being updated, but new maps have not yet been released.

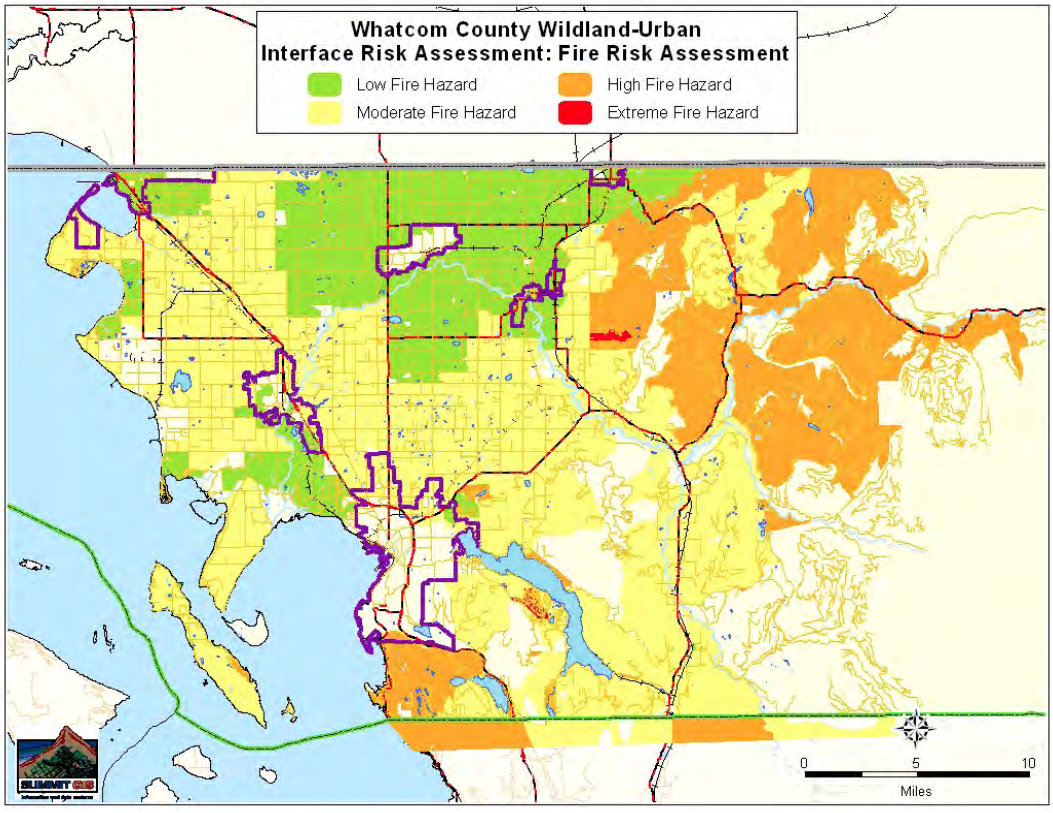


Figure 7. Interface Risk Assessment- Fire Risk Assessment map shows areas of the county at most risk of wildfire,

including the Chuckanut Mountains, and east County near Everson, Nooksack, Kendall and Glacier.

The NFPA 299 was further refined, to reflect Whatcom County Fire Manager's input, producing a map that reflects Landscapes of Like Risk (Communities at Risk). Areas that received a high to extreme risk ranking were grouped into landscapes and named. The result is depicted in the following map. These areas of Whatcom County are at highest risk of catastrophic loss to a Wildland fire.

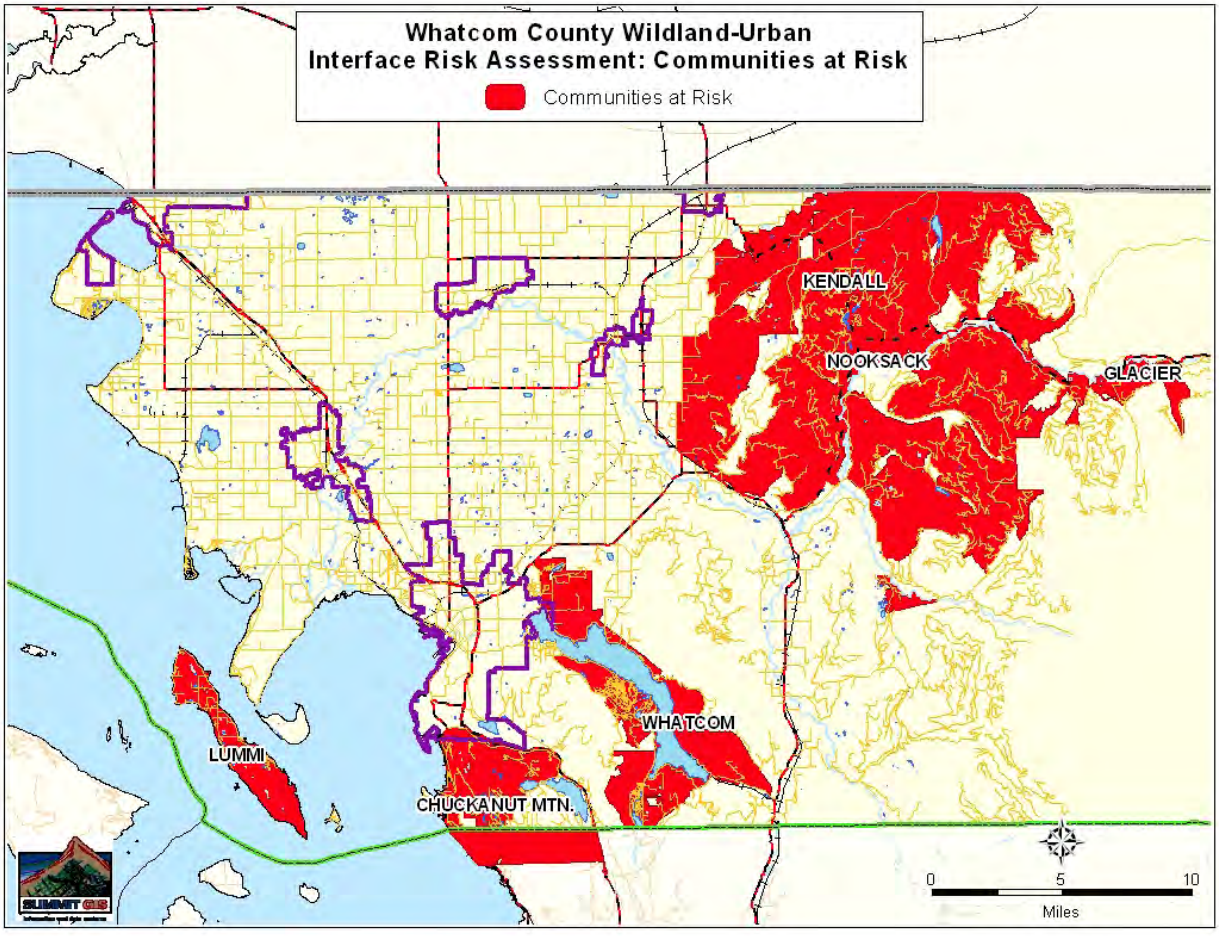


Figure 8. Interface Risk Assessment- Communities at Risk map shows communities most at risk of fire, including Lummi Island, communities around Lake Whatcom and in the Chuckanut Mountains, and the Kendall, Nooksack, and Glacier communities in east Whatcom County.

E. MITIGATION STRATEGIES

In cooperation with fire managers from WADNR, NW Region, three mitigation strategies were

developed to address Whatcom County's fire hazards. Each is discussed below.

Inter-Agency Cooperation & Partnerships

Inter-agency cooperation and successful partnerships are is the key to a successful wildland fire mitigation strategy. In the case of wildland fire risk mitigation, continued development and enhancement of support between fire protection agencies will be emphasized. Working with local, state, and regional partners that are working in fire adaptation to share a unified message about wildland fire preparedness is a priority and includes participation in the NW Region Wildland Fire Local Coordinating Group and supporting Local Coordination group activities.

Support of actions proclaimed by the governor's office and the Whatcom County Executive's Office in relation to wildland fire prevention and preparedness, such as Wildfire Awareness Month and Community Wildfire Preparedness Day, should be made a priority. In addition, it is essential to support Whatcom County-----based community wildland fire preparedness programs such as Whatcom Conservation District's Wildfire Risk Reduction Program that provide a direct service to residents of Whatcom County.

County-Wide Wildland Fire Prevention

In the RAMS Compartments, where the wildland fire risk has been assessed at moderate, multi-agency cooperative fire prevention activities will occur during the summer months addressing the following:

- Public awareness of current fire danger
- Press releases
- Media opportunities for fire prevention news articles
- Radio and TV spots, as needed
- Use of burn restrictions, including bans, if necessary, during periods of high fire danger
- Use of Smokey Bear fire prevention programs targeting age-specific audiences during periods of extreme fire danger, or during significant wildland fire events
- Consideration of mobilizing Washington State Inter-agency fire prevention teams
- Use of other fire prevention tactics and strategies, as needed, and as conditions warrant

Wildland/Urban Interface (WUI) Communities at Risk Preparedness

As a result of efforts conducted by WADNR, the following list of Landscapes of Like Risk were

established.

1. Lake Whatcom watershed
    a. Sudden Valley
    b. Northshore
    c. Homes/neighborhoods adjacent to City acquisition lands
2. Nooksack
3. Glacier
4. Lummi Island – Lummi Island Scenic Estates, a community on Lummi Island, has received national recognition for their mitigation activities under NFPA's Firewise USA program. Lummi Island as a whole is part of the Washington State Fire Adapted Communities Learning Network and is recognized as a community working to become more fire adapted
5. Columbia Valley/Kendall – Peaceful Valley Community is working toward becoming a nationally recognized Firewise USA site.
6. Chuckanut Mountain – Chuckanut Crest is actively working on community wildfire planning and preparedness

Communities located in the Landscapes of Like Risk should consider the following actions:

- Participation in the NFPA Firewise USA Program (www.firewise.org)
- Host wildfire preparedness workshops
- Increase homeowner awareness
- Facilitate community involvement and support
- Facilitate media involvement
- Sign up for individual wildfire home evaluations
- Use the NFPA Firewise USA program to:
    - Bring neighbors together to address shared risk
    - Provide a framework for community mitigation
    - Nationally recognize achievement
    - Receive access to grant funds for wildfire risk reduction projects

The Whatcom Conservation District can provide assistance to homeowners and communities in their understanding of wildfire, NFPA Firewise program efforts, and on-the-ground mitigation efforts. Services like free wildfire home evaluations and neighborhood wildfire risk assessments are provided through the Community Wildfire Risk Reduction Program at the Conservation District.

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SECTION 2.2 OTHER HAZARDS OF CONCERN

AVALANCHES

A. DEFINITIONS

Avalanche Masses of snow ice which move in swift motion down a mountainside or over a precipice. During the avalanche, earth, rock or other material such as trees may also be picked up. Avalanches can grow to be large, although they are not defined by their size, and depending on the situation even small avalanches can be dangerous.

B. BACKGROUND INFORMATION

Whatcom County has remote mountainous sections which receive high levels of snowfall during winter months. The maritime snowpack is traditionally deep, dense and prone to avalanches. Whatcom County is also a popular destination for winter recreationalists increasing the population exposure to avalanche.

In the future, WSDOT would like to build a new weather station in the Diablo Gorge area. This will help teams better anticipate avalanches and protect people using the mountain areas. The Northwest Avalanche Center (NWAC) offers a space for people to report observations of potentially dangerous avalanche conditions. Receiving input from the community is valuable to those who seek to keep residents and visitors safe from the risk avalanches present. You can submit a “field observation” here. You can also see observations submitted by other users here. By participating in NWAC’s field observations, you can keep yourself and your community members safe. Also located on the NWAC website you can see avalanche forecasts by mountain zone and a snow depth chart, so you can plan your travels more safely.

D. RECENT HISTORY IN WHATCOM COUNTY

2020 One skier in a party of three triggered and was caught and carried by a slab avalanche that released on a SE aspect around 5500' in an area of Mt. Herman known as East Gully above Bagley Lakes. The skier was carried up to 100' downhill before hitting and being pinned against a tree. He was able to free his left arm and immediately cleared his airway. His partners helped extract him. The skier suffered minor injuries but was fortunate enough to recover all of his gear and ski down unassisted.

2020 A skier was fully buried in an avalanche that occurred adjacent to the Mt. Baker Ski Area. The avalanche was triggered by a traveler from a different party. Mt. Baker Ski Patrol was on the scene immediately, located the victim quickly, dug them out, and cleared their airway. The individual survived and reported no injuries. The slab avalanche was 1 ft deep and at its widest point broke 500 feet across the slope.

2018 A single snowmobiler triggered and was caught, carried and killed in a large slab avalanche on Park Butte in the Mt. Baker National Recreation Area. The avalanche (HS-AMu-R3-D3-O) was triggered just below the summit on a NE aspect near 5400'. The victim was carried 1000' through a gully and sparse trees. The avalanche was 200 ft (60 m) wide and averaged 4' deep (1.2m). It failed on a 2 cm thick layer of facets above a firm rain crust.

2017 Widespread 1-2 ft storm slabs and larger 3-5 ft wind slabs were reported in the backcountry near Mt Baker on Saturday, March 4th. An incident occurred on Mt Herman when a large wind slab on an east aspect was triggered from a party above, partially burying two and completely burying one in a separate party at the base of the slide path. The impacted party was transitioning back to climbing skins when they were caught in the avalanche.

2017 The lead skier in a party of four triggered a D1.5 storm slab descending the north aspect of Table Mt. at 5000'. Skier was caught and carried a few hundred feet down slope and sustained minor injuries. The other members of the party were able to assist skier off slope and back to ski area boundary.

2016 Two skiers caught, 1 seriously injured and 1 killed by a wet slab (glide) avalanche in the Mt. Baker area.

2014 Two skiers in party, one caught by a natural avalanche while ascending on

foot and carried several thousand feet, one fatality.

2009 One skier caught and partially buried with broken leg on Table Mountain near Mt. Baker Ski Resort. Helicopter lift off mountain.

2009 Mt. Baker Hwy. closed due to avalanche activity near town of Glacier.

2008 Five snowmobilers caught, three buried, two die near Church Mountain.

2006 Skier caught, buried and killed near Mt. Herman.

2005 Two snowboarders caught, buried and revived after 15 minutes.

2004 Six burials, three deaths in 2004 season, all within 5 miles of Mt. Baker Ski Resort.

C. VULNERABILITY ASSESSMENT

Avalanche incidents are primarily isolated to specific backcountry user groups. Mountainous roads, however, are susceptible to avalanches, in particular Hwy 542 (Mt. Baker Hwy) and Hwy 20. Hwy 20 is closed during most of the avalanche season; however, a large avalanche obstructing Hwy 542 has the potential to isolate hundreds to thousands at the Mt. Baker Ski Resort with limited services. Multi-agency networking, particularly between NWAC and WSDOT, allows for road crews to work proactively to reduce vulnerability to avalanches. With avalanche forecasting, which utilizes NWAC forecasting, Geographic Information Systems (GIS), and historical events (magnitude and return interval), road crews are able to close roadways and remotely trigger an avalanche using controlled detonations before they harm people. Even a small avalanche can be deadly to a person outside of their vehicle, which is why an abundance of caution and proactive action is necessary.

As most of Whatcom County is below the seasonal snowline, risk of avalanche incident is mainly limited to winter recreationalists. The threat to life from avalanches is extreme and Whatcom County traditionally will average at least one fatality a year due to avalanches. Actions are being taken to reduce the fatalities. WSDOT hosts an annual avalanche search and rescue training for operators avalanche prone areas. Furthermore, WSDOT is aiming to provide avalanche rescue gear to as many operator vehicles in avalanche prone areas, as possible in the coming years, along with quick reference cards so that these operators know how to safely work in an avalanche zone. Furthermore, plans for new avalanche retaining walls, like those seen on I-90, are being discussed.

DAM FAILURE

A. DEFINITIONS

Dam Failure The uncontrolled release of impounded water resulting in downstream flooding, which can affect life and property.

B. BACKGROUND INFORMATION

There are many dams for many different purposes throughout Whatcom County: Nooksack Diversion Dam which shunts water to Lake Whatcom from the South Fork of the Nooksack River[4]; dams for waste water reservoirs; flood-control dams; lakes dammed for recreational purposes; and hydroelectric projects on the Baker and Skagit Rivers. Dam failures can be caused by flooding, earthquakes, volcanic eruption, blockages, landslides, lack of maintenance, improper operation, poor construction, vandalism, or terrorism.

In 2020, the Middle Fork Nooksack Dam was removed. This removal was done safely with controlled detonations.

D. RECENT HISTORY IN WHATCOM COUNTY

There are no known occurrences of dam failures in Whatcom County.

C. VULNERABILITY ASSESSMENT

A failure of a dam can have many effects such as loss of life and damage to structures, roads, utilities, crops, and the environment. Economic losses also can result from a lowered tax base and interruption of electrical power production.

With regular dam inspection, maintenance, and repair, the risk of dam failure is low. However, if a geologic or terrorist event precipitated a failure, the effects could be dire on the

[4] Not to be confused with the recently removed diversion dam on the Middle Fork of the Nooksack.

downstream residents in addition to the loss of critical infrastructure.

A comprehensive analysis was performed in 2016 of dam failure modes and dam safety program. The tests showed the dams were safe.

DROUGHT

A. DEFINITIONS

Drought An extended period of months or years when a region notes a deficiency in its water supply. Generally, this occurs when a region receives consistently below average precipitation.

B. BACKGROUND INFORMATION

Droughts can be difficult to identify due to their typical long length. A drought's impact may not materialize for several years of less than average precipitation, or sudden droughts can have quick impacts if there is an extremely dry year or season. Near the beginning of a drought the agricultural sector is usually the first to be impacted. Although Whatcom County is traditionally a wet maritime climate there is potential and history of dry periods.

D. RECENT HISTORY IN WHATCOM COUNTY

2019 Washington State governor declares Whatcom County and 26 other counties as drought emergency.

2010 Mandatory water restrictions imposed across the City of Bellingham.

2001 Governor Gary Locke declares statewide drought emergency. First time in history for a state in the Pacific Northwest.

1997 Severe drought conditions existed statewide, lowest precipitation, snowpack and stream flows recorded.

1934-1935 Longest drought period recorded in Western Washington history.

C. VULNERABILITY ASSESSMENT

Droughts can have impacts on nearly everyone in a community. A lack of water reduces irrigation capabilities of farmers limiting the crop yield for the season/year and, critically, may reduce the availability of drinking water in the Lake Whatcom reservoir. Low water may also

affect fishers, both recreational and commercial, as several native species require cooler waters to survive. Electricity prices can increase during a drought event due to the lack of hydroelectric capabilities of dams. Droughts can also increase vulnerability to other hazards such as fires and ecological epidemics.

Severe drought in Whatcom County could have long-reaching effects due to the large amounts of agriculture and fishery as well as usage of hydro-electric power, though the County's typically wet climate prevents impacts from being as severe as they would be in drier counties.

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SECTION 2.3 WHATCOM COUNTY STORM EVENTS DATABASE

The following events, all found within NOAA's National Centers for Environmental Information Storm Events Database, are events that occurred between 2010 and 2020. While the database contains 164 events for this time period, below are the events that have a non-zero record of deaths, injuries, or recorded damage value. Only 26 events met these criteria.

EVENT_ID	214457
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	04/02/2010 1304 PST-8 / 04/02/2010 1800 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($50000/ $0)
WFO	SEW
SOURCE	ASOS
EVENT_NARRATIVE	Bellingham (KBLI) recorded a 61-mph peak gust. Sandy Pt. Shores measured 38g58 mph at 231 PM and 236 PM. About 5,000 customers lost power.
EPISODE_NARRATIVE	A deep low passed just NW of Tatoosh Island. High wind was recorded on the coast and in a few inland zones. Strong wind was reported in other inland zones.

EVENT_ID	260893
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	11/15/2010 2024 PST-8 / 11/15/2010 2224 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES	(0/0)

(Direct/Indirect)	
DAMAGE (Property/Crops)	($40000/ $0)
WFO	SEW
SOURCE	Mesonet
EVENT_NARRATIVE	Both Sandy Point and Cherry Point recorded sustained wind in excess of 40 mph 824 PM to 854 PM. A tree fell on a home and another on a car in the Bellingham area.
EPISODE_NARRATIVE	South winds of 20 to 30 mph and gusts to 45 mph occurred on the evening of November 15 in parts of western Washington and then after the cold front passed, strong onshore flow brought marginal high wind to a few zones, mainly near the Strait of Juan de Fuca.

EVENT_ID	273698
CZ_NAME_STR	WHATCOM CO.
BEGIN LOCATION	DIABLO
BEGIN/END DATE & TIME	12/12/2010 600 PST-8 / 12/13/2010 300 PST-8
EVENT_TYPE	Flood
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($100000/ $0)
WFO	SEW
SOURCE	Newspaper
EVENT_NARRATIVE	Parts of Highway 20 between Newhalem and Diablo were washed away by heavy rain and flooding.
EPISODE_NARRATIVE	The Stillaguamish River reached record level. There were several roads washed out in Kitsap County. 2 homes were damaged from mudslides.

EVENT_ID	347687
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	09/26/2011 1200 PST-8 / 09/26/2011 1600 PST-8
EVENT_TYPE	Strong Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($10000/ $0)
WFO	SEW
SOURCE	Newspaper
EVENT_NARRATIVE	Scattered power outages were reported in the Bellingham area. A car was damaged by fallen tree limbs. Several other trees fell over roadways.
EPISODE_NARRATIVE	Strong southerly winds brought high wind to the north coast and to the area around Lake Lawrence in the southwest interior. The central coast had about 9000 lose power, and the Bellingham area had scattered power outages and a car damaged by tree limbs.

EVENT_ID	350649
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	11/21/2011 2330 PST-8 / 11/22/2011 400 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($5000/ $0)

WFO	SEW
SOURCE	ASOS
EVENT_NARRATIVE	Bellingham, Cherry Point, and Ferndale all recorded high wind category winds of 40 mph sustained and/or gust 58 mph. In Birch Bay, the strong winds blew part of the roof off a manufactured home.
EPISODE_NARRATIVE	High wind occurred over the coast and northwest interior.

EVENT_ID	350662
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	11/27/2011 041 PST-8 / 11/27/2011 412 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($1000/ $0)
WFO	SEW
SOURCE	Mesonet
EVENT_NARRATIVE	Cherry Point recorded 40 mph sustained wind. Ferndale had a 62-mph gust. A building which was in its framing stages was blown down near of Squalicum High School.
EPISODE_NARRATIVE	High wind occurred over the northwest interior.

EVENT_ID	396151
CZ_NAME_STR	WHATCOM CO.
BEGIN LOCATION	DEMING
BEGIN/END DATE & TIME	06/23/2012 1415 PST-8 / 06/23/2012 1415 PST-8
EVENT_TYPE	Thunderstorm Wind
DEATHS	(0/0)

(Direct/Indirect)	
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($1000/ $0)
WFO	SEW
SOURCE	NWS Storm Survey
EVENT_NARRATIVE	Damage survey indicated strong thunderstorm wind damage. A number of tree limbs and a few trees blown down. One power line was down near the junction of state route 9 and state route 542 east of Deming.
EPISODE_NARRATIVE	Thunderstorm wind caused minor damage.

EVENT_ID	396153
CZ_NAME_STR	WHATCOM CO.
BEGIN LOCATION	CLIPPER
BEGIN/END DATE & TIME	06/23/2012 1504 PST-8 / 06/23/2012 1504 PST-8
EVENT_TYPE	Thunderstorm Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($1000/ $0)
WFO	SEW
SOURCE	Trained Spotter
EVENT_NARRATIVE	Observer reports limbs of 8 to 10 inches diameter blown off trees as the storm went through. Also received half an inch of rainfall and one-eighth inch hail.
EPISODE_NARRATIVE	Thunderstorm wind caused minor damage.

EVENT_ID	423211
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	

BEGIN/END DATE & TIME	12/17/2012 700 PST-8 / 12/17/2012 1300 PST-8
EVENT_TYPE	Coastal Flood
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($100000/ $0)
WFO	SEW
SOURCE	Newspaper
EVENT_NARRATIVE	Birch Bay Cafe and Bistro suffered damage as waves pushed a large log through the large bay facing window. A nearby consignment shop was also damaged. About 15 homes and properties were also affected near Terrell Creek. In some cases, the water only got into the front yard, but in others it flooded garages and homes. Flooding closed about 4 miles about Birch Bay Drive.
EPISODE_NARRATIVE	High astronomical tides coincided with low pressure to cause record high tide levels throughout Puget Sound. Many homes and yards along the shoreline were flooded.

EVENT_ID	429156
CZ_NAME_STR	WHATCOM CO.
BEGIN LOCATION	BLAINE
BEGIN/END DATE & TIME	01/08/2013 2100 PST-8 / 01/08/2013 2200 PST-8
EVENT_TYPE	Debris Flow
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($5000/ $0)
WFO	SEW
SOURCE	Newspaper
EVENT_NARRATIVE	Heavy rain caused a mudslide near Semiahmoo Bay.
EPISODE_NARRATIVE	Two mudslides between Jan 8th and 9th caused minor damage in King and Whatcom counties.

EVENT_ID	433529
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	02/25/2013 654 PST-8 / 02/25/2013 854 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($10000/ $0)
WFO	SEW
SOURCE	Mesonet
EVENT_NARRATIVE	Sandy Point Shores reported sustained wind of 40+ mph, with gusts as high as 62 mph, for a few hours. A power line was downed in southern Whatcom County.
EPISODE_NARRATIVE	There were a few hours of high wind in three of four northwest interior zones.

EVENT_ID	492737
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	01/03/2013 700 PST-8 / 01/03/2013 900 PST-8
EVENT_TYPE	Coastal Flood
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($1000/ $0)
WFO	SEW
SOURCE	Emergency Manager
EVENT_NARRATIVE	Near Birch Bay, minor coastal flooding damaged some outdoor furniture.
EPISODE_NARRATIVE	Near Birch Bay, minor coastal flooding damaged some outdoor furniture.

EVENT_ID	540612
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	10/21/2014 2224 PST-8 / 10/22/2014 206 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(1/0)
DAMAGE (Property/Crops)	($80000/ $0)
WFO	SEW
SOURCE	Mesonet
EVENT_NARRATIVE	Several sites--Sandy Point Shores, Cherry Point, and Ferndale--recorded sustained wind of 40-42 mph with gusts up to 62 mph.||Blaine homeowners Charley and Donna Robbins, who are both in their 70s, said a horrendous windstorm swept through town on Wednesday, knocking several trees into their house. ||The couple was able to get out of the way as one tree crashed through their roof, though Charley suffered a rib injury. They say the estimate to fix their house is $80,000.
EPISODE_NARRATIVE	High wind affected the north coast, San Juans, and western Whatcom County during the night of October 21-22.

EVENT_ID	542363
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	11/06/2014 833 PST-8 / 11/06/2014 1754 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE	($200000/ $0)

(Property/Crops)	
WFO	SEW
SOURCE	C-MAN Station
EVENT_NARRATIVE	Ferndale had gusts 58-60 mph from 833 Am to 1210 PM. Bellingham had 40 mph sustained wind at 952 AM. Sandy Point Shores had 40-41 mph sustained wind 444 PM to 514 PM. Cherry Point had sustained wind 40 mph 454 PM to 554 PM. About 10,000 customers lost power.
EPISODE_NARRATIVE	A deep but filling low moved northeast across central Vancouver Island. The KPDX-KBLI gradient reached about +10 with the KOLM-KBLI portion about 2/3 of that. There was brief high wind in several zones. |At the stormï¿½ï¿½ï¿½s peak, more than 14,000 Puget Sound Energy customers were without electricity, with the worst outages in Whatcom, Skagit and Island counties. On Thursday evening, more than 3,000 Seattle City Light customers were without power, most from an outage in Shoreline caused by a downed tree. ||From a Seattle Times article:||A storm with high winds Thursday caused power outages across the Puget Sound region and downed power lines and trees, including one that injured a semitruck driver in Snohomish County and another that trapped a man in North Seattle. |Gusts of more than 40 mph were reported in the Seattle area, with a peak of 44 mph recorded about three miles west of Des Moines, according to the National Weather Service. |The strongest winds were recorded in the northern interior and North Coast from a ï¿½ï¿½ï¿½pretty vigorous systemï¿½ï¿½ï¿½ that came in from the Pacific Ocean, meteorologist Johnny Burg said. The weather service issued a high-wind warning for the area. Destruction Island, off the North Coast, reported gusts of 63 mph, while Paine Field in Everett had a peak of 51 mph and a sustained wind of 39 mph. |A tree fell on a semi on Highway 530 near Oso on Thursday afternoon and trapped the driver inside, according to the State Patrol. The man was airlifted to Harborview Medical Center with critical injuries. Highway 530 just west of 310th Street Northeast was blocked in both directions for about an hour before it opened to alternating

	traffic around 5 p.m. ||Firefighters in Seattleï¿½ï¿½ï¿½s Bitter Lake neighborhood rescued a man trapped by a downed tree there. The man was taken to Harborview in stable condition with no visible injuries, according to the Seattle Fire Department. ||Fallen trees were reported from Bellevue to Bainbridge Island to Sedro-Woolley and were responsible for many of the Seattle City Light and Puget Sound Energy outages throughout the day. ||At the stormï¿½ï¿½ï¿½s peak, more than 14,000 Puget Sound Energy customers were without electricity, with the worst outages in Whatcom, Skagit and Island counties. On Thursday evening, more than 3,000 Seattle City Light customers were without power, most from an outage in Shoreline caused by a downed tree. ||Washington State Ferries canceled two afternoon runs between Port Townsend and Coupeville because of high winds.

EVENT_ID	593403
CZ_NAME_STR	WESTERN WHATCOM (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	08/29/2015 1043 PST-8 / 08/29/2015 1243 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/2)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($250000/ $0)
WFO	SEW
SOURCE	Newspaper
EVENT_NARRATIVE	Two elderly people died in their home near Everson after inhaling a generatorï¿½ï¿½ï¿½s exhaust fumes during the weekend power outage.
EPISODE_NARRATIVE	High wind struck parts of Western Washington beginning around mid-morning on Saturday August 29th and continued into the afternoon hours. Widespread tree damage and power outages occurred, about 450,000 in total. Storm force winds developed over the coastal waters and Northern Inland waters.

	Solid Gale force winds occurred on the remaining waters. Ferry service between Port Townsend and Coupeville was suspended because of the windstorm. ||A tree feel on an automobile in Gig Harbor resulting in 1 death. At least 23 car collisions reported around Puget Sound by news media, possibly weather related. Highway 99 closed for a few hours through downtown Seattle was weather-related according to media and Seattle Police. Numerous reports of trees or branches on roadways. Widespread power outages. Power outages examples: 161,000 Puget Sound Energy and 58,000 Seattle City light customers. ||A 10-year-old girl was killed in SeaTac when a falling tree branch hit and killed her. |Two elderly people died in their home near Everson after inhaling a generatorï¿½ï¿½ï¿½s exhaust fumes during the weekend power outage.

EVENT_ID	603539
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	11/17/2015 1124 PST-8 / 11/17/2015 1324 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($250000/ $0)
WFO	SEW
SOURCE	COOP Observer
EVENT_NARRATIVE	Lynden had 62 mph at 1124 AM. Some Puget Sound Energy customers lost power.
EPISODE_NARRATIVE	Windy conditions lasted for several hours over most of western Washington. There were about 370,000 power outages reported throughout western Washington.

EVENT_ID	608906
CZ_NAME_STR	CASCADES OF WHATCOM AND SKAGIT COUNTIES (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	42393 1230 PST-8 / 42393 1230 PST-8
EVENT_TYPE	Avalanche
DEATHS (Direct/Indirect)	(1/0)
INJURIES (Direct/Indirect)	(1/0)
DAMAGE (Property/Crops)	($0/ $0)
WFO	SEW
SOURCE	Newspaper
EVENT_NARRATIVE	Mark Panthen, 36, of Bellingham, died Sunday afternoon after two avalanches on the north slope of the mountain, next to the Mount Baker Ski Resort.|A man who was skiing with Panthen called an employee of the resort from a cellphone around 12:45 p.m., saying Panthen was injured and needed help.|There were two avalanches within 15 minutes. The avalanches were at 4,200 feet.|Using a helicopter, emergency responders confirmed Panthen died around 2:20 p.m., authorities said. They provided aid to the other skier, who suffered a head injury.
EPISODE_NARRATIVE	Mark Panthen, 36, of Bellingham, died Sunday afternoon after two avalanches on the north slope of the mountain, next to the Mount Baker Ski Resort. ||A man who was skiing with Panthen called an employee of the resort from a cellphone around 12:45 p.m., saying Panthen was injured and needed help.

EVENT_ID	615026
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	03/10/2016 002 PST-8 / 03/10/2016 913 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES	(0/1)

(Direct/Indirect)	
DAMAGE (Property/Crops)	($350000/ $0)
WFO	SEW
SOURCE	ASOS
EVENT_NARRATIVE	The Bellingham ASOS had 41g67 mph for several hours. A CWOP west of Bellingham recorded 41 mph before failing. Sandy Point Shores had 40g58 mph for several hours. A spotter 6 miles northeast of Bellingham reported an 80-mph gust. A Home Depot building in Bellingham was damaged.|Three fishermen were rescued by the U.S. Coast Guard early Thursday, when their commercial fishing boat broke free from its moorage in a windstorm. The boat had been moored near Bellingham Cold Storage. One fisherman injured his foot after he had to jump in the water.
EPISODE_NARRATIVE	High wind occurred for several hours on the coast and over the north interior. Power out to about 50000 customers. Hood Canal bridge closed for 2 hours. Ferry service suspended. A 75-year-old fishing boat was destroyed when it broke free from its moorage and was pounded against some rocks.

EVENT_ID	615033
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	03/13/2016 1434 PST-8 / 03/13/2016 1914 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($90000/ $0)
WFO	SEW
SOURCE	ASOS
EVENT_NARRATIVE	The Bellingham ASOS reported 36g58 mph. A CWOP west of Bellingham measured 50g67 mph over several hours. Sandy

	Point Shores recorded 44g68 mph over nearly five hours.
EPISODE_NARRATIVE	About 250,000 people lost power. A 42-year-old man died when his car was hit by a tree in Seattle's Seward Park. Several homes were damaged. Scaffolding at the UW was reduced to a pile of rubble by the winds. The Hwy 520 bridge and Hood Canal Bridge were closed for several hours, as was parts of I-405. There was minor damage to the 520 bridge draw span. A semi-truck was toppled on the Tacoma Narrows bridge, halting traffic. Downed trees blocked two lanes of southbound 405 in Snohomish County. Washington State Ferries canceled or delayed several routes.

EVENT_ID	673026
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	01/04/2017 204 PST-8 / 01/04/2017 404 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($153000/ $0)
WFO	SEW
SOURCE	Mesonet
EVENT_NARRATIVE	Sandy Point Shores recorded a gust of 58 mph. Puget Sound Energy responded to a number of power outages.
EPISODE_NARRATIVE	Brief high wind occurred at Sandy Point Shores.

EVENT_ID	666304
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	01/10/2017 1014 PST-8 / 01/11/2017 234 PST-8
EVENT_TYPE	High Wind

DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($208000/ $0)
WFO	SEW
SOURCE	Mesonet
EVENT_NARRATIVE	An unusually large number of sites recorded high wind. These include Sandy Point Shores, 38g67 mph; Ferndale, 21g60 mph; Lynden, 41g54 mph; Maple Falls, 60 mph gust; Lummi Island, 70 mph gust; and Everson, 65 mph gust. Puget Sound Energy responded to a number of power outages in the area.
EPISODE_NARRATIVE	In a strong Fraser River outflow pattern, high wind occurred in western Whatcom County and the San Juan Islands.

EVENT_ID	677905
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	02/08/2017 1400 PST-8 / 02/09/2017 1600 PST-8
EVENT_TYPE	Ice Storm
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($700000/ $0)
WFO	SEW
SOURCE	Official NWS Observations
EVENT_NARRATIVE	A multitude of observational sources (NWS spotters, CoCoRaHS, etc) show that 1 to 3 inches of snow fell across Western Whatcom County followed immediately by heavy freezing rain, resulting an ice sheet up to a half inch thick on top of new and older snow. The result was treacherous road conditions, power outages, and closures of businesses and schools.
EPISODE_NARRATIVE	A Pacific frontal system combined with sub-freezing easterly flow

	across the Cascades passes and Fraser outflow brought a major episode of snow and freezing rain to the Cascades and Western Whatcom County. All three Washington Cascades passes (Stevens Pass, Snoqualmie Pass, and White Pass) were closed to traffic in both directions for almost 24 hours due to snow and accumulating ice, avalanche danger, and slides of snow and trees. In Western Whatcom County snow became covered with a sheet of ice as thick as a half inch as precipitation changed to freezing rain.

EVENT_ID	706935
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	08/01/2017 2000 PST-8 / 08/10/2017 600 PST-8
EVENT_TYPE	Heat
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(5/0)
DAMAGE (Property/Crops)	($0/ $0)
WFO	SEW
SOURCE	Newspaper
EVENT_NARRATIVE	The heat wave resulted in 1 fatality due to heat-related causes, plus five other berry pickers treated for dehydration.
EPISODE_NARRATIVE	An extended period of unseasonably hot weather impacted Western Washington from the 1st through the 10th of the month. A male berry picker at a farm 1 mile east of Sumas in Whatcom County fell ill on the 3rd and later died. At least 5 other pickers were treated for dehydration.

EVENT_ID	721279
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)

BEGIN LOCATION	
BEGIN/END DATE & TIME	10/18/2017 1015 PST-8 / 10/18/2017 1415 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($800000/ $0)
WFO	SEW
SOURCE	ASOS
EVENT_NARRATIVE	KBLI had sustained wind 30 mph or greater from 1015 AM to 215 PM. Highest sustained wind was 33 mph with a peak gust of 53 mph. This verifies the high wind warning for this first event of the season, when lower criteria for high wind are in effect.
EPISODE_NARRATIVE	High wind was forecast over the two coast zones and four northwest interior zones. Since this was the first event of the season, wind speeds somewhat less than typical high winds were forecast, but impacts were expected to be similar to what higher winds would cause later in the season.

EVENT_ID	723713
CZ_NAME_STR	WESTERN WHATCOM COUNTY (ZONE)
BEGIN LOCATION	
BEGIN/END DATE & TIME	11/13/2017 1413 PST-8 / 11/13/2017 1723 PST-8
EVENT_TYPE	High Wind
DEATHS (Direct/Indirect)	(0/0)
INJURIES (Direct/Indirect)	(0/0)
DAMAGE (Property/Crops)	($250000/ $0)
WFO	SEW
SOURCE	Mesonet
EVENT_NARRATIVE	Ferndale recorded a 69-mph gust. Lynden recorded a 61-mph gust. Sandy Point Shores recorded 41 mph sustained wind, gusting to 59 mph. KBLI recorded a peak gust of 58 mph. A CWOP near Bellingham recorded 40 mph sustained wind, gusting to 58 mph.
EPISODE_NARRATIVE	A strong Pacific weather system moved through Western Washington and produced wind gusts up to 70 mph in many parts of the region. The strong winds blew down some trees, knocked power out to as many as 200,000 through the area, delayed or cancelled ferry service, and produced heavy rain amounts that produced some local urban flooding. The peak of the wind event occurred between 2 and 7 PM, adversely impacting the afternoon and evening commute. A tree fell on a vehicle in Renton, killing the 32-year-old female driver and seriously injured a passenger. Another tree fell onto a mobile home in Port Orchard, seriously injuring a 15-year-old girl. Power restoration cost just over $7 million.

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SECTION 3. JURISDICTION PROFILES AND MITIGATION ACTION PLANS

The following section chapters provide profiles and future mitigation actions for the participating jurisdictions in this Plan. Each chapter is organized into the following sections:

1. **Contact Information** – the person involved with providing information for the Plan from the jurisdiction.
2. **Approving Authority** – the person or persons who will approve the final version of the Plan.
3. **Planning Process** – describes how the jurisdiction updated the Plan.
4. **Key Contributor List –** lists both the individuals who contributed to the Plan update and lists other documents that are, or will be, informed by the updated Plan.
5. **Plan Maintenance –** explains how the Plan will be maintained and how its contents will be communicated to the public.
6. **Geography** – provides Census Bureau population information and area, as well as a jurisdiction map.
7. **Growth Trends** – areas designated as an Urban Growth Area (UGA), under Washington State's Growth Management Act (GMA).
8. **Presence of Hazards and their Impacts** – provides a table of major hazards, the area exposed to the hazards, a qualitative assessment of the severity of impacts anticipated, and a brief description of each hazard and its potential impacts.
9. **Natural Hazard Maps** – provides seismic, wildland-urban interface, liquefaction, flood, landslide, volcano, and tsunami hazard maps for the jurisdiction. Please note the hazard maps may display only those facilities within municipality limits, so facilities outside these limits may not be displayed. Refer to the map in the Whatcom County section for facilities located outside of a jurisdiction's city limits. Most recent natural hazard datasets available were used for the maps. Data used includes: Federal Emergency Management Agency (FEMA) 2019 flood risk, Washington Department of Natural Resources (WA DNR) 2010 liquefaction susceptibility, WA DNR 2017 Boulder Creek Fault Zone seismic, WA DNR 2019 wildland-urban interface, Washington Geological Survey (WGS) 2020 landslide inventory data, United States Geological Survey Mount Baker Future Activity (1995), and Whatcom County 2020 tsunami inundation data. All

data projected to NAD 1983 StatePlane Washington North FIPS 4601 (US Feet) coordinate system. No data used was changed, only symbology was edited.

10. **Critical Facilities List** – list of critical facilities for each jurisdiction's area. These facilities were provided by each jurisdiction and include the facility name, type of facility, location information, and qualitative assessment of the significance of each facility. The section also includes a critical facilities map.

11. **Areas and Assets Exposed, Per Hazard –** geospatial analysis was performed to calculate the percent of area, population, parcels, and critical facilities exposed to different levels of seismic, liquefaction, landslide, volcano, tsunami, flood, and wildfire risk. Areas and assets exposed to hazards were calculated using Whatcom County parcel data, jurisdiction boundaries and critical facilities, natural hazard data, and Washington State Office of Financial Management (OFM) 2020 population and housing estimates for census blocks. The percent of area and parcels were calculated in ArcGIS Pro using the tabulate intersect tool, which calculates the intersection of two feature classes. For the parcel geospatial analysis, only parcels 45% or greater in a hazard were considered for the asset table. The percent of critical facilities in each hazard was found using the overlay layers tool. This tool takes multiple layers and outputs one single layer, keeping each layers' attributes. Percent of population was calculated only using 2020 population data. Since the population data is in census blocks, in order to calculate percent of population, population was allocated. This assumes population is evenly distributed among the census block, although this is generally not the case, the assumption is made to calculate the estimates. The census block population data was intersected with each natural hazard data layer to join only census blocks that overlapped with a hazard. The area of the new census block (that overlaps with the hazard) were calculated. The area of the new census block was then divided by the original census block, multiplied by the original census block's 2020 population to estimate how many people were in a hazard zone.

12. **Public Outreach and Education –** each jurisdiction identified the programs engaged public outreach and education, including those programs administered by non-profit organizations, through the local government, through schools, or public-private partnerships. StormReady and Firewise certification was also assessed.

13. **Status of 2015—2020 and Ongoing Hazard Mitigation Actions** – each jurisdiction reviewed and provided an update to actions proposed in the 2016 Plan, such as indicating whether the action was completed, deferred, or ongoing. Those that had not

been started or completed were considered for 2021-2025.

14. **Proposed Hazard Mitigation Strategy for 2021-2025** – lists jurisdiction-specific actions put together by each jurisdiction. This information is a detailed jurisdiction-specific extension of each hazard summary and assessment of past proposed actions. A review was conducted internally by each jurisdiction to determine priority for the mitigation actions and maximize anticipated benefits.
15. **Hazard Specific Action Items 2021-2025 Annual Review and Progress Reporting** – provides a framework for tracking 2021-2025 mitigation actions and annual progress reporting.

Overall Exposure of Whatcom County Assets

Below is the overall assessment of how much exposure the county has to key natural hazards. It analyzes exposure by area, population, parcels and critical facilities and includes both unincorporated and incorporated sections of the county. The results show that the entire county is exposed to earthquake hazard and about two thirds of the county is exposed to some flood risk, although only about 4% is in the designated 100-year and 500-year flood plain; due to good natural hazards planning, only 8% of the population levels in these flood risk areas. A third of the county area is exposed to liquefaction risk, though a majority of residents live in this area. About a third of the county is exposed to volcanic hazard, with only a very small portion of the population in these areas. About 15% of the county is in the WUI, exposed to wildfire, but over half of the population lives is in these areas.

Whatcom County Exposure to Natural Hazards						
	Hazard Susceptibility	**Asset County (% of Total)**				**Critical Facilities Appraised Value (Million)**
		Area (sq.mi.)	**Population**	**Parcels**	**Critical Facilities**	
Geological	**Earthquake**, Shaking Intensity					
	MMI IV	8.9%	-	0.03%	-	-
	MMI V	36.7%	10.7%	15.7%	17.5%	$722 [1]
	MMI VI	34.3%	77.4%	66.8%	62.3%	$2235 [1]
	MMI VII	13.5%	8.1%	8.4%	14.6%	$97 [1]
	MMI VIII - IX	6.6%	3.7%	7.4%	5.4%	$76
	TOTAL	100%	99.9%	98.3%	99.8%	$3130
	Liquefaction					
	Very Low to Low	16.9%	41.2%	41.8%	39.2%	$942 [1]
	Low to Moderate	7.5%	29.8%	27.5%	20.3%	$1506 [1]

	Moderate	-	-	-	-	-
	Moderate to High	4.9%	5.8%	8.5%	16.3%	$140 [1]
	High	0.02%	0.04%	0.04%	2%	$249 [1]
	TOTAL	29.32%	76.84%	77.84%	77.8%	$2837
	Landslide					
	Landslide Low	0.8%	0.1%	0.25	-	-
	Landslide Moderate	1.2%	0.09%	0.1%	-	-
	Landslide High	3.2%	0.5%	1.9%	0.6%	-
	Fan Low	0.1%	0.04%	0.06%	-	$0.3
	Fan Moderate	0.4%	0.1%	0.2%	-	-
	Fan High	0.9%	1%	1.9%	1.4%	$3 [1]
	Mine Hazard	0.1%	2.6%	2.1%	0.8%	$19 [1]
	TOTAL	6.7%	4.43%	6.51%	2.8%	$22.3
	Volcanic Eruption					
	Case 1 Debris Flows	1.8%	1.9%	2.1%	6.2% [3]	$74 [1/3]
	Case 2 Debris Flows	1.1%	0%	-	-	-
	Case M Flows	3.3%	4.3%	6.3%	11% [3]	$111 [1/3]
	Pyroclastic Flows, Lava Flows, and Ballistic Debris	6.8 %	0.1%	0.6%	0.8% [3]	$0.3 [3]

	Lateral Blast Hazard Zone	26.2%	0.1%	5.5%	3.1% [3]	$21 [1/3]
	TOTAL	39.2%	6.4%	14.5%	21.1%	$206.3
	Tsunami, Inundation Zone					
	Low to Moderate Inundation Potential	0.3%	1.4%	1.1%	3.7%	$24[1]
	Moderate to High Inundation Potential	0.3%	2.4%	0.5%	5.4%	-
	High Inundation Potential	0.7%	0.5%	4.9%	6.2%	$335 [1]
	TOTAL	1.3%	4.4%	6.5%	15.3%	$359
Hydrological	**Flooding**					
	100-year Flood	3.9%	4.9%	8%	31.8%	$119 [1]
	500-year Flood	0.5%	1.6%	3.4%	16.9%	$164 [1]
	Floodway	0.9%	1%	-	0.8%	$34 [2]
	Undetermined (Zone D)	60.4%	0.04%	0.05%	0.6%	$9
	TOTAL	65.7%	7.54%	11.45%	50.1%	$326
Meteorological	**Wildfire Zones**					
	Interface Very Low-Low Structure Density	1%	1.03%	7.7%	2%	$27
	Interface Medium-High Structure Density	1.6%	31.2%	26.9%	27.9%	$1851 [1]
	Intermix Very Low-Low Structure Density	6.9%	8.4%	1.6%	12.1%	$118 [1]

	Intermix Medium-High Structure Density	4.7%	18.4%	30.4%	22.8%	$86 [1]
	TOTAL	14.2%	59.03%	66.6%	64.8%	$2082

[1]This value shows the total of 2020 Whatcom County parcel data appraised total value and community's critical facility assessed dollar value (found in the community's critical facilities list). The critical facility's assessed dollar value was used instead of the appraised total value when available.

[2]Shows the assessed dollar value when provided by the community in their critical facilities list. Does not include the appraised total value.

[3]Some critical facilities located in multiple hazard zones.

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CITY OF BELLINGHAM

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Approving Authority

Mayor Seth Fleetwood and City Council Members

210 Lottie Street

Bellingham, WA 98225

360 778 8000

Planning Process

The City of Bellingham's process for the 2021 update of the Whatcom County Hazard Mitigation Plan began in January of 2021 when the City's Emergency Manager attended a "Kickoff" meeting hosted by the Whatcom County Sheriff's Division of Emergency Management. This was the first of five planning meetings hosted by DEM staff. During the next several months the City's Emergency Manager and the Environmental Policy Manager met with staff from multiple City departments including Planning, Public Works, Parks, Police and Fire to solicit input on sections of the 2016 NHMP that needed updates and new goals and actions for the 2021 revision. The City's Planning Senior GIS Analyst also reviewed the plan and provided key updates to the Critical Facilities list and the plan maps. In addition to the planning meetings and outreach to City staff, a news release describing the planning process and soliciting public input was issued on March 2, 2021. The news release also included social media posts on the City's

and Fire Department's Facebook pages. The Emergency Manager also created a webpage for the plan update that directed the public to the County's website to review and comment on the plan in the public comment portal that DEM created. The City Council was provided an update on the process on March 22 which was followed by a public meeting hosted by DEM on March 23. In preparation for the public meeting the Emergency Manager also created a meeting announcement that was sent out to the City's list serve and it was posted on the Fire Department's Facebook page. Subsequent public meetings were advertised in a similar fashion.

The 2021 update of the NHMP received substantial assistance from Dr. Paci-Green, Director of the Resilience Institute, and two masters level students at Western Washington University as they revised the format of the Countywide NHMP, developed content, and provided consultation to City of Bellingham staff working on the update.

Key Contributor List

- Liz Coogan, Emergency Manager, City of Bellingham
- Clare Fogelsong, Environmental Resource Manager, City of Bellingham
- Chris Behee, Planning Senior GIS Analyst, City of Bellingham

The information contained in the Natural Hazards Mitigation Plan update regarding hazards, risks, vulnerability and potential mitigation is based on the best available science and technology currently available. This information and related data on natural hazards potentially impacting City of Bellingham will be used as a tool when the City updates other plans and programs, such as the following:

- Comprehensive Plan required by the Growth Management Act (GMA)
- Development regulations required by the GMA
- Critical Areas Ordinance
- Capital Improvement Program
- Capital facilities planning
- Water Resource Inventory Area planning
- Shoreline Master Program
- Climate Adaptation Plan

- Habitat Restoration Plans
- Wildfire Risk Reduction Programs
- Neighborhood plans

As additional information becomes available from other planning sources that can enhance this Plan, that information will be incorporated through the periodic update process.

- Coastal Storm Modeling Systems, CoSMoS, will provide additional information on Sea Level Rise/Storm Surge impacts on the waterfront lands of Bellingham Bay. Expected to be available by June of 2021.
- Sea Level Rise Vulnerability Assessment and Risk Analysis for Bellingham Bay. Expected to be completed in June of 2022.

Plan Maintenance for the City of Bellingham

The City of Bellingham Office of Emergency Management cultivates awareness of local hazards, disaster preparedness, and resiliency in the community through a variety of education and outreach activities.

Presentations on hazard awareness and preparedness are delivered to the public in person and via videoconferencing. Information about local hazards and emergency preparedness guides are made available to the public in print and electronic forms. Outreach efforts are amplified by regular contact with twenty-five neighborhood associations which maintain close ties with households in their respective areas. Public engagement and input are encouraged through the neighborhood associations and in all interactions with this office.

The Office of Emergency Management coordinates grassroots disaster planning and resiliency at the neighborhood level by providing support and coordination for an ongoing Map Your Neighborhood program that is conducted by and for neighborhood households. The Office of Emergency Management coordinates and participates in local safety fairs and other relevant community connection programs when available.

A volunteer Auxiliary Communications Service (ACS) unit is also supported and coordinated as an opportunity for higher levels of public involvement and a resource for the Fire Department. This office also maintains open channels for ad hoc questions and comments from the public, including social media accounts, email, telephone, and text, with a representative assigned to interface with the public.

Public Outreach and Education

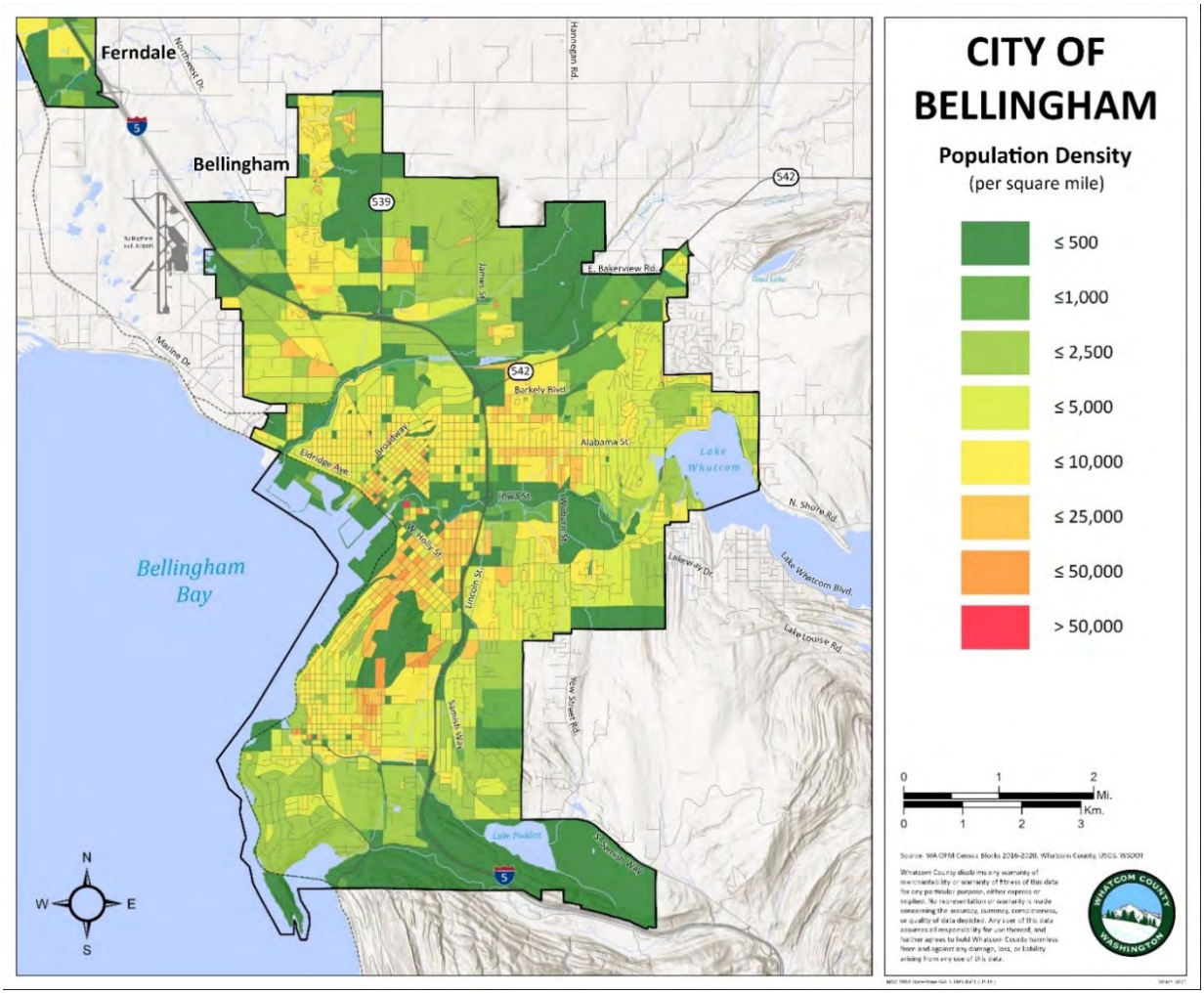
Program	Yes/No, Year Adopted	Description
Nonprofit organizations or local resident groups focused on hazard mitigation, emergency preparedness, vulnerable populations, etc.	Yes, 1999	Map Your Neighborhood has been in use by Bellingham since 1999. This network allows for residents to prepare to help their neighbors before help can arrive following a disaster, which will save lives.
	Yes, 1999	**CERT:** Community Emergency Response Training prepares residents to safely and efficiently assist others in their neighborhood or workplace following an event when professional responders are not immediately available to help.
	Yes, 2019	Bellingham Auxiliary Communication Service was initiated in 2019 to provide amateur radio communication support for City public service agencies and authorized volunteer emergency response units.
Ongoing public education or information programs	Yes, 2019	Public outreach events were delivered on tsunami

		awareness in 2019 and will resume post-COVID
School-related programs for natural hazard safety	Yes	Partnering with Red Cross for disaster awareness education in classrooms. Bellingham School District participates in the state-wide Great ShakeOut drill each October.
StormReady certification	Yes, 2003	Whatcom County is one of 14 counties in Washington State to be certified StormReady. StormReady uses a grassroots approach to help communities develop plans to handle all types of extreme weather.
Firewise Community certification	Yes, 2019	Clark's Point is a Firewise site as of November 1st, 2019.

Overview of Bellingham, Hazards, and Assets

Geography of the City of Bellingham

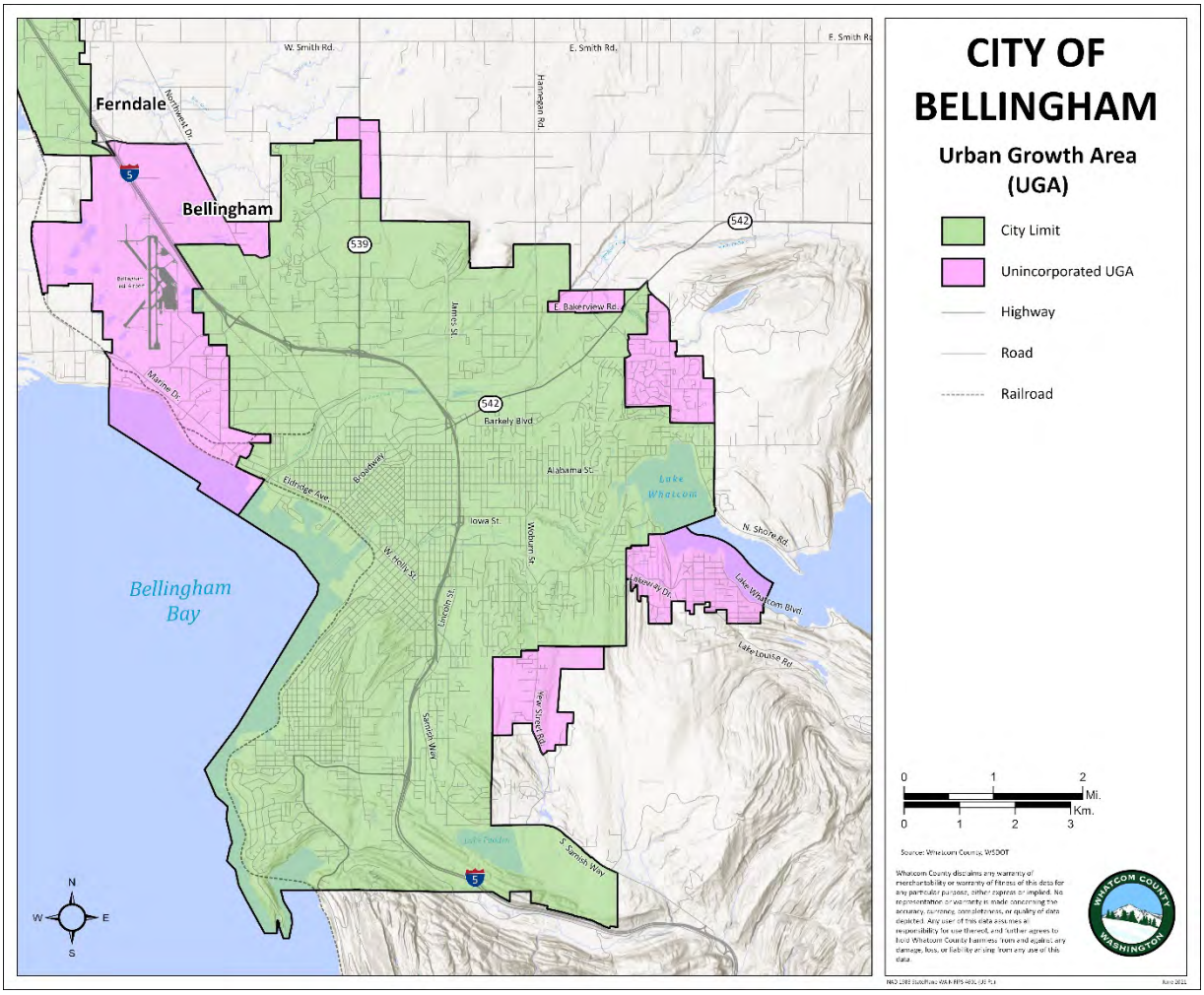
Bellingham Population	91,610 (2020 estimate)
Total area	28 sq. mi. (within city limits)



Washington State Office of Financial Management (OFM) 2020 population and housing estimates for 2010-2020 census block data. This map uses the 2016-2020 average population to show population density per square mile.

Growth Trends

This map displays the UGA for the City of Bellingham, as designated by the Whatcom County Comprehensive Plan.



Presence of Hazards and their Impacts in the City of Bellingham

Natural hazards that could occur in the City of Bellingham would be related to flood events, landslides, wildfires, and earthquakes/tsunamis, as well as the effects of sea level rise and storm surge on additional flood events and marine bluff destabilization.

Since the adoption of the 2016 NHMP, Bellingham has grown by roughly 6000 people. Most City growth has occurred outside flood and landslide areas, in accordance with the City's Critical Areas Ordinance, which regulates development in these areas. In partnership with the Port of Bellingham, the City has begun development on the Waterfront Subarea, portions of which would be at risk of tsunami inundation. This risk is being mitigated by the installation of tsunami sirens, the development of a countywide tsunami action plan, the creation of tsunami evacuation route maps, and building design and construction that accounts for tsunami forces. More information on where development in Bellingham is allowed can be seen in Bellingham Municipal Code below.

The Bellingham Municipal Code (BMC) has regulations related to flooding, landslides and sea level rise.

BMC 16.55.390, .400. Addresses development in frequently flooded areas. Generally, these rules prohibit development in the FEMA floodway and severely limit development in the FEMA Floodplain (limited infrastructure). The City has also mapped frequently flooded areas NOT recognized by FEMA that could - if allowed to develop - experience impacts and damage to property as well as present a risk to life safety and welfare - not to mention additional impacts to floodplain function. The floodplain rules are more effective at determining WHERE development occurs.

BMC 16.55.450 and .460. Development in geologically hazardous areas (landslide and seismic) requires additional geo-technical analysis by a qualified professional to certify that if a landslide or earthquake occurred structures would not be compromised, inhabitants would remain safe and abutting property owners would not incur damage from failed structures. These rules don't necessarily limit WHERE development can occur but rather, the FORM that it takes in order to be safe.

BMC 16.30 EXHIBIT A – Section B 1-7. Development in areas expected to be impacted by Sea Level Rise. As part of construction of on-site infrastructure, site grades shall be raised to accommodate potential long-term sea level rise and tsunami conditions, appropriate to the design lifetime of the project, as determined using the higher end of the range predicted using best available science. The range of Sea Level Rise encoded in Bellingham regulations is found in the Waterfront District sub-area plan: "Sea Level Rise. The Waterfront District infrastructure

and development will be constructed to accommodate potential long**[1]**term sea level rise and tsunami conditions. Development in the Waterfront District shall be constructed in accordance with the best available sea level rise science at the time the development occurs. Recent climate change studies have projected sea level to rise 15" to **50**" over the next 100 years.

In the table below is a list of the major hazards that effect Whatcom County. The second column provides the percentage of Bellingham's total area that is exposed to each hazard. The third column indicates the severity of anticipated impacts to community function, considering the credible worst-case hazard scenario. Severity of anticipated impacts considers effects on basic community function such as shelter, transportation, utilities, commerce, industry, agriculture, education, health, recreation, and cultural identity. Severity ranges from none to extreme, as shown in the key below the table. Finally, the last column of the table describes where the hazard impacts the community and which services the hazard would most significantly impact.

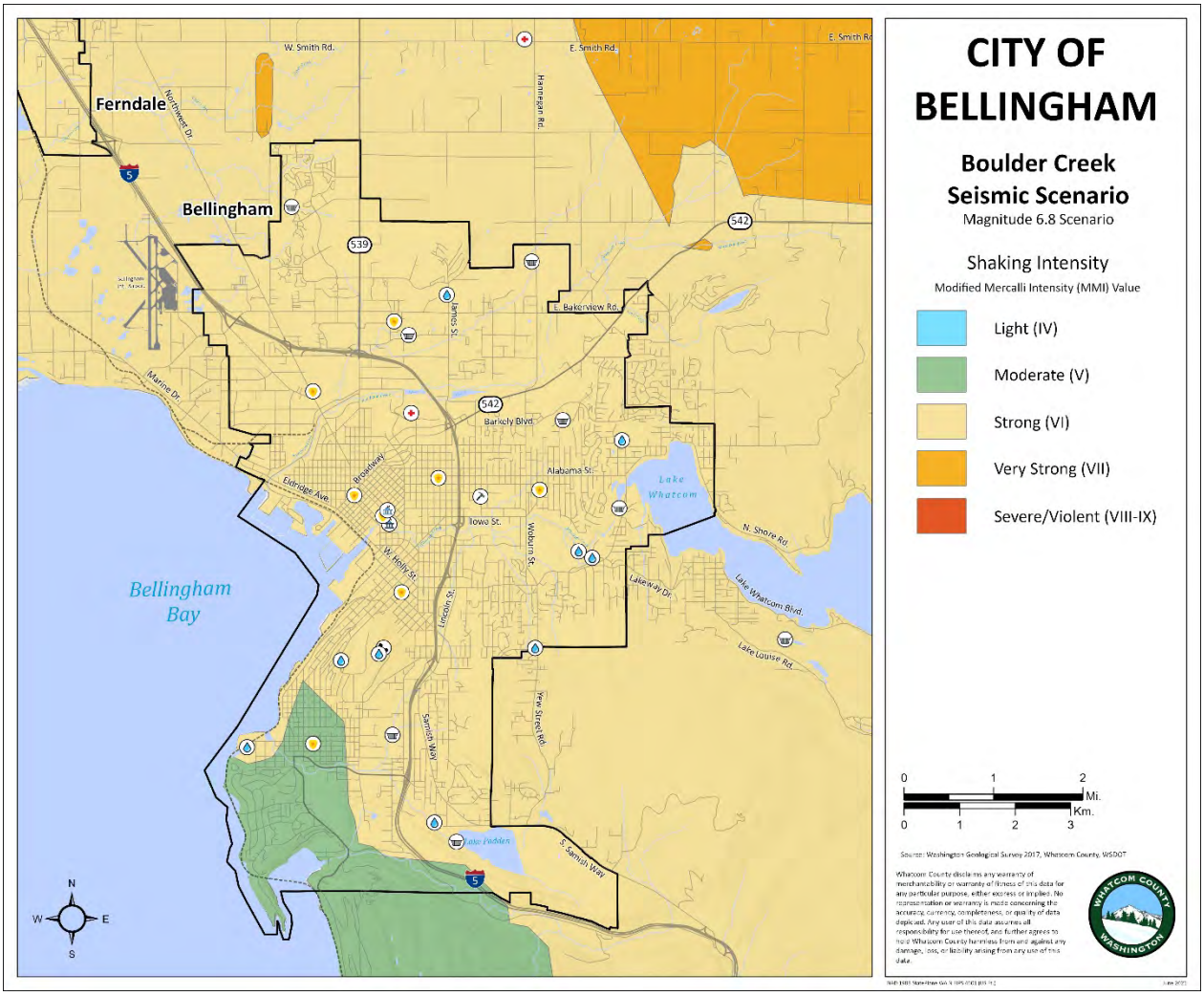
	Hazard	% area Exposed	Severity of Anticipated Impacts	Hazard Descriptions
Geological	**Earthquake**	95.2%	High	An earthquake of a magnitude predicted in the Cascadia Rising exercise would have citywide impacts as well as regional impacts of multi month duration. There is the potential for damage to roads, utilities, water supply infrastructure, communication, buildings of all types and the marine waterfront. Disruption of food and fuel delivery as well as interjurisdictional aid is also likely. Damage to the Lake Whatcom control dam would be an added flooding hazard.
	Liquefaction	64.4%	Mod	Destabilization of soils in waterfront areas built on fill would damage buildings, utilities, roads, and parks in those areas.
	Landslide	0.13%	Low	Landslides due to soil destabilization from precipitation saturation could be limited to geologically vulnerable areas identified by the Critical Area Ordinance development process. Landslides from bluff erosion due to sea level rise would be limited to marine bluffs i.e. Edgemore, Eldridge, Marine Drive. Landslides that result from earthquakes could be more widespread, impacts would be to residences, some commercial buildings, and utilities.
	Volcano	0%	Low	In addition to the potential ashfall within the City, the Middle Fork Diversion Facility would be impacted by lahar flows in the river.
	Tsunami	3.1%	Mod	A severe tsunami resulting from a large earthquake would significantly impact the shoreline of Bellingham Bay. Roads,

				buildings, marinas, parks, fish and wildlife habitat, and utilities could be damaged.
	Mine Hazards	4.5%	Mod	Limited to two areas of the city, Birchwood neighborhood and the downtown business district, that include critical infrastructure, residences, and commercial buildings.
Hydro-logical	**Flooding**	9.67%	Low	Multiple creeks systems (Chuckanut, Padden, Silver/Bear, Squalicum, and Whatcom that pass through the city are subject to flooding. In heavy rains these creeks can exceed their banks. Near term impact of flooding due to storm surge disrupts passability of Roeder Avenue. Long term impacts of sea level rise may be severe unless anticipated and mitigated.
Meteorological	**Wildfire**	57.7%	Mod	Mostly limited to the urban/rural edge and damage to residences, parks and some commercial buildings. Wildland-urban interface areas adjacent to large parks and natural areas will increase risk in a warming climate. Regional fires degrade air quality.

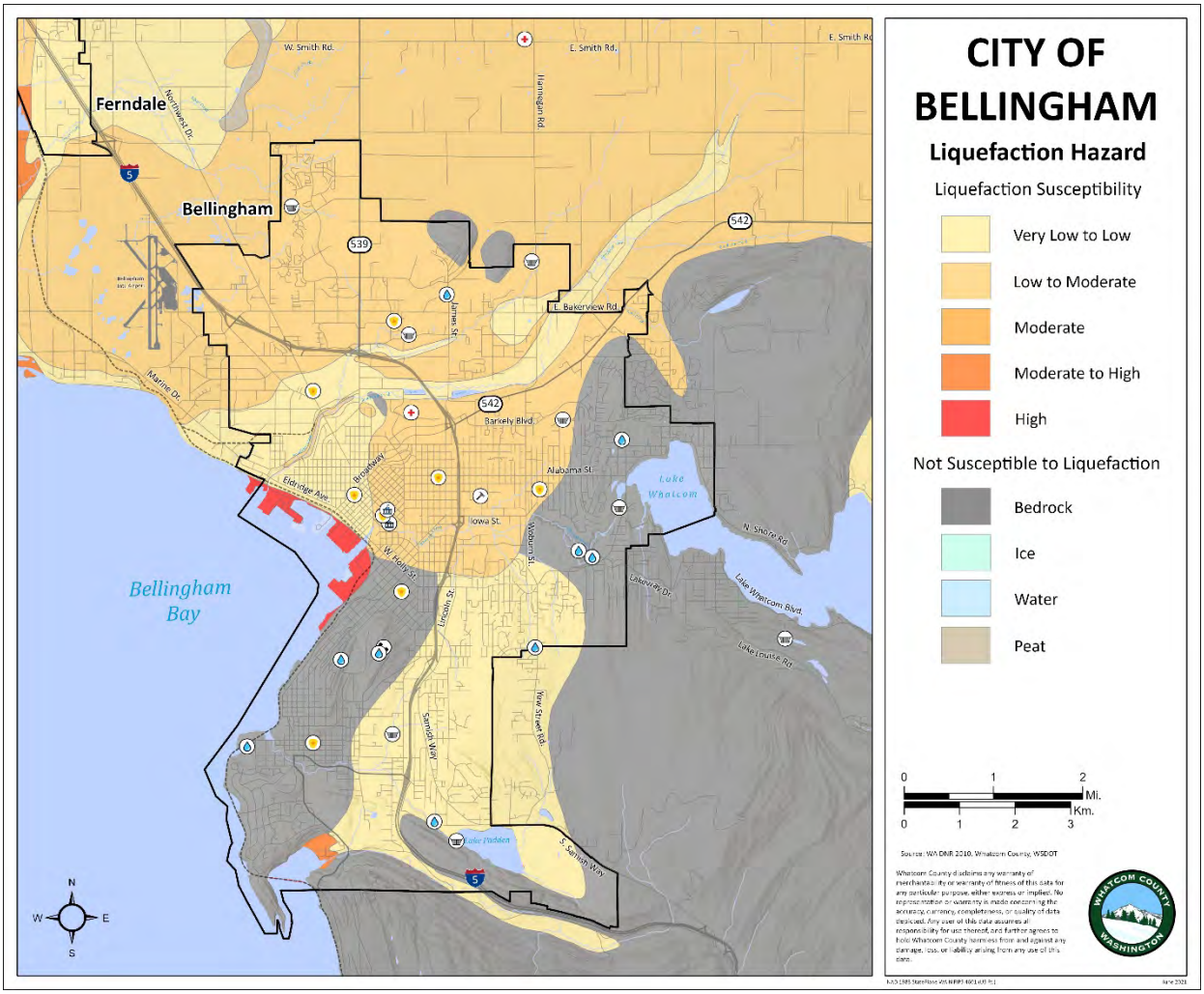
Severity Scale: **None** = no impact to community function
Low = minor degradation of community functions, not widespread
Moderate = moderate degradation over multiple weeks or widespread
High =degradation or loss over many weeks, widespread

Natural Hazard Maps

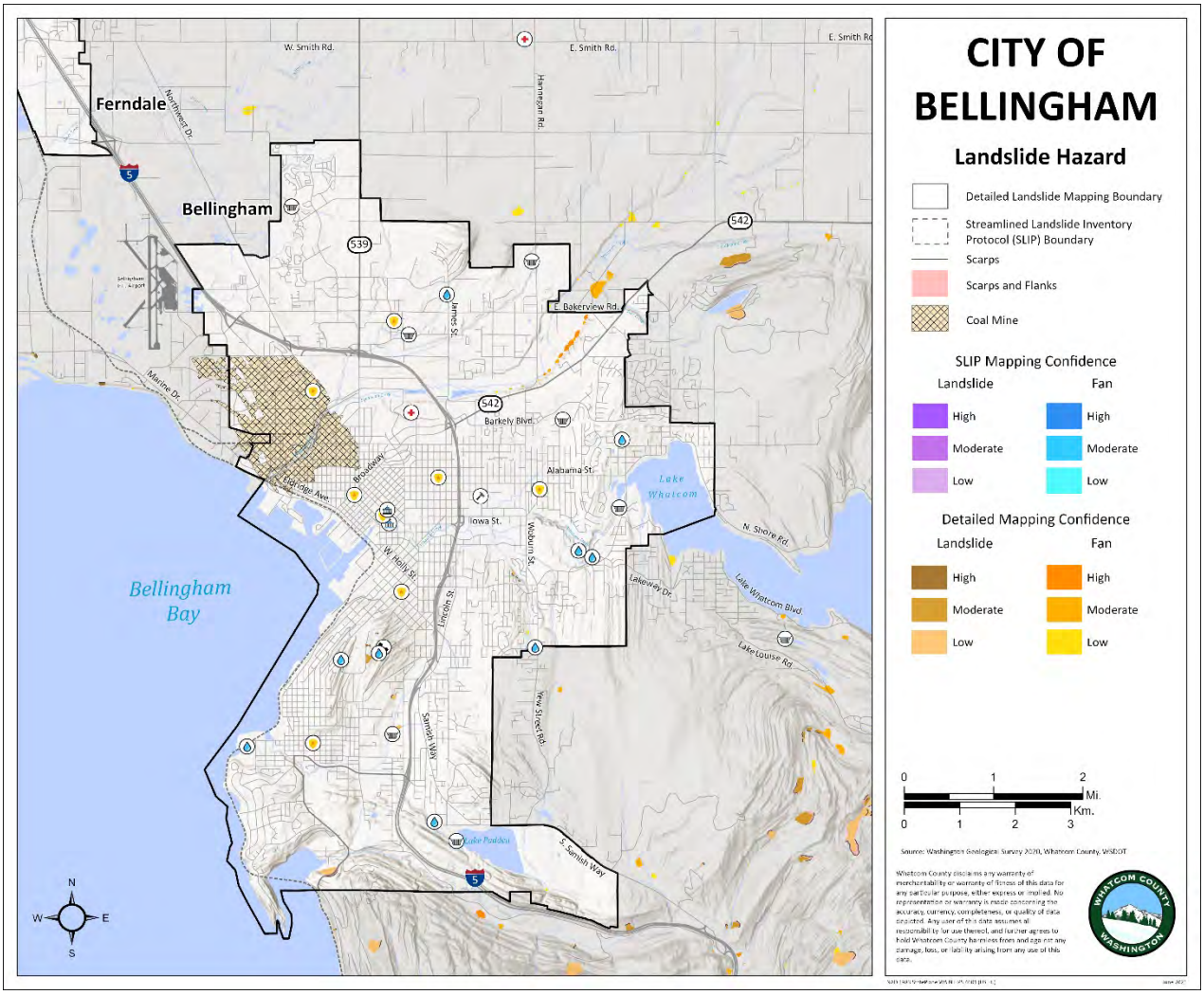
The following figures depict the natural hazards present within the jurisdiction.



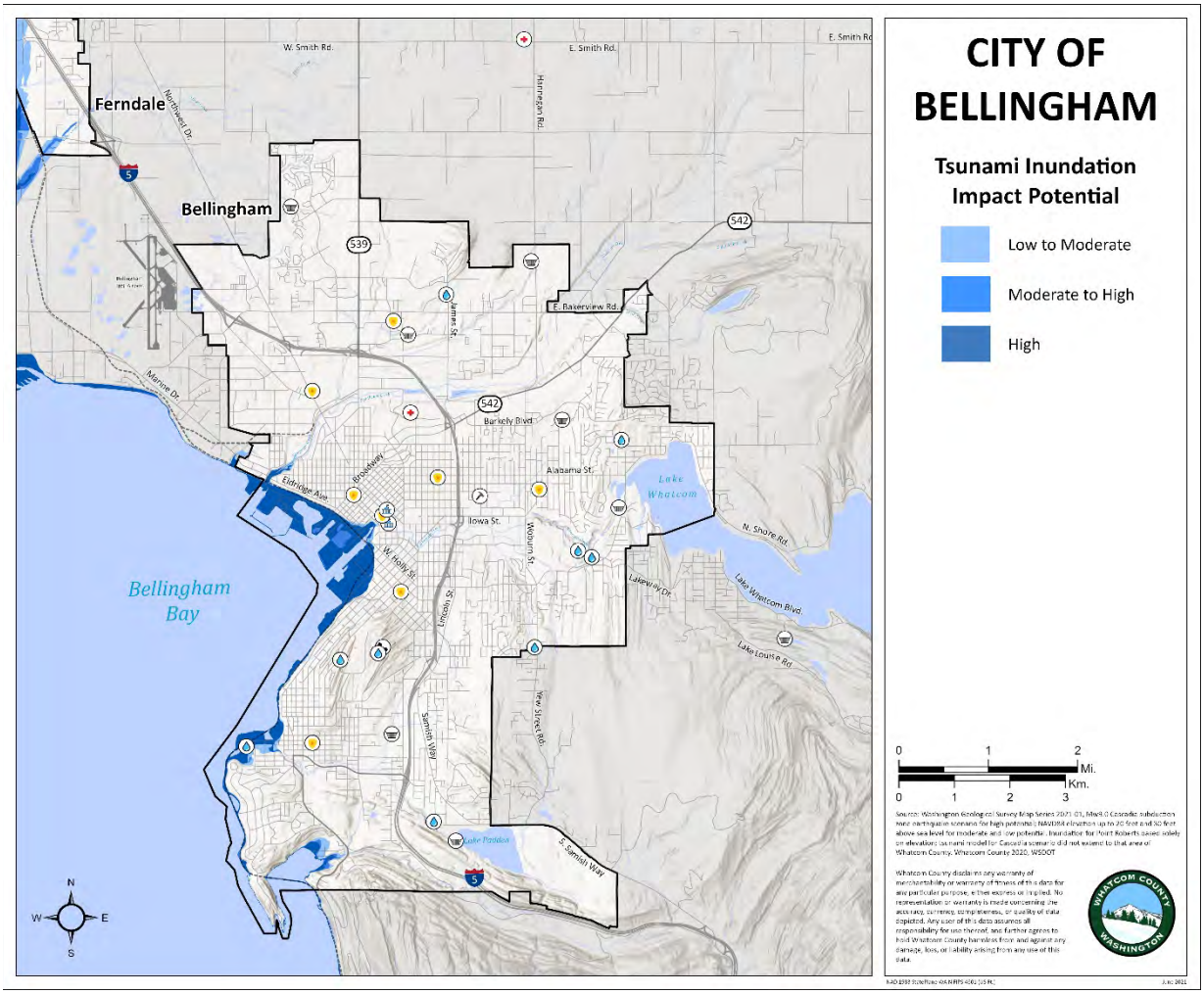
Washington Department of Natural Resources (WA DNR) 2017 Boulder Creek Fault Zone seismic scenario of magnitude 6.8 data. Displays extent and severity of the modeled earthquake in the Modified Mercalli Intensity (MMI) scale.



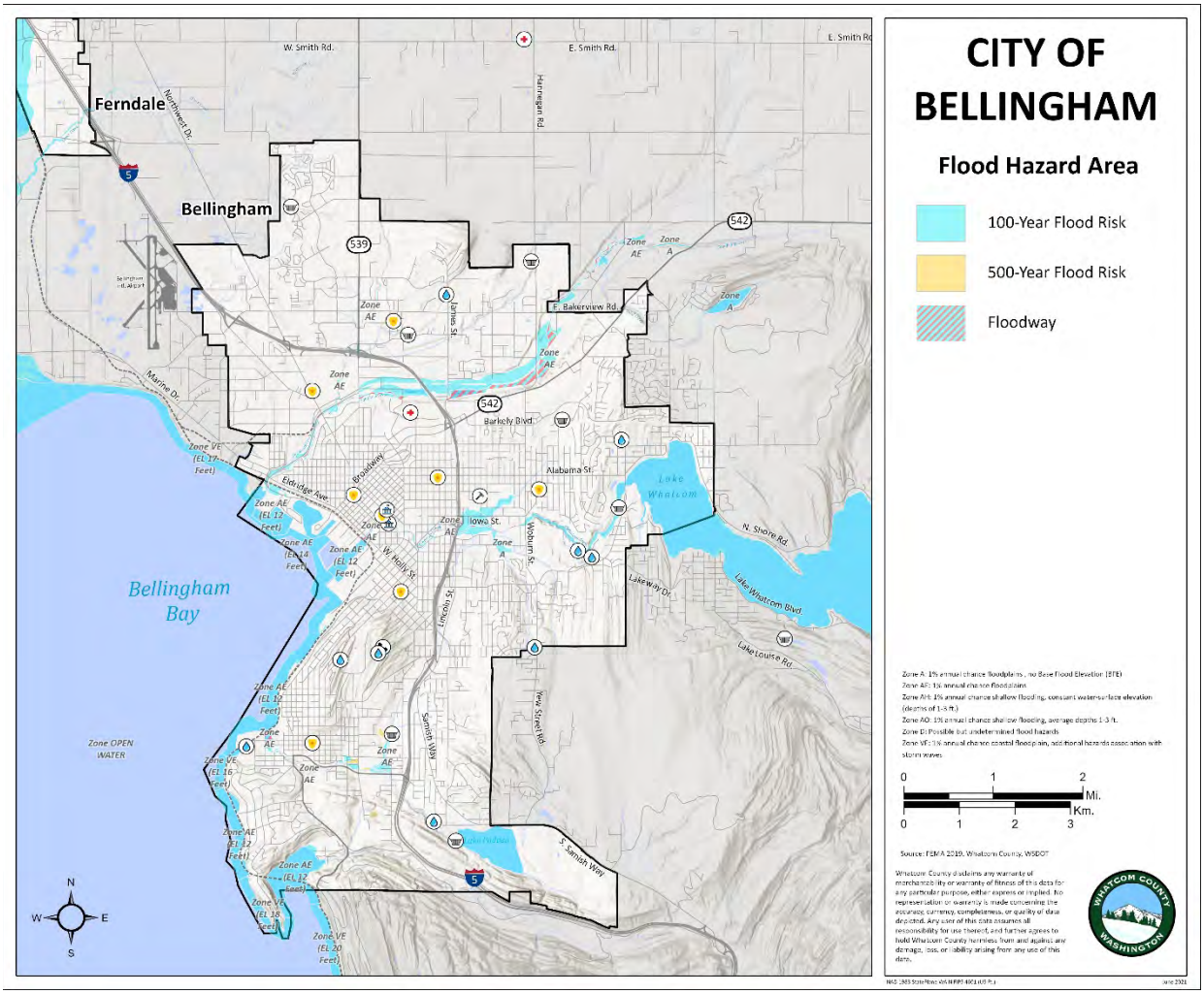
Washington Department of Natural Resources (WA DNR) 2010 liquefaction susceptibility data. This feature class is part of a geodatabase that contains statewide ground response data for Washington State.



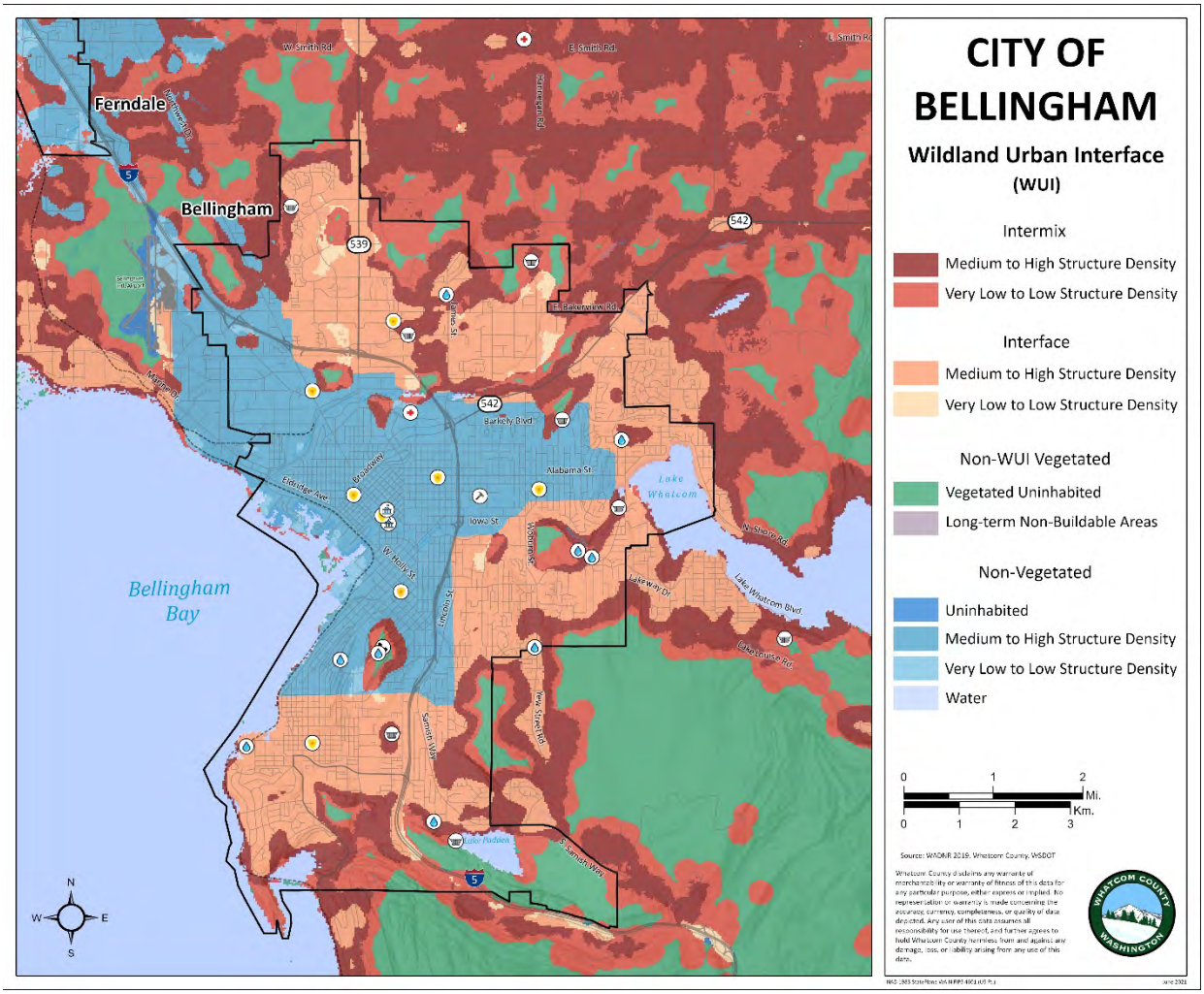
Washington Geological Survey (WGS) 2020 Washington landslide inventory data compiled following streamline landslide mapping protocol (SLIP). SLIP was developed by the WGS's Landslide Hazards Program to help geologists rapidly map landslide landforms from lidar. This data shows both detailed mapping and SLIP landslide data.



Map of Bellingham tsunami inundation impact potential. The high impact potential zone is based upon Washington Geological Survey Map Series 2021-01, Mw9.0 Cascadia subduction zone earthquake scenario occurring at mean high tide. The moderate to high and the low to moderate impact potential areas are based upon elevation of up to 20 feet and 30 feet, respectively, above mean sea level (NAVD88). Inundation for Point Roberts is based solely on elevation; tsunami model for the Cascadia subduction zone scenario did not extend to Point Roberts.



FEMA 2019 flood hazard data showing 100-year flooding, 500-year flooding, floodways, and flood zones. FEMA flood data includes both riverine and coastal flooding.



Washington Department of Natural Resources (WA DNR) 2019 mapped data of Washington's Wildland Urban Interface (WUI). The WUI displays areas of WA where structures and wildland overlap with specific structure densities.

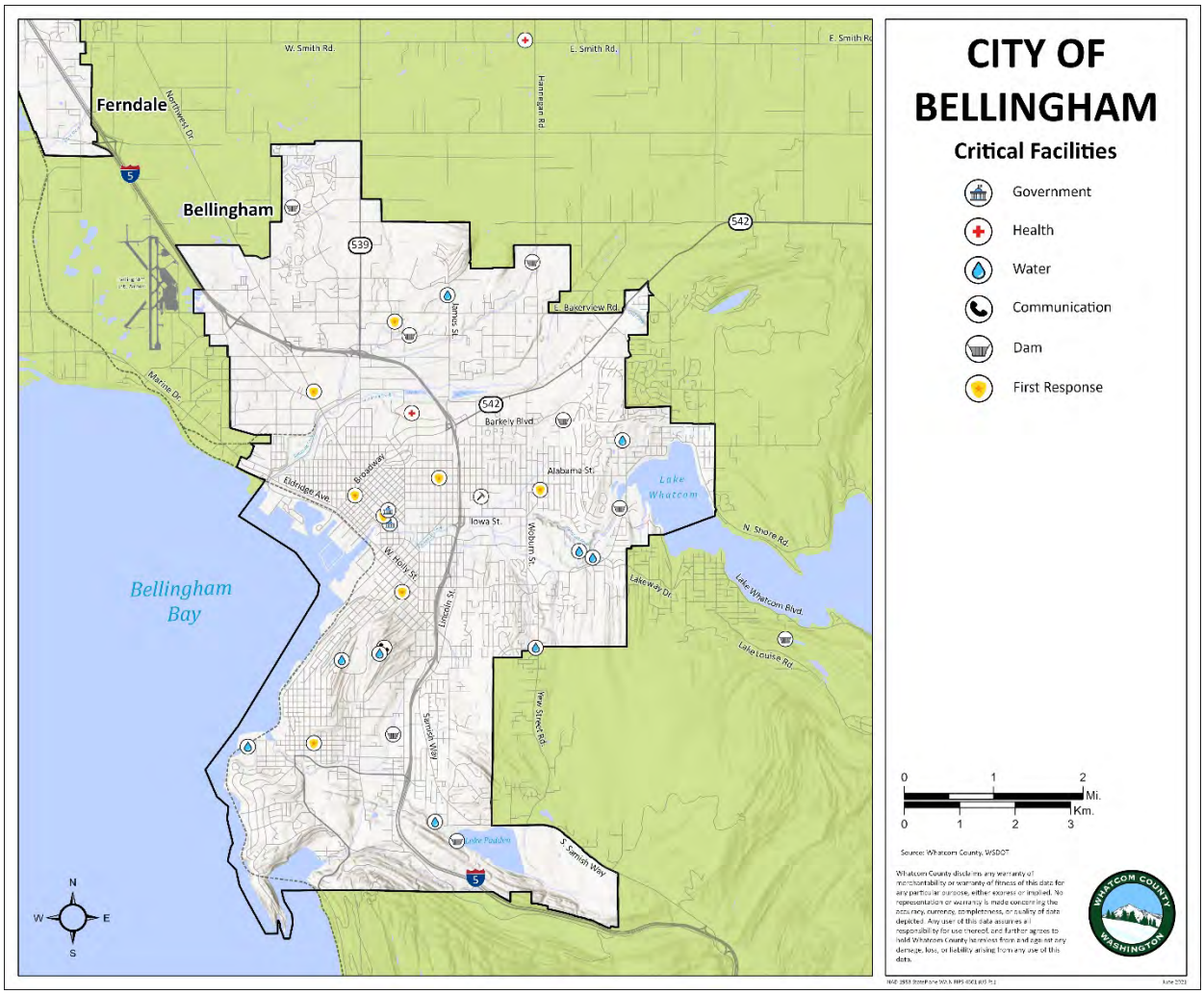
City of Bellingham's Critical Facility List

Facility Name	Facility Type	Signi-ficance	Location	Assessed Dollar Value	Notes
Bellingham City Hall	EF	2	210 Lottie Street	$33,962,612	Government offices
Police Headquarters	EF	3	505 Grand Avenue	$13,251,745	
What-Comm dispatch	EF	3	620 Alabama Street	$6,717,415	911 dispatch
Fire Station 1	EF	3	1800 Broadway	$7,286,642	
Fire Station 2	EF	3	1590 Harris Avenue	$2,396,622	
Fire Station 3	EF	3	1111 Billie Frank Junior Street	$2,516,048	
Fire Station 4	EF	3	2306 Yew Street	$1,993,010	
Fire Station 5	EF	3	3314 Northwest Avenue	$2,101,186	
Fire Station 6	EF	3	4060 Deemer Road	$2,396,622	
Smith Rd Medic Sta.	EF	3	858 East Smith Road	$ 384,208	
WUECC	EF	3	3888 Sound Way		Shared City/County/ Port facility
Municipal Court Bldg	EF	2	2014 C Street	$10,492,727	
Sehome Communications Tower	LUS	3	Sehome Hill	$1,742,009	
Post Point Plant	LUS/HMF	3	200 McKenzie Avenue	$4,622,186	

Public Works Central Operations Campus	EF	3	2221 Pacific Street	$13,820,928	
Middle Fork NR Diversion Facility	HPL	1	Lat N48 46 15.7 Long W122 04 21.4	$10,000,000	
Lake Whatcom Control Dam	HPL	3	Electric Avenue between 2107 and 2109	$3,000,000	
Lake Padden Control Dam	EF	1	West Lake Padden outlet to Padden Creek	$500,000	
Geneva Dam	EF	1	2647 Strawberry Shore Dr	$500,000	
Hannegan Road Detention Dam	EF	1	Section SE1/4 08 Township 38N Range 03E	$500,000	
Happy Valley Detention Dam	EF	1	Section 06 Township 3 7 Range 03	$500,000	
Telegraph Detention Dam	EF	1	Section 18 Township 38N Range 03E	$500,000	
St Clair Detention Dam	EF	1	Section 29W Township 38N Range 03E	$500,000	
Horton Road Detention Dam	EF	1	Section 01 Township 38N Range 02E	$500,000	
Water Treatment Plant	HMF	3	3201 Arbor Court	$20,000,000	
Water Supply Storage Reservoirs	LUS	3	2500 Yew Street Road 231 Highland Drive Balsam Lane, near Big	$2,000,000 $2,000,000 $2,000,000	

			Rock Garden 4185 James Street 3820 Broad Street 3201 Arbor Way Sehome Hill Arboretum, E Ivy Street	$2,000,000 $2,000,000 $2,000,000 $2,000,000	
PeaceHealth St Joseph Medical Center	EF/HPL	3	2901 Squalicum Way		Essential facilities not owned or maintained by the City
Bellingham School District	HPL	2	14 Elementary 4 Middle Schools 4 High schools		Essential facilities not owned or maintained by the City

Facility Type: **EF** = Essential Facility; **HMF** = Hazardous Materials Facility; **HPL** = High Potential Loss; **LUS** = Lifeline Utility System
Significance to community function: **1**=Moderate; **2**= High; **3** =Very High



Map of critical facilities identified by the City of Bellingham. Across Whatcom County, critical facilities fell into 15 categories. Unique categories developed for this plan update include mass shelter, assisted living, and recovery resources. Mass shelter includes facilities such as fairgrounds and community centers. Recovery resources are facilities that are required post-hazard event, for example public works and private construction companies. Not all judications identified or included critical facilities in each category.

Critical Facility Rankings for the City of Bellingham

The table below indicates whether each critical facility falls within known hazard zones for earthquake, liquefaction, landslide, tsunami, volcano, riverine flooding, coastal flooding and wildfire zones. A rank assessment in the last column indicates how the relative risk of community impact. This ranking considers the significance of the facility to the community and the number of hazard zones the facility is within. The frequency of each hazard is also considered, such that being in a low frequency hazard zone would receive a lower ranking than that same facility being in a high frequency hazard zone. Ranking is on a scale of 1 to 10, with 1 being the facility with the highest-ranking score, and 10 being a facility with the lowest ranking score in the jurisdiction.

$$\text{Rank} = \text{Significance} * \left[\frac{\text{EQ\_Zone}}{\text{EQ\_Freq}} + \frac{\text{LQ\_Zone}}{\text{LQ\_Freq}} + \frac{\text{LS\_Zone}}{\text{LS\_Freq}} + \ldots \frac{\text{WF\_Zone}}{\text{WF\_Freq}} \right]$$

Significance: 1=moderate; 2=high; 3=very high, as assessed in the critical facilities list in the previous section

Zone: 0=facility not in hazard zone; 1 = facility in the hazard zone

Frequency (e.g. EQ_Freq, LQ_Freq) is the most difficult variable to which to assign a value. Frequency varies based upon the magnitude of a hazard event and varies from one place to another. It was not possible within the time constraints to assess frequency of hazard at each critical facility location. Instead, a qualitative assessment of the hazard frequency across the entire county was made, as shown in the chart below.

Description	Freq Value used in formula	Hazards
Frequent, occurring on the order of decades	3	Riverine flooding (FL); Coastal flooding (COA)
Rare, occurring on the order of centuries	2	Earthquake (EQ); Liquefaction (LQ); Landslide (LS); Wildfire (WF)
Very rare, occurring on the order of millennia	1	Tsunami (TSU); Volcano (VOL)

Note: Severe storm, a very frequent hazard, was omitted because it is ubiquitous and because no hazard map of storm severity was available.

Critical Facilities Ranking Table

Facility Name	Facility Type	Signi-ficance	EQ	LQ	LS	TSU	VOL	FL	COA	WF	Rank Assessment
Bellingham City Hall	EF	2	1	1	0	0	0	0	0	0	0.33
Police Headquarters	EF	3	1	1	0	0	0	0	0	0	0.5
What-Comm dispatch	EF	3	1	1	0	0	0	0	0	0	0.5
Fire Station 1	EF	3	1	1	0	0	0	0	0	0	0.5
Fire Station 2	EF	3	1	0	0	0	0	0	0	1	0.5
Fire Station 3	EF	3	1	0	0	0	0	0	0	0	0.25
Fire Station 4	EF	3	1	1	0	0	0	0	0	0	0.5
Fire Station 5	EF	3	1	1	1	0	0	0	0	0	0.75
Fire Station 6	EF	3	1	1	0	0	0	0	0	1	0.75
Smith Rd Medic Sta.	EF	2	1	1	0	0	0	0	0	1	0.5
WUECC	EF	3	1	1	0	0	0	0	0	0	0.5
Municipal Court Bldg	EF	2	1	1	0	0	0	0	0	0	0.33
Sehome Communications Tower	LUS	3	1	0	0	0	0	0	0	0	0.25
Post Point Plant	HMF	3	1	0	0	1	0	0	0	1	1
Public Works Central Operations Campus	EF	3	1	1	0	0	0	0	0	0	0.5
Middle Fork NR Diversion Facility	HPL	1	1	0	0	0	0	0	0	0	0.08
Lake Whatcom Control Dam	HPL	3	1	0	0	0	0	1	0	1	0.66
Lake Padden Control Dam	EF	1	1	1	0	0	0	0	0	1	0.25
Geneva Dam	EF	1	1	0	0	0	0	0	0	0	0.08
Hannegan Road Detention Dam	EF	1	1	1	0	0	0	0	0	1	0.25
Happy Valley Detention Dam	EF	1	1	1	0	0	0	1	0	1	0.31

Telegraph Detention Dam	EF	1	1	1	0	0	0	0	0	1	0.25
St Clair Detention Dam	EF	1	1	1	0	0	0	0	0	1	0.25
Horton Road Detention Dam	EF	1	1	1	0	0	0	0	0	1	0.25
Water Treatment Plant	HMF	3	1	0	0	0	0	0	0	1	0.5
Water Supply Storage Reservoirs	LUS	3	1	1	0	0	0	0	0	1	0.75
PeaceHealth St Joseph Medical Center	EF/LUS/ HPL	3	1	1	0	0	0	0	0	0	0.5
Bellingham School District schools (22)	HPL	2	1	1	0	0	0	0	0	0	0.33

Notes: **EQ** = Earthquake; **LQ** =Liquefaction; **LS** = Landslide; **TSUN** = Tsunami; **VOL** = Volcano; **FL** = Riverine Flooding; **COA** = Coastal Flooding; **WF** = Wildland Fire

Areas and Assets Exposed, Per Hazard

	City of Bellingham Exposure to Natural Hazards					
	Hazard Susceptibility	Asset County (% of Total)				Critical Facilities Appraised Value (Million)
		Area (sq.mi.)	Population	Parcels	Critical Facilities	
Geological Hazards	**Earthquake**, Shaking Intensity					
	MMI V	9.1%	6.8%	8.4%	3.1%	$2 [2]
	MMI VI	86.1%	93.2%	91.4%	93.8%	$249 [1]
	MMI VII	-	-	-	3.1%	$10
	MMI VIII - IX	-	-	-	-	-
	TOTAL	95.2%	100%	99.8%	100%	$261
	Liquefaction					
	Very Low to Low	26.3%	26.7%	27.8%	18.8%	$5 [2]
	Low to Moderate	36.5%	39.4%	39.3%	43.8%	$183 [1]
	Moderate	-	-	-	-	-
	Moderate to High	0.3%	0.1%	0.2%	-	-
	High	1.3%	0.1%	0.1%	-	-
	TOTAL	64.4%	66.3%	67.4%	62.6%	$188
	Landslide					
	Landslide Low	0.04%	.04%	0.02%	-	-
	Landslide Moderate	0.02%	-	-	-	-

	Landslide High	-	-	-	-	-
	Fan Low	-	-	-	-	-
	Fan Moderate	0.02%	0.01%	-	-	-
	Fan High	0.05%	0.01%	-	-	-
	Mine Hazard	4.4%	6.2%	7.06%	3.1%	$0.2 [2]
	TOTAL	4.53%	6.26%	7.08%	3.1%	$0.2
	Volcanic Eruption					
	Case 1 Debris Flows	-	-	-	3.1% [3]	$10 [2/3]
	Case 2 Debris Flows	-	-	-	-	-
	Case M Flows	-	-	-	3.1% [3]	$10 [2/3]
	Pyroclastic Flows, Lava Flows, and Ballistic Debris	-	-	-	3.1% [3]	$10 [2/3]
	TOTAL				9.3%	$30
	Tsunami, Inundation Zone					
	Low to Moderate Inundation Potential	0.4%	0.3%	0.2%	-	-
	Moderate to High Inundation Potential	0.3%	2.7%	0.03%	-	-
	High Inundation Potential	2.5%	-	0.7%	3.1%	$5 [2]
	TOTAL	3.2%	3%	0.93%	3.1%	$5

Hydrological Hazards	**Flooding**					
	100-year Flood	8.9%	1.4%	1%	9.4%	$4 [2]
	500-year Flood	0.07%	0.1%	0.1%	-	-
	Floodway	0.7%	0.3%	0.1%	-	-
	Undetermined (Zone D)	-	-	-	-	-
	TOTAL	9.67%	1.8%	1.2%	9.4%	$4
Meteorological Hazards	**Wildfire Zones**					
	Interface Very Low-Low Structure Density	1.2%	0.4%	0.2%	-	-
	Interface Medium-High Structure Density	33.2%	39%	44.7%	18.8%	$15 [2]
	Intermix Very Low-Low Structure Density	8.9%	1.9%	1%	3.1%	$2 [2]
	Intermix Medium-High Structure Density	14.3%	8.5%	7.7%	28.1%	$28 [2]
	TOTAL	57.6%	49.8%	53.6%	50%	$45

[1]This value shows the total of 2020 Whatcom County parcel data appraised total value and community's critical facility assessed dollar value (found in the community's critical facilities list). The critical facility's assessed dollar value was used instead of the appraised total value when available.

[2]Shows the total assessed dollar value provided by the community in their critical facilities list. Does not include the appraised total values.

[3]Some critical facilities located in multiple hazard zones.

Status of Bellingham's 2016-2020 and Ongoing Hazard Mitigation Actions

This section describes the status of mitigation actions that were proposed in the 2016 Mitigation Plan and are now 1) currently being implemented and are ongoing, 2) are now completed, or 3) are now discontinued because they are no longer needed. The actions are organized by hazard and indicate the lead agency, funding source, and status.

1	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
5	Funding Source:	Local; State; FEMA; Private; Other
6	Current Status	Action Discontinued / Action Completed / Action ongoing and expected completion date

General: All Hazards

G-a. Emergency preparedness education programs for schools

Bellingham Fire Department (BFD) conducted October fire and earthquake safety presentations in public and private school 2nd grade classrooms 2016-2019 (partnered with American Red Cross 2016-2018 on this program until they were no longer able to provide staffing). 2nd grade presentations were suspended in 2020 due to COVID-19 pandemic.

Lead Agency	School Districts/Office of Emergency Management (OEM)/Western Washington University (WWU)/Police/Fire
Funding Source	Local/Grants
Current Status	Ongoing

G-b. Drills, exercises in homes, workplaces, classrooms

Reassigned to Bellingham Fire Department Office of Emergency Management (OEM) promotes participation in the annual international ShakeOut drill to practice taking proper actions to save lives and reduce the risk of injury during an earthquake.

Lead Agency	OEM
Funding Source	Local
Current Status	Ongoing

G-c. Public service announcements

Lead Agency	OEM /Police/Fire
Funding Source	Local
Current Status	Ongoing

G-d. Hazard "safety fairs"

OEM sponsored “GearUp!” an emergency preparedness fair in 2017 that offered community members the opportunity to learn about steps they can take to prepare for a future disaster by utilizing resources already at their disposal.

Lead Agency	OEM
Funding Source	Local
Current Status	Ongoing

G-e. Hazard conferences, seminars

OEM staff attend and host conferences and seminars as time and resources allow to learn and share lessons to enhance community preparedness.

Lead Agency	OEM
Funding Source	Local/State/Private/Other
Current Status	Ongoing

G-f. Hazard awareness weeks

Lead Agency	OEM
Funding Source	Local
Current Status	Ongoing

G-g. Preparedness handbooks, brochures. Distribution of severe weather guides, homeowner’s retrofit guide, etc.

In cooperation with Whatcom County, OEM makes available to the public throughout the year an all-hazards emergency preparedness guide, a variety of age-appropriate preparedness and awareness publications (activity books, comic books), and a graphic “two weeks ready” guide. Most recently, OEM developed and delivered tsunami awareness guides that feature evacuation routes and related details for shoreline inundation zones.

Lead Agency	OEM
Funding Source	Local/State/FEMA/Private

Current Status	Ongoing

G-i. Annual correspondence with residents reminding them of the need to be hazard prepared.

The Public Works Department offers education programs to inform city workers to prepare 72-hour emergency prep kits. OEM issues annual reminders about fireworks safety and regulations in the City of Bellingham and contributes reminders to staff and community newsletters as resources allow.

Lead Agency	OEM /Public Works
Funding Source	Local
Current Status	Ongoing

Drought/heat wave

D-a. Assess Vulnerability to Drought Risk

The City's Water Shortage Contingency Plan includes recognition of drought risk as established by an assessment of regional climate conditions. The WSCP defines the levels of response to a range of drought conditions.

Lead Agency	Public Works
Funding Source	Local
Current Status	Ongoing

D-b. Monitor Water Supply

The City maintains a water supply model of the City's water supply source, the Lake Whatcom Reservoir. Model data parameters include lake levels, annual precipitation, estimated evapotranspiration, water use trends.

Lead Agency	Public Works
Funding Source	Local
Current Status	Ongoing

D-c. Plan for Drought

The City's Water Shortage Contingency Plan describes actions to be taken by the public in response to defined thresholds of reservoir capacity coupled with weather forecasts. The actions range from low water level alerts to a series of curtailment measures.

Lead Agency	Public Works
Funding Source	Local
Current Status	Ongoing

D-d. Require Water Conservation During Drought Conditions

The Water Shortage Contingency Plan requires different levels of water use restrictions in response to various reservoir levels, precipitation and weather forecasts.

Lead Agency	Public Works
Funding Source	Local
Current Status	Ongoing

D-e. Retrofit Water Supply Systems

Since 2016 the water meter program has successfully completed retrofit metering of 22,743 residential customers. Now all buildings within the City of Bellingham and most customers outside of the City are metered.

Lead Agency	Public Works
Funding Source	Local/Grants
Current Status	Completed

D-f. Enhance Landscaping and Design Measures to include drought tolerant native plants

Environmental restoration and park restoration projects include a mix of native plants some of which are drought tolerant. These programs are ongoing with multiple projects each year. Recent completion of The Native Plant Material Selection Guidelines includes a thorough discussion of plant stress due to climate change and options for maintaining resilient local plant communities in the face of climate challenges. Options include different approaches to assisted migration.

Lead Agency	Public Works
Funding Source	Local/Grants
Current Status	Ongoing

D-g. Educate Residents on Water Saving Techniques

The City of Bellingham's Water Use Efficiency program provides education about water saving techniques to youth, households and businesses through a variety of programs and offerings, including property assessments, in-school education and community education campaigns.

Focus is placed on both indoor and outdoor water conservation techniques.

- Provides youth education through our 5th grade Water School program.
- Contracts education to K-12 in a partnership with ReSources, a local non-profit.
- Contracts with Community Energy Challenge to provide water assessments at homes, multifamily and commercial properties and to provide rebates for a fixture retrofit program.
- Provide outdoor summer watering education through advertising campaigns and an online pledge that provides customers with free tools to help with outdoor water conservation, such as hose-timers, efficient spray nozzles and moisture meters.
- Participate in the county-wide Whatcom Water Alliance which has a goal to coordinate water conservation practices and outreach throughout the county.
- Education materials accompany City sponsored events such as annual planning and participation in World Water Week events.

Lead Agency	Public Works
Funding Source	Local/Grants
Current Status	Ongoing

Earthquake

EQ-a Adopt and Enforce Building Codes that increase earthquake resilience

The City has adopted the 2018 International Building Code with State and Local amendments. Each code cycle strengthens earthquake resilience as new studies, new technology, and new construction methods are devised. Fire enforces these codes through the new construction permitting process (average of 1,250 construction inspections per year) and performing approximately 500 inspections per year on existing buildings throughout the City. Planning and Community Development Services provides structural inspections for code compliance.

Lead Agency	Planning, Fire
Funding Source	Local
Current Status	Ongoing

EQ-c. Map and Assess Community Vulnerability to Seismic Hazards

A map of seismic vulnerable areas has been completed, is included in this report and is

available to the public.

Lead Agency	OEM /Public Works
Funding Source	Local
Current Status	Ongoing

EQ-d Conduct Inspections of Building Safety

Fire conducts an average of 1,250 new construction inspections per year and performing approximately 500 inspections per year on existing buildings (code enforcement inspections) throughout the City. Community Development Services conducts inspections of building structural compliance with earthquake codes.

Lead Agency	Planning, Fire
Funding Source	Local
Current Status	Ongoing

EQ-e. Protect Critical Facilities and Infrastructure

The City conducts routine assessment and maintenance of critical facilities and infrastructure to ensure they remain in good repair. The Sehome Hill Communications Tower, a critical facility was replaced in 2020.

Lead Agency	Public Works
Funding Source	Local
Current Status	Ongoing

EQ-f. Implement Structural Mitigation Techniques

City buildings are earthquake retrofitted as funding allows.

Lead Agency	Planning/Public Works
Funding Source	Local
Current Status	Ongoing

EQ-g. Increase Earthquake Risk Awareness

Multiple City departments participate in state and local exercises, including Cascadia Rising exercise planning and execution of the exercise. Increased earthquake awareness and public participation has been facilitated by the CERT program.

Lead Agency	OEM
Funding Source	Local
Current Status	Ongoing

EQ-h. Conduct Outreach to Builders, Architects, Engineers, and Inspectors

Outreach to the development community is conducted through Pre-Application Conferences (average 100 conferences per year) and one-on-one meetings, emails, and telephone calls. Technical Advisory Bulletins with code updates are sent to builders and other members of the development community several times a year.

Lead Agency	Planning
Funding Source	Local
Current Status	Ongoing

Extreme Temperature

ET-a. Reduce Urban Heat Island Effect – Increase tree canopy in neighborhoods

Development and Critical Areas regulations require certain tree retention, and replacement during design and construction.

Lead Agency	Planning/Public Works
Funding Source	Local
Current Status	Ongoing

ET-b. Increase Awareness of Extreme Temperature Risk and Safety

Shelters for vulnerable populations have increased community awareness of extreme temperature risk and safety.

Lead Agency	OEM
Funding Source	Local
Current Status	Ongoing

ET-c. Assist Vulnerable Populations.

The City partners with and/or provides funding to several organizations that provide emergency overnight shelter, day center accommodations and safe camping for vulnerable populations.

The Bellingham Fire Department (BFD) responds to all types of medical emergency calls (fires, medical, public service, etc.) per year within the City limits. The City's Planning Department and BFD's Life Safety Division are involved in the review, approval, and inspection of homeless shelters, emergency shelters, and encampments.

Lead Agency	OEM /Planning/Police/Fire/Private
Funding Source	Local
Current Status	Ongoing

ET-d. Educate Property Owners About Freezing Pipes

Lead Agency	OEM /Fire/PW
Funding Source	Local
Current Status	Ongoing

Hail

HA-a. Increase Hail Risk Awareness

Lead Agency	OEM
Funding Source	Local
Current Status	Ongoing

Flooding

F-a. Incorporate Flood Mitigation in Local Planning

The Bellingham Municipal Code and the Surface and Stormwater Comprehensive Plan address flood hazards, development standards and mitigation strategies.

Lead Agency	OEM /Public Works
Funding Source	Local/State/FEMA
Current Status	Ongoing

F-b. Form Partnerships to Support Floodplain Management

Bellingham Municipal Code for floodplain management is included in sections administered by both the Public Works Department and the Planning and Community Development Department. Interjurisdiction floodplain management is coordinated between the City of Bellingham, Whatcom County and the Washington State Department of Ecology.

Lead Agency	OEM /Public Works
Funding Source	Local
Current Status	Ongoing

F-c. Adopt and Enforce Building Codes and Development Standards

The Bellingham Municipal Code and the Surface and Stormwater Comprehensive Plan address flood hazards, development standards and mitigation strategies. Building codes and development standards meet FEMA standards. Planning and Community Development Department administers the Critical Areas Ordinance that includes frequently flooded areas which are areas that have an increased risk of flooding and that are an expansion of FEMA designated flood areas.

Lead Agency	Planning/Police/Fire
Funding Source	Local
Current Status	Ongoing

F-d. Improve Stormwater Management Planning

The Surface and Stormwater Comprehensive Plan was updated in 2020. Improvements to mapping and facility maintenance are part of the plan. Near-term sea-level rise impact analysis, funding obligations and needs, prioritization, conveyance capacity analysis, and a capital improvement plan are also included.

Lead Agency	Public Works
Funding Source	Local/Grants
Current Status	Ongoing

F-e. Adopt Polices to Reduce Stormwater Runoff

The Surface and Stormwater Comprehensive Plan conditions all new buildings to minimize or be stormwater runoff neutral. A residence focused program in the Lake Whatcom watershed incentivizes actions that reduce stormwater runoff from individual parcels. Bellingham

Municipal Code includes sections on stormwater management. The 2017 Municipal Code update made Low Impact Development techniques required if feasible on a site.

Lead Agency	Public Works
Funding Source	Local
Current Status	Ongoing

F-f. Improve Flood Risk Assessment

Hydrology model data are used to assess the impacts of new development, re-development and stream restoration projects on flood control and carrying capacity. Bellingham is a National Flood Insurance Program participating community. The Operations and Maintenance Plans and Emergency Action Plans for seven flood control dams are updated every 5-years. Ecology Dam Safety office performs inspections and receives records from the City every 5-years.

Lead Agency	Public Works/OEM
Funding Source	Local/Grants
Current Status	Ongoing

F-g. Improve Stormwater Drainage System Capacity

The Comprehensive Surface and Stormwater Plan includes analysis of stormwater infrastructure needs and projects. Projects are selected by committee based on needs analysis that considers risks, areas of growth, age of infrastructure, road projects, opportunities and other issues identified by stormwater staff.

Lead Agency	Public Works
Funding Source	Local/Grants
Current Status	Ongoing

F-h. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures

The City's stormwater conveyance system is regularly maintained to clear debris and replace failing infrastructure to ensure it is fully functional. Stormwater crews perform routine maintenance and repair activities on all City owned drainage structures and conveyance pipes. Work crews video-inspect 267 total miles of mains, 15,066 drainage structures, and clean structures as required. The City meets or exceeds the requirements in our Western Washington Phase II Municipal Stormwater Permit. Additional inspections and maintenance is

also conducted on all flow control and bioretention facilities which includes nearly 150 rain gardens, 190 ponds and bioswales, and 5 regional detention facilities. City staff also assist in performing private facility inspections.

Lead Agency	Public Works
Funding Source	Local
Current Status	Ongoing

F-i. Elevate or Retrofit Structures and Utilities

Utility facilities are sited with consideration of potential flooding impacts. Recent development of models that predict potential flooding due to sea level rise are also being used as guidance for utility planning in waterfront areas. Utilities located within either City or Federal designation with a flood potential are retrofitted, designed, and contracted to minimize the possibility of floodwaters from entering the system.

Lead Agency	Public Works
Funding Source	Local/Grants
Current Status	Ongoing

F-j. Protect Infrastructure

Utilities located within either City or Federal designation with a flood potential are retrofitted, designed, and constructed to minimize the possibility of floodwaters from entering the system.

Lead Agency	Public Works
Funding Source	Local/Grants
Current Status	Ongoing

F-k. Protect Critical Facilities

Critical facilities that are located within either City or Federal designation with a flood potential are retrofitted, designed, and constructed to minimize the possibility of floodwaters from entering the facility and damage caused by flooding.

Lead Agency	Planning/PW/Police/Fire
Funding Source	Local/Grants
Current Status	Ongoing

F-l. Construct Flood Control Measures

The City's flood control infrastructure includes 150 rain gardens, 190 ponds and bioswales, and 7 regional detention facilities throughout the city to capture and retain stormwater runoff. The combined stormwater facilities work in concert to lessen the impacts of localized and regional storm events. Flood control berm along the lower portions of Whatcom Creek. All new and redevelopment projects are subject to stormwater flow control requirements.

Lead Agency	Public Works
Funding Source	Local/Grants
Current Status	Ongoing

F-m. Protect and Restore Natural Flood Mitigation Features

Seven stormwater regional detention facilities are built in natural floodways to increase the flood storage capacity of the natural system. These sites are regulated by the Critical Areas Ordinance and are included in wetland and riparian restoration and mitigation plans projects.

Lead Agency	Parks/Public Works/Planning
Funding Source	Local/Grants
Current Status	Ongoing

F-n. Preserve Floodplains as Open Space

Accomplished through the City's Critical Areas Ordinance, Frequently Flooded Areas section.

Lead Agency	Parks/Planning
Funding Source	Local/Grants
Current Status	Ongoing

F-o. Increase Awareness of Flood Risk and Safety

The City is a National Flood Insurance Program participating community.

Lead Agency	OEM/Parks/Public Works
Funding Source	Local
Current Status	Ongoing

F-p. Educate Property Owners about Flood Mitigation Techniques

The City is a National Flood Insurance Program participating community.

Lead Agency	Parks/ Public Works/OEM
Funding Source	Local
Current Status	Ongoing

Landslide/Erosion

ER-a. Map and Assess Vulnerability to Landslides and Erosion

The Critical Areas Ordinance defines and maps landslide hazard areas. No additional action has occurred.

Lead Agency	Planning
Funding Source	Local
Current Status	Ongoing

ER-b. Manage Development in Landslide and Erosion Hazard Areas

The Critical Areas Ordinance conditions development in Landslide and Erosion Hazard areas.

Lead Agency	Planning
Funding Source	Local
Current Status	Ongoing

ER-c. Promote or Require Site and Building Design Standards to Minimize Erosion Risk

The Critical Areas Ordinance and Subdivision Ordinance together require site designs to consider building with existing contours and minimizing recontouring. No new action taken.

Lead Agency	Planning
Funding Source	Local
Current Status	Ongoing

ER-d. Stabilize Erosion Hazard Areas

Public Works Natural Resources includes elements to stabilize banks and reduce erosion in all habitat restoration projects. The Parks & Recreation Department also designs park uplands and nearshore areas to withstand sea level rise and floodwaters to protect critical habitat areas that might otherwise be lose or eliminated during a natural disaster. Boulevard Park and Waypoint Park beach enhancement projects were designed for the upper end of predicted sea level rise,

including king tides and storm surges. These projects mitigate flood damage and erosion to uplands by providing natural nearshore environments capable of sustaining large storm events.

Lead Agency	Public Works/Parks
Funding Source	Local/Grants
Current Status	No action taken

ER-e. Increase Awareness of Erosion Hazards

A map of geological hazards is available to the public on the City's website and can be ordered.

Lead Agency	Public Works/OEM
Funding Source	Local
Current Status	Ongoing

Land Subsidence

SU-a. Map and Assess Vulnerability to Subsidence

A map of land areas at risk of subsidence events is a layer in City IQ, the City's publicly accessible property mapping database.

Lead Agency	Public Works
Funding Source	Local/Grants
Current Status	Ongoing

SU-b. Manage Development in High-Risk Areas

City zoning, building regulations, critical areas restrictions and the Comprehensive Plan manage development in all hazard areas.

Lead Agency	Planning
Funding Source	Local
Current Status	Ongoing

SU-c. Consider Subsidence in Building Design

Building codes regulate building foundation in light of the potential for stress from events such as subsidence.

Lead Agency	Planning

Funding Source	Local
Current Status	Ongoing

SU-d. Monitor Subsidence Risk Factors

Changes in land elevations, slumps, street integrity, or other signs of subsidence are reported to City staff.

Lead Agency	Public Works
Funding Source	Local
Current Status	Ongoing

Lightning

L-a. Protect Critical Facilities and Equipment

Critical facilities and equipment receive ongoing maintenance.

Lead Agency	Public Works/Private/Planning
Funding Source	Local
Current Status	Ongoing

Severe Storm

SS-a. Increase Severe Storm Preparedness

The City participates in the annual severe storm preparedness meeting conducted by the Whatcom County Sheriff's Office Division of Emergency Management.

Severe Wind

SW-a. Adopt and Enforce Building Codes

Building codes require wind studies and engineered designs in response to wind analysis for development in designated high wind zones.

Lead Agency	Planning
Funding Source	Local
Current Status	Ongoing

SW-b. Promote or Require Site and Building Design Standards to Minimize Wind Damage

Building codes require site specific analysis of land clearing proposals in high wind designated areas, to determine impacts on trees and structures in the immediate area. Temporary tent permits require prescribed amount of ballasting to prevent blow-over or damage from wind. Fire issues temporary tent permits and performs inspections on roughly 15 temporary tents per year.

Lead Agency	Planning/Fire
Funding Source	Local
Current Status	Ongoing

Tornadoes

No actions ongoing, discontinued, or completed for this hazard.

Tsunami

TSU-a. Map and Assess Vulnerability to Tsunami

The City of Bellingham participates in the Washington State Department of Emergency Management's Inner Coast Tsunami Workgroup that publishes tsunami inundation and current velocity maps that show the expected depth of water and the speed of the currents from an earthquake-generated tsunami, as well as tsunami pedestrian evacuation walk maps.

Lead Agency	OEM
Funding Source	Local/Grants
Current Status	Ongoing

TSU-b. Manage Development in Tsunami Hazard Areas

The City's Shoreline Master Program regulates development in Tsunami Hazard Areas.

Lead Agency	Planning
Funding Source	Local
Current Status	Ongoing

TSU-c. Increase Public Awareness of Tsunami Hazard

The City of Bellingham is a key stakeholder in Whatcom County Sheriff's Office Tsunami Action Plan and will actively prepare for, respond and participate in recovery from any tsunami threat. Public outreach events were delivered on tsunami awareness in 2019 and will resume post-COVID.

Lead Agency	OEM
Funding Source	Local
Current Status	Ongoing

Wildfire

WF-a. Map and Assess Vulnerability to Wildfire

City's Wildland-Urban Interface mapping is being performed in 2nd quarter 2021 by consultant as part of City's Urban Forest Management Plan. State DNR is also in the process of mapping and performing risk assessment in each county.

Lead Agency	Fire
Funding Source	Local
Current Status	Ongoing

WF-b. Create Defensible Space Around Structures and Infrastructure

Awaiting results of Wildland-Urban Interface mapping/risk assessment in order to target highest risk areas of City.

Lead Agency	OEM/Fire
Funding Source	Local
Current Status	Ongoing

WF-c. Participate in Firewise Program

Partnered with Conservation District's Wildfire Risk Reduction Program staff to identify vulnerable areas. Provided education materials to property owners in target area. Clark's Point is a Firewise site as of November 1st, 2019.

Lead Agency	Fire
Funding Source	Local
Current Status	Ongoing

WF-d. Educate Property Owners about Wildfire Mitigation Techniques

Property owner education included in Wildfire Risk Reduction and Firewise programs.

Lead Agency	Fire
Funding Source	Local
Current Status	Ongoing

Winter storms/Freezes

WW-a. Adopt and Enforce Building Codes

International and State Building Codes adopted by the City include snow load calculations and requirements for roofs.

Lead Agency	Planning/Fire
Funding Source	Local
Current Status	Ongoing

WW-b. Protect Buildings and Infrastructure

Public Work Facilities maintains all city government buildings to avoid weather incurred damage. Fire-Operations responds to all types of hazardous conditions and emergencies

Lead Agency	Public Works/Fire
Funding Source	Local
Current Status	Ongoing

WW-c. Reduce Impacts to Roadways

City Public Works applies icing prevention compounds to main city streets ahead of predicted winter snow storms, and freezing rain events.

Lead Agency	Public Works/DOT
Funding Source	Local/Grants
Current Status	Ongoing

WW-d Conduct Winter Weather Risk Awareness Activities

Efforts to provide shelters for vulnerable populations have increased community awareness of winter weather risks.

Lead Agency	OEM
Funding Source	Local/Grants
Current Status	Ongoing

WW-e. Assist Vulnerable Populations

Shelters have been provided for vulnerable populations.

Lead Agency	OEM/Police/Fire/Private
Funding Source	Local/Grants
Current Status	Ongoing

Multiple Hazards

MU-a. Assess Community Risk

City departments continue to reassess the most current information when planning response to hazard risks.

Lead Agency	OEM /Public Works
Funding Source	Local
Current Status	Ongoing

MU-b. Map Community Risk.

The City maintains maps of hazardous areas and conditions that are available to the public on the City website and hardcopy.

Lead Agency	OEM /Public Works
Funding Source	Local
Current Status	Ongoing

MU-c. Update Policies, Codes, Standards, Regulations, and Plans for all hazards included in this plan as needed

Lead Agency	Planning/Fire
Funding Source	Local
Current Status	Ongoing

MU-d. Adopt Development Regulations in Hazard Areas

Development in hazard areas is regulated by the Critical Areas Ordinance.

Lead Agency	Planning
Funding Source	Local
Current Status	Completed

MU-e. Limit Density in Hazard Areas

Comprehensive Plan updates may include evaluation of zoning including hazard conditions analysis for any contemplated zoning changes.

Lead Agency	Planning
Funding Source	Local
Current Status	No action taken

MU-f. Integrate Mitigation into Local Planning

The information and related data contained in the Natural Hazards Mitigation Plan regarding hazards, risks, vulnerability and potential mitigation potentially impacting City of Bellingham will be used as a tool when the City updates other plans and programs.

Lead Agency	OEM
Funding Source	Local
Current Status	Ongoing

MU-g. Strengthen Land Use Regulations

Washington State and Bellingham are national leaders in development and land use regulations.

Lead Agency	Planning/Public Works
Funding Source	Local
Current Status	Ongoing

MU-h. Adopt and Enforce Building Codes

State and City of Bellingham adopted the 2015 body of International Code Council (ICC) codes on July 1, 2016, including local Bellingham Municipal Code (BMC) amendments; then adopted 2018 ICC Codes with implementation date of February 1, 2021 (also with BMC amendments). Each code cycle strengthens resilience as new studies, new technology, and new construction methods are devised. Fire enforces these codes through the new construction permitting process (average of 1,250 construction inspections per year) and performing approximately 500 inspections per year on existing buildings throughout the City.

Lead Agency	Planning/Fire/Police
Funding Source	Local
Current Status	Ongoing

MU-i. Protect Infrastructure and Critical Facilities

Critical infrastructure and facilities are maintained regularly.

Lead Agency	Police/Fire
Funding Source	Local/Grants
Current Status	Ongoing

MU-j. Increase Hazard Education and Risk Awareness

Map Your Neighborhood has been in use by Bellingham since 1999. This network allows for residents to prepare to help their neighbors before help can arrive following a disaster, which will save lives.

Lead Agency	OEM
Funding Source	Local
Current Status	Ongoing

MU-k. Improve Household Disaster Preparedness

Map Your Neighborhood has been in use by Bellingham since 1999. This network allows for residents to prepare to help their neighbors before help can arrive following a disaster, which will save lives.

Lead Agency	OEM
Funding Source	Local
Current Status	Ongoing

Bellingham Hazard Mitigation Strategy 2021-2025

Whatcom County Hazard Mitigation Goals

Whatcom County has identified five overarching hazard mitigation goals, which represent what a community seeks to achieve through mitigation actions.

Goal 1. Protect Life, Property and Public Welfare

Goal 2. Increase Public Awareness

Goal 3. Preserve and Enhance Natural Systems

Goal 4. Encourage Partnership for Implementation

Goal 5. Ensure Continuity of Emergency Services

These countywide goals help guide any prioritization and implementation of mitigation actions, ensuring that the actions contribute to a community's vision for the future.

City of Bellingham-Specific Hazard Mitigation Goals

Bellingham adds to these county-wide goals, the following community-specific mitigation planning goals:

- **Goal BELL-1.** Reduce the possibility of damages and losses due to coastal flooding caused by Sea Level Rise.
- **Goal BELL-2.** Reduce disproportionate natural hazard impact on vulnerable populations (e.g. elderly, low-income residents, disabled, health-compromised, rural/urban, and similar).
- **Goal BELL-3.** Collaborate with partners to create a countywide public safety radio system available to all public safety agencies for daily operations as well as emergency and disaster response.

Mitigation Action Options

Appendix E of the Whatcom County Natural Hazard Mitigation Plan provides a list of mitigation options. The City of Bellingham considered mitigation options related to earthquakes, tsunamis, and severe storms, especially those related to coastal flooding, because these hazards have the

potential to cause the greatest loss and damage. Not all mitigation options in Appendix E were relevant or a strong priority for Bellingham. Some options have already been implemented or are ongoing in Bellingham, as documented in the section above on the status of 2016-2020 and ongoing hazard mitigation actions.

Mitigation Action Prioritization

The mitigation actions in this section are new actions that the City of Bellingham has prioritized for the 2021-2025 planning period and beyond. Mitigation options were prioritized based upon review of the following two criteria: 1) The action's Overall Feasibility based on engineering, environmental, financial, and political considerations, 2) The Criticality of the action, based upon a consideration of which actions had the greatest potential to protect life, property, and public welfare. Blaine is working in cooperation with the County and other participating communities and special districts to develop a systematic methodology that would use multiple evaluation criteria to determine mitigation action prioritization. This new methodology will be used in future updates of this Plan.

In the following Identified Mitigation Actions 2021-2025 table, each priority action is listed by hazard. Each action is followed by planning goals, lead agency, the priority evaluation, timeline, funding source and estimated cost, where such information is available. This information can be used by local decision makers in pursuing strategies for implementation.

1	Goals	Indicates the hazard mitigation planning goal or goals this action addresses; countywide and/or community-specific
2	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
3	Priority:	H (High); M (Medium); L (Low)
4	Timeline:	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing
5	Funding Source:	Local; State; FEMA; Private; Other

Bellingham Identified Mitigation Actions 2021-2025

CITY OF BELLINGHAM IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility for Carrying out Measure	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
Multiple Hazards	MU-1 Assess Community Risk - For all hazards included in this Plan	G6	OEM	M	O	Local	Staff
	MU-2 Map Community Risk – For all hazards included in this plan	G6	OEM	M	O	Local	Staff
	MU-3 Update Policies, Codes, Standards, Regulations, and Plans for all hazards included in this plan as needed	G1 G5	Planning/Fire	M	O	Local	Staff

	MU-4 Enforce Codes, Standards, or Regulations for all hazards included in this Plan.	G1	Planning/Fire/ Police	M	O	Local	Staff
	MU-5 Protect Infrastructure and Critical Facilities	G1 G5	Fire/Police/PW	H	O	Local	Staff + Capital Project Cost
	MU-6 Update Natural Hazard Early Warning Systems	G1 G2 B1 B2	OEM	M	O	Local	Staff
	MU-7 Create Local Funding Mechanisms for Hazard Mitigation	G1	Administration	L	M	Local	Staff
Education and Outreach all hazards	**EO-1 Support Map Your Neighborhood, Community Emergency Response Training (CERT), and other community preparedness initiatives.**	G1, G2, B2	Various, see notes	L	O	Local	$50,000
	EO-2 Provide emergency preparedness education programs for schools, and community groups.	G2, B2	OEM	L	O	Local	$50,000
	EO-3 Conduct drills, exercises in homes, workplaces, classrooms	G2, B2	OEM	L	O	Local	$50,000

	EO-4 Deliver Public Service Announcements to the community	G2, B2	OEM	L	O	Local	$125,000
	EO-5 Host or attend hazard safety fairs, conferences, seminars.	G2, B2	OEM	L	O	Local	$15,000
	EO-6 Sponsor hazard awareness weeks	G2, B2	OEM	L	O	Local	$15,000
	EO-7 Distribute risk awareness and emergency preparedness handbooks, brochures, severe weather guides, homeowner's retrofit guide, etc.to the community.	G2, B2	OEM	L	O	Local	$50,000
	EO-8 Provide information for regular newspaper articles	G2	OEM	L	O	Local	Staff +$1,000
	EO-9 Provide annual correspondence with residents reminding them of the need to be hazard prepared.	G2, B2	OEM	L	O	Local	$20,000
Dam/Levee Failures	**DL-1 Update early warning notification list as needed.**	G1	Public Works/OEM	M	O	Local	Staff
Drought	**D-1 Monitor Water Supply**	G6	Public Works	M	O	Local	Staff
	D-2 Implement Drought Contingency Plan when needed	G1	Public Works	L	O	Local	Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

	D-3 Develop/Implement plant resiliency plan	G3	PWNR, Parks	L	O	Local	Staff +$10,000
	D-4 Ongoing -- Educate Residents on Water Saving Techniques	G2	Public Works	L	O	Local	Staff +$10,000
Earthquake	**EQ-1 Provide Information on Structural and Non-Structural Retrofitting**	G1 G2	Planning	L	M	Local	Staff +$10,000
	EQ-2 Implement Structural Mitigation Techniques, building retrofits.	G1 G2	Planning	L	M	Local	Staff +$10,000
Extreme Temperatures	**ET-1 Reduce heat impacts, increase shade**	G1 G4 B2	Plan PW	L	S	Local	$20,000
	ET-2 Assist Vulnerable Populations, provide shelters and access to shade	G2, B2	OEM/Fire/ Police/PW	L	O	Local	$1,000,000
Flooding	**FL-1 Consider policy response to Sea Level Rise**	G1, B1	Planning	L	M	Local	Staff
	FL-2 Implement projects of the Surface and Stormwater Comprehensive Plan	G1 G3	PWNR	M	O	Local Grants	$1,500,000
	FL-3 Maintain Partnerships to Support Floodplain Management	G4	Public Works	L	O	Local	Staff

Landslides/ Erosion	**LE-1 Assess impacts of Sea Level Rise on marine bluff stability**	G1	Planning	L	O	Local	Staff +$12,000
Land Subsidence	**LS-1 Monitor Subsidence Risk Factors**	G1	Public Works	M	O	Local	Staff
Lightning	**L-1 Protect Critical Facilities and Equipment**	G1	Planning	M	O	Local	Staff +Capital Project Cost
Severe Wind	**SW-1 Retrofit Residential Buildings**	G1	BHA	L	M	Local	Staff +Project Cost
	SW-2 Retrofit Public Buildings and Critical Facilities	G1	Public Works	L	M	Local	Staff + Project Cost
Tsunami	**TSU-1 Include Sea Level Rise in Tsunami Risk Assessment**	G2	PWNR	L	S	Local	Staff
	WF-1 Participate in Firewise program	G1 G2 G4	Fire	M	O	Local	$100,000

Wildfires	**WF-2 Create Defensible Space Around Structures and Infrastructure**	G1	Fire	M	S	Local	Staff + Project Cost
Winter Weather	**WW-1 Reduce Impacts to Roadways**	G1, G5	Public Works	L	O	Local	Staff
	WW-2 Assist Vulnerable Populations	B2	Various	M	O	Local	Staff + $1,500,000

Bellingham Annual Review and Progress for Hazard-Specific Mitigation Actions 2021-2025

Progress monitoring means tracking the implementation of the hazard specific mitigation actions over time. Each jurisdiction must identify how, when, and by whom action items will be monitored. The responsible agency assigned to each mitigation action is responsible for tracking and reporting on each of their actions.

Annual review and progress reporting includes the following:

Step One: Identify mitigation actions that your planning team has identified for the annual review. The planning team has the option to address ALL action items, or only those that should be acted on during each review cycle.

Step Two: Use the table below to track annual progress. For each action item selected for annual review insert the appropriate letter that indicates the status of that action item.

Step Three: Complete a progress report form as illustrated in Appendix G for each mitigation action item selected for annual review

Step Four: Submit the completed form(s) to the Whatcom County DEM.

City of Bellingham Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
MULTIPLE HAZARDS						
MU-1. Assess Community Risk - for all hazards included in this Plan						
MU-2. Map Community Risk – For all hazards included in this plan						
MU-3. Update Policies, Codes, Standards, Regulations, and Plans for all hazards included in this plan as needed						
MU-4. Enforce Codes, Standards, or Regulations for all hazards included in this Plan.						
MU-5 Protect Infrastructure and Critical Facilities						
MU-6 Update Natural Hazard Early Warning Systems						
MU-7 Create Local Funding Mechanisms for Hazard Mitigation						
Add Addition Actions as Needed						
EDUCATION AND OUTREACH ALL HAZARDS						
EO-1 Support Map Your Neighborhood, Community Emergency Response Training (CERT), and other community preparedness initiatives.						

EO-2 Provide Emergency preparedness education programs for schools, and community groups.						
EO-3 Conduct drills, exercises in homes, workplaces, classrooms.						
EO-4 Deliver public service announcements to the community.						
EO-5 Host or attend hazard safety fairs, conferences, seminars.						
EO-6 Sponsor hazard awareness weeks.						
EO-7 Distribute risk awareness and preparedness handbooks, brochures, severe weather guides, homeowner's retrofit guide, etc.to the community.						
EO-8 Provide information for regular newspaper articles						
EO-9 Provide annual correspondence with residents reminding them of the need to be hazard prepared.						
Add Addition Actions as Needed						
DAM/LEVEE FAILURES						
DL-1 Update early warning notification list as needed.						
Add Addition Actions as Needed						
DROUGHTS/HEAT WAVES						
D-1 Monitor Water Supply						
D-2 Implement Drought Contingency Plan when needed						
D-3 Develop/Implement plant resiliency plan						
D-4 Ongoing -- Educate Residents on Water Saving Techniques						

Add Addition Actions as Needed						
EARTHQUAKES						
EQ-1 Provide Information on Structural and Non-Structural Retrofitting						
EQ-2 Implement Structural Mitigation Techniques, building retrofits.						
Add Addition Actions as Needed						
EXTREME TEMPERATURE						
ET-1 Reduce heat impacts, increase shade						
ET-2 Assist Vulnerable Populations, provide shelters and access to shade						
Add Addition Actions as Needed						
FLOODING						
FL-1 Consider policy response to Sea Level Rise						
FL-2 Implement projects of the Surface and Stormwater Comprehensive Plan						
FL-3 Maintain Partnerships to Support Floodplain Management						
Add Addition Actions as Needed						
LANDSLIDES/EROSION						
LE-1 Assess impacts of Sea Level Rise on marine bluff stability						
LAND SUBSIDENCE						
LS-1 Monitor Subsidence Risk Factors						
Add Addition Actions as Needed						

LIGHTNING						
L-1 Protect Critical Facilities and Equipment						
Add Addition Actions as Needed						
SEVERE WIND						
SW-1 Retrofit Residential Buildings						
SW-2 Retrofit Public Buildings and Critical Facilities						
Add Addition Actions as Needed						
TSUNAMI						
TSU-1 Include Sea Level Rise in Tsunami Risk Assessment						
Add Addition Actions as Needed						
WILDFIRES						
WF-1 Participate in Firewise program						
WF-2 Create Defensible Space Around Structures and Infrastructure						
Add Addition Actions as Needed						
WINTER STORMS/FREEZES (SEVERE WINTER WEATHER)						
WW-1 Reduce Impacts to Roadways						
WW-2 Assist Vulnerable Populations						
Add Addition Actions as Needed						

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CITY OF BLAINE

Contact Information	**Stacie Pratschner** Community Development Services Director 435 Martin St. Blaine, WA 98230 (360) 332-8311
Approving Authority	**Blaine City Council** 435 Martin St., Ste 3000, Blaine, WA 98230 (360) 332-8311

Planning Process

Beginning in late February 2021, City of Blaine staff began reviewing the content within their section of the plan. Regular meetings were attended with the county and other cities to ensure the revision and updating process was on schedule. Staff revisions and updates were put into a new template provided by Dr. Rebekah Paci-Green. The City provided opportunity for public input on the edits, and kept the community appraised of the process through regular postings on social media and in the local newspaper.

Key Contributor List

- Stacie Pratschner, Community Development Services Director
- Stacy Clauson, Community Planner II
- Michael Jones, City Manager

The information contained in the Natural Hazards Mitigation Plan update regarding hazards, risks, vulnerability, and potential mitigation is based on the best available science and technology currently available. The City of Blaine is a community fully planning under the Growth Management Act, and this information and related data on natural hazards potentially impacting the City will be used as a tool when the City updates other plans and programs, such as the following:

- Blaine Comprehensive Plan
- Blaine Municipal Code:
    - Critical Areas Ordinance
    - Zoning bulk and dimensional standards
- Capital Improvement Plan
- Transportation Improvement Plan

- Water Resource Inventory Area planning
- General Sewer Systems Plan

As additional information becomes available from other planning sources that can enhance this Plan, that information will be incorporated through the periodic update process.

Plan Maintenance for Blaine

The City of Blaine's communication strategy concerning hazards includes social media postings; partnerships with the Chamber of Commerce and other community groups; and coordination with partner agencies to provide information and provide a platform for concerns.

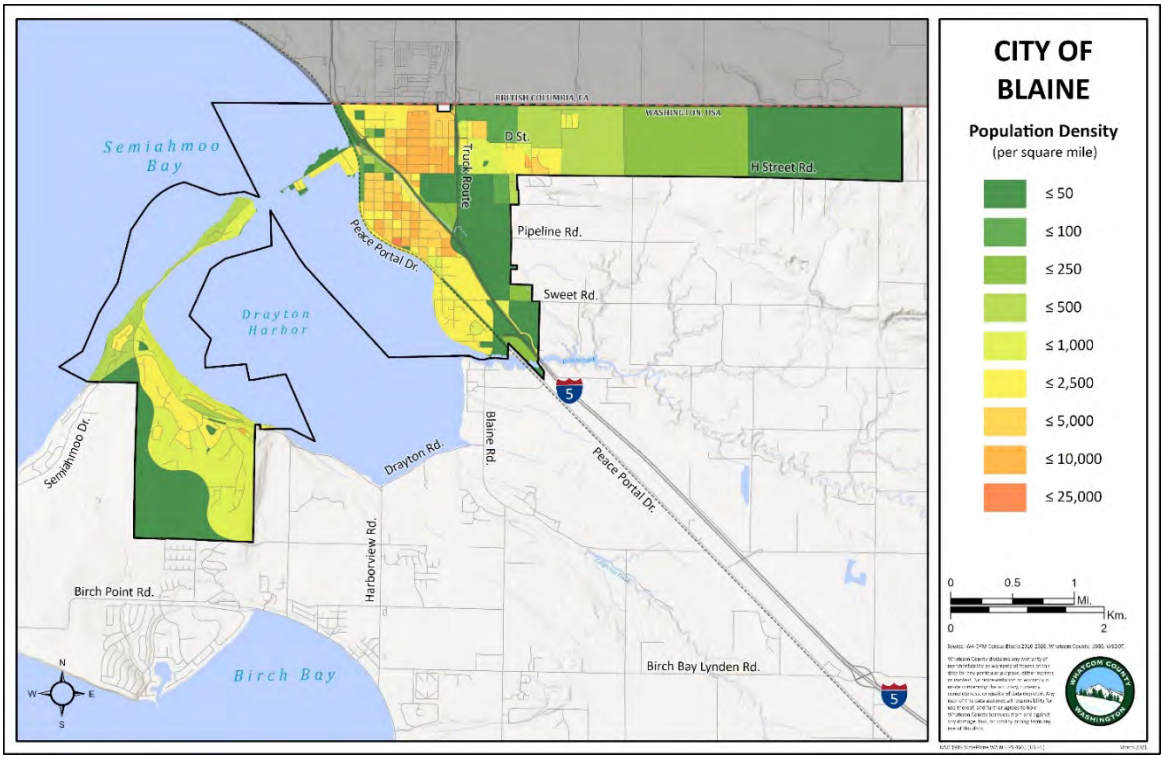
Public Outreach and Education

Program	Yes/No, Year Adopted	Description
Nonprofit organizations or local residents groups focused on hazard mitigation, emergency preparedness, vulnerable populations, etc.		Whatcom Unified Emergency Operations Center participates in the CERT program. Blaine residents are part of the Mt Baker chapter of Red Cross.
Ongoing public education or information programs	Yes,	Blaine is a part of the Whatcom Water Alliance which educates residents about outdoor water conservation. Blaine participates in the Great Shakeout (Earthquake preparedness drill) on an every-other-year basis.
School-related programs for natural hazard safety	No	Blaine School District practices routine drills in the classroom.
StormReady certification	No	Whatcom County is a StormReady certified county.
Firewise Community certification	No	Blaine does not have any Firewise sites.
Public-Private Partnership initiatives addressing disaster-related issues	No	
Other		

Overview of Blaine, Hazards and Assets

Geography of Blaine

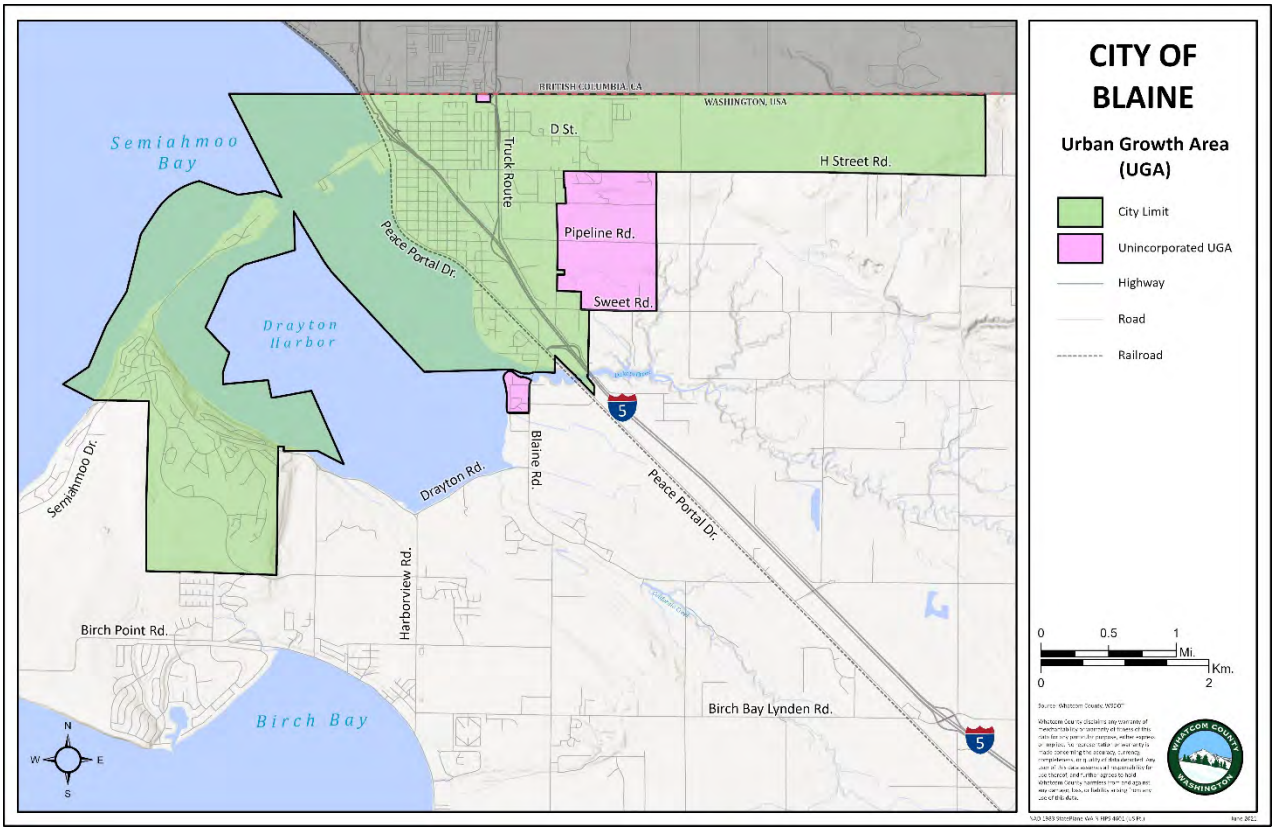
Blaine Population	5,520 (2020 estimate)
Total area	8.62 sq. mi. (within city limits)



Washington State Office of Financial Management (OFM) 2020 population and housing estimates for 2010-2020 census block data. This map uses the 2016-2020 average population to show population density per square mile

Growth Trends

This map displays the UGA for the City of Blaine, as designated by the Whatcom County Comprehensive Plan.



Presence of Hazards and their Impacts in Blaine

The City of Blaine has grown by roughly 700 people since the 2016 plan was first released. This growth is seen mainly in the Semiahmoo Uplands and East Blaine.

Since the last NHMP update, the City of Blaine has experienced impacts (and in some cases loss) of public infrastructure due to winter storm events. This includes the damage to the road on Semiahmoo Spit; and, damages to the shoreline at Marine Park.

Blaine takes the hazard areas described in this plan into consideration when making development permit decisions. The City, as a community fully planning pursuant to the Growth Management Act, employs best available science in the application of critical areas regulations; stormwater management; and, adopts by reference the most recent versions of the International Building Code.

In the table below is a list of the major hazards that effect Whatcom County. The second column provides the percentage of Blaine's total area that is exposed to each hazard. The third column indicates the severity of anticipated impacts to community function, considering the credible worst-case hazard scenario. Severity of anticipated impacts considers effects on basic community function such as shelter, transportation, utilities, commerce, industry, agriculture, education, health, recreation, and cultural identity. Severity ranges from none to extreme, as shown in the key below the table. Finally, the last column of the table describes where the hazard impacts the community and which services the hazard would most significantly impact.

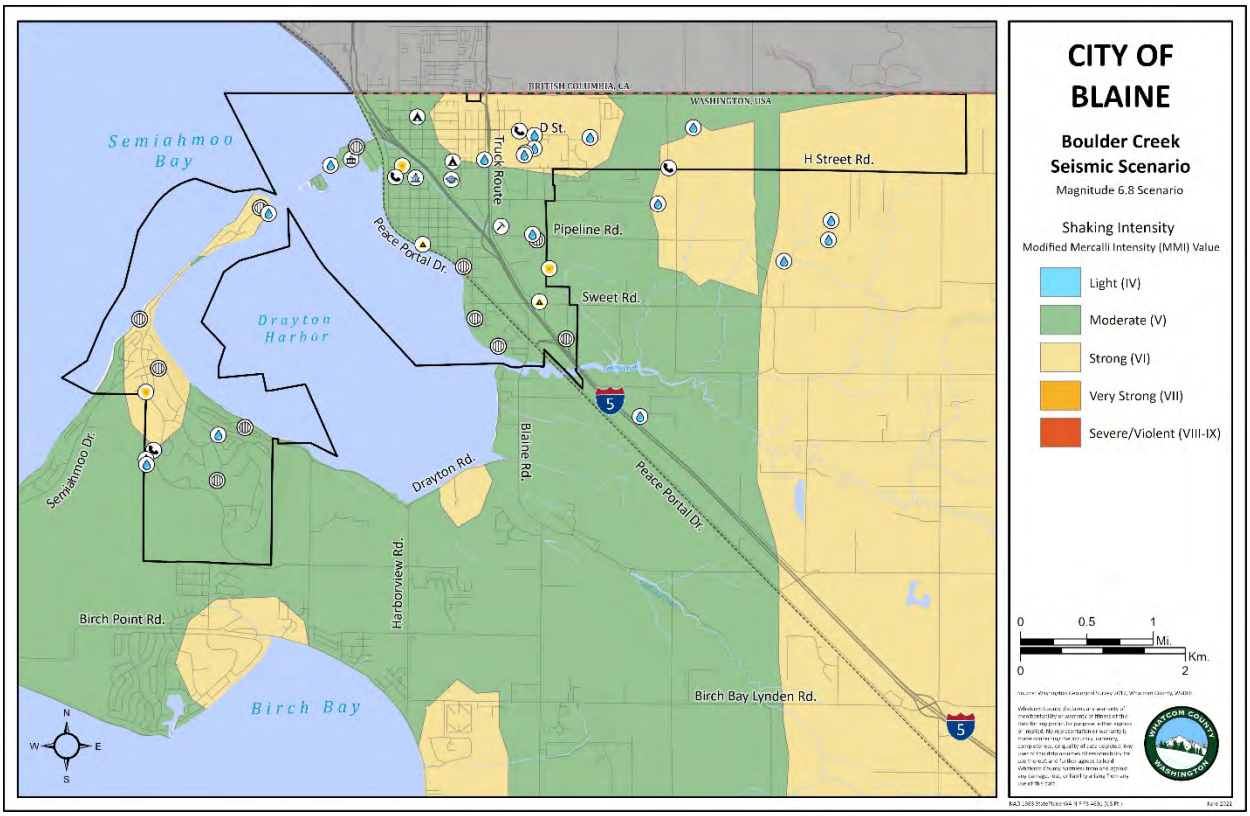
	Hazard	% area Exposed	Severity of Anticipated Impacts	Hazard Descriptions
Geological	**Earthquake**	65.6%	High	Moderate to high risk. Strong shaking expected on Semiahmoo Spit and Drayton Harbor Rd, as well as near the Hwy 543 US-Canada border crossing. Moderate shaking expected in the higher density residential neighborhoods of Blaine west of I5.
	Liquefaction	65.1%	Unknown	Seismically-sensitive soils present.
	Landslide	0.07%	Moderate	
	Volcano	0%	Low	The area is at risk of ash fall, with potential damage or disruptions to buildings, transportation, air quality, and water and wastewater.
	Tsunami	7.2%	High	Some areas within the city limits are subject to Tsunami inundation. The Semiahmoo Spit development, the Wharf District (Port of Bellingham Marina, Milholin Drive and Marine Drive), and some residential areas west of Peace Portal Drive are within hazard areas. Dakota Creek presents inundation risks as the Tsunami water can travel back up the creek channel.
	Mine Hazards	0%		N/A
Hydro-logical	**100-Year Flood**	20.4%	Low	Dakota Creek presents a flooding hazard. Areas within the city limits are subject to tidal flooding.
	500-Year Flood	0%		

Meteorological	**Wildfire**	45.1%	Moderate	Outlying homes in the East Blaine and Semiahmoo neighborhoods are in wooded areas, which can be at risk to seasonal wildland fire danger.

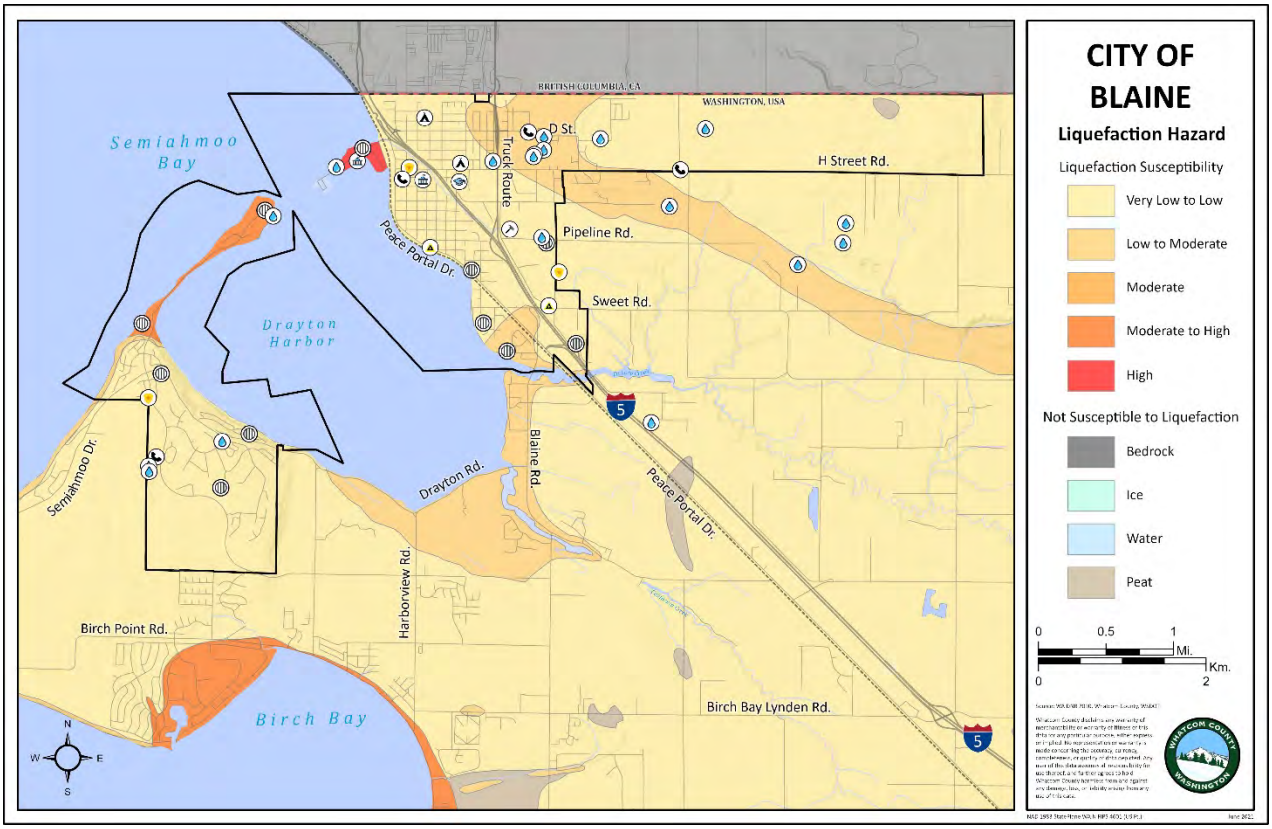
Severity Scale: **None** = no impact to community function
Low = minor degradation of community functions, not widespread
Moderate = moderate degradation over multiple weeks or widespread
High =degradation or loss over many weeks, widespread

Natural Hazard Maps

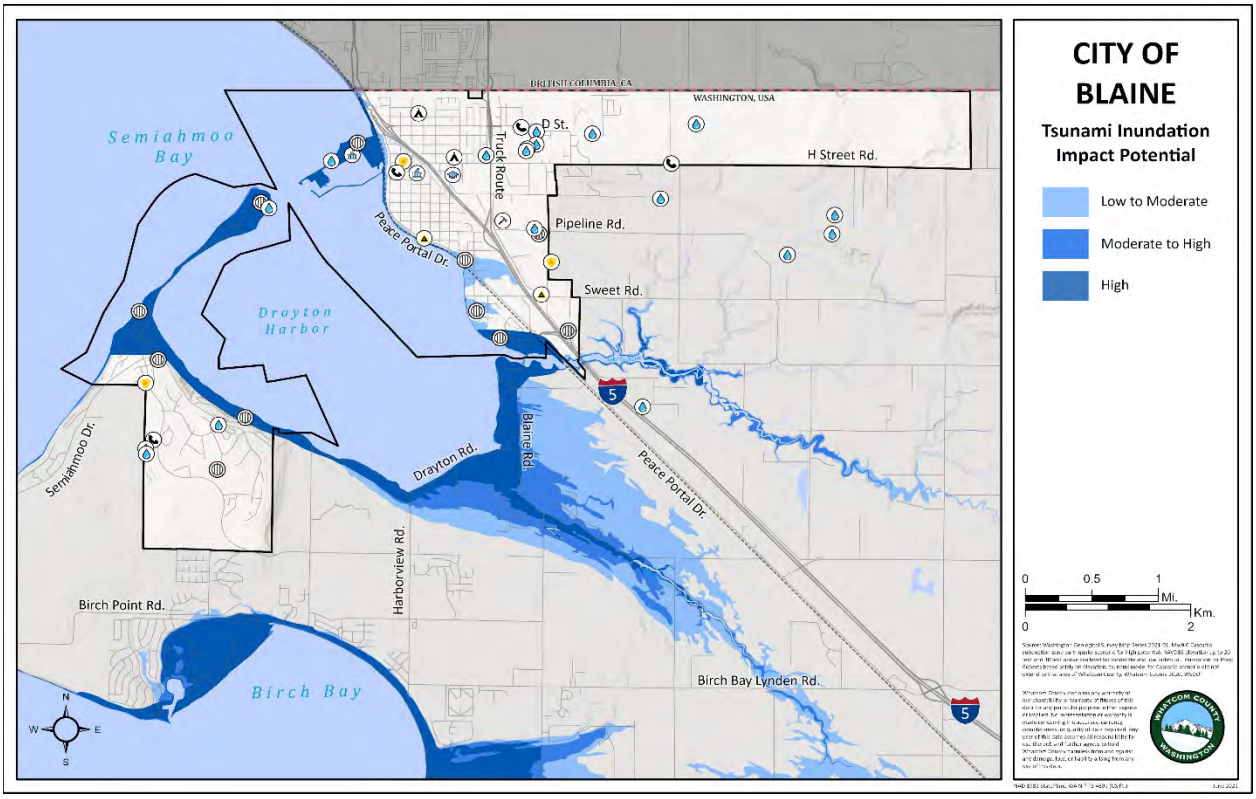
The following figures depict the natural hazards present within the jurisdiction.



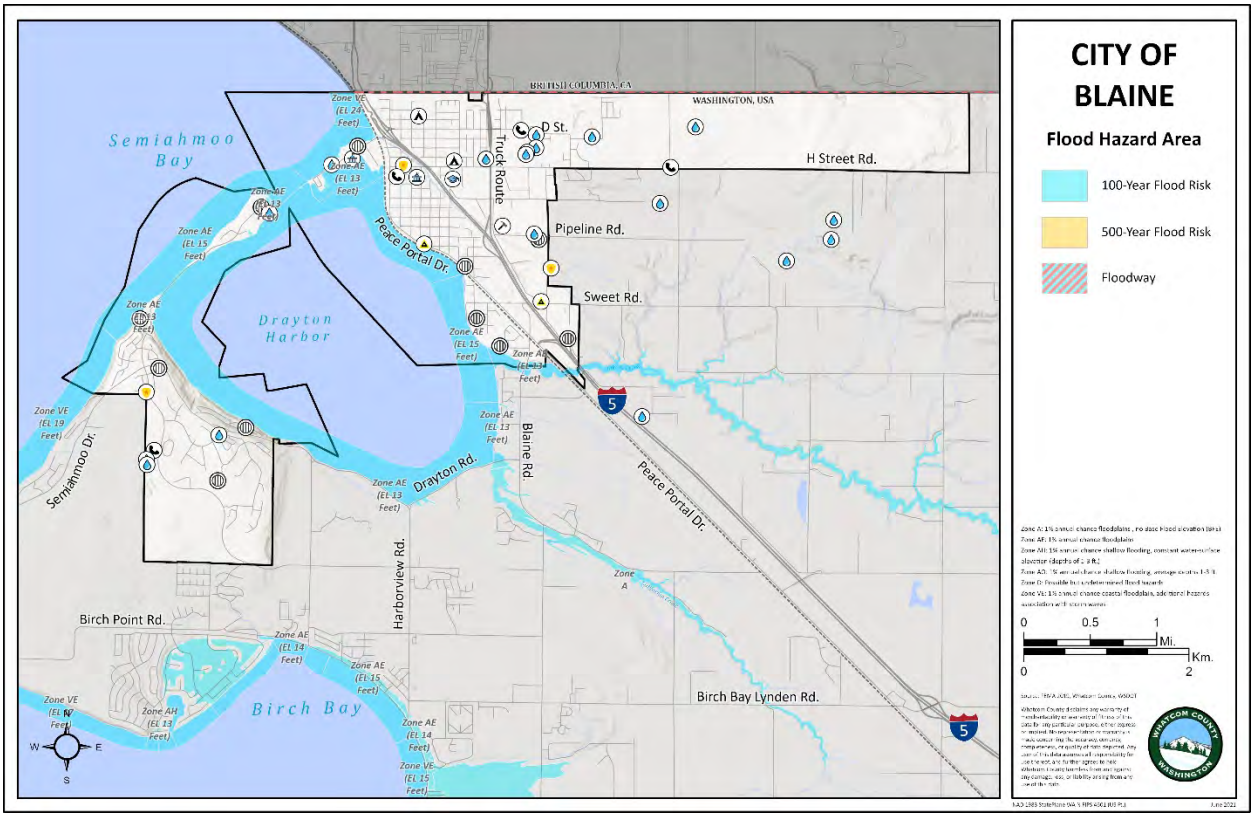
Washington Department of Natural Resources (WA DNR) 2017 Boulder Creek Fault Zone seismic scenario of magnitude 6.8 data. Displays extent and severity of the modeled earthquake in the Modified Mercalli Intensity (MMI) scale.



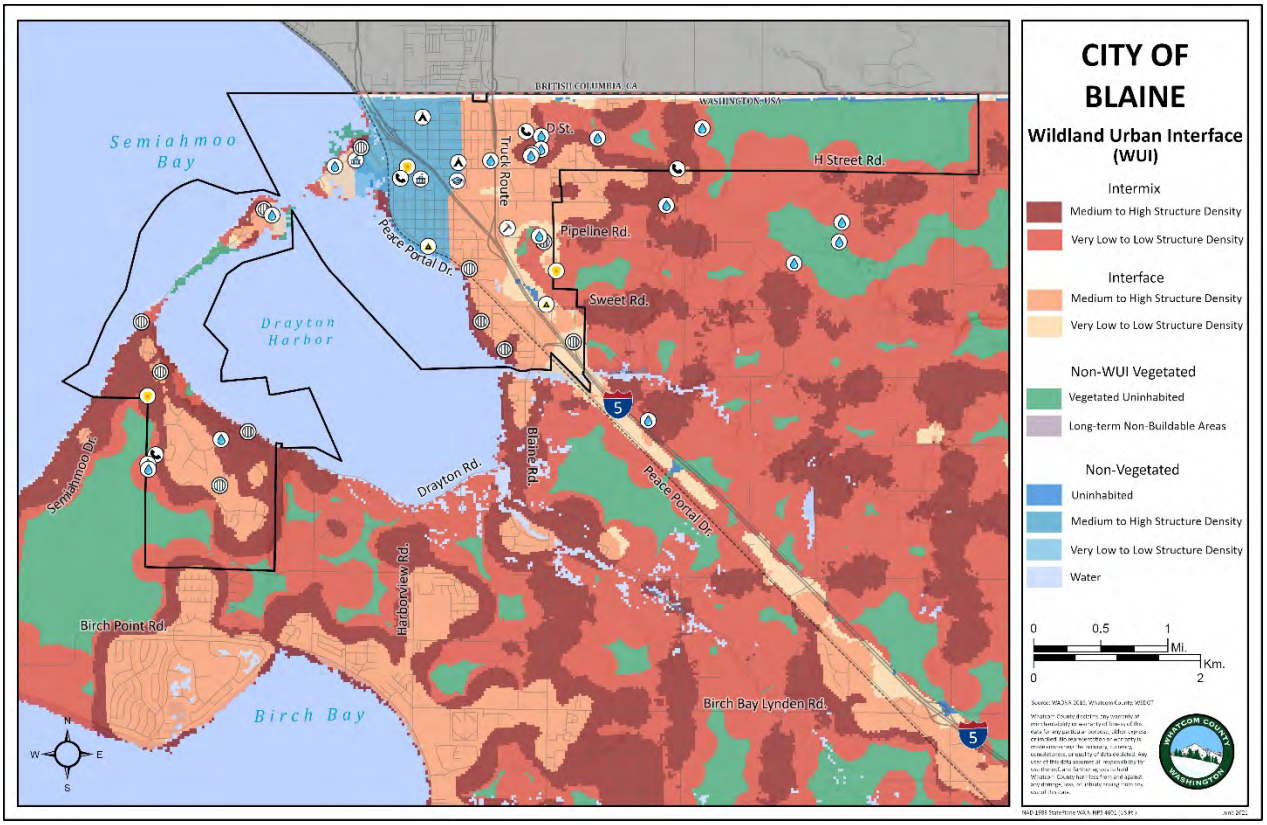
Washington Department of Natural Resources (WA DNR) 2010 liquefaction susceptibility data. This feature class is part of a geodatabase that contains statewide ground response data for Washington State.



Map of Blaine tsunami inundation impact potential. The high impact potential zone is based upon Washington Geological Survey Map Series 2021-01, Mw9.0 Cascadia subduction zone earthquake scenario occurring at mean high tide. The moderate to high and the low to moderate impact potential areas are based upon elevation of up to 20 feet and 30 feet, respectively, above mean sea level (NAVD88). Inundation for Point Roberts is based solely on elevation; tsunami model for the Cascadia subduction zone scenario did not extend to Point Roberts.



FEMA 2019 flood hazard data showing 100-year flooding, 500-year flooding, floodways, and flood zones. FEMA flood data includes both riverine and coastal flooding.



Washington Department of Natural Resources (WA DNR) 2019 mapped data of Washington's Wildland Urban Interface (WUI). The WUI displays areas of WA where structures and wildland overlap with specific structure densities.

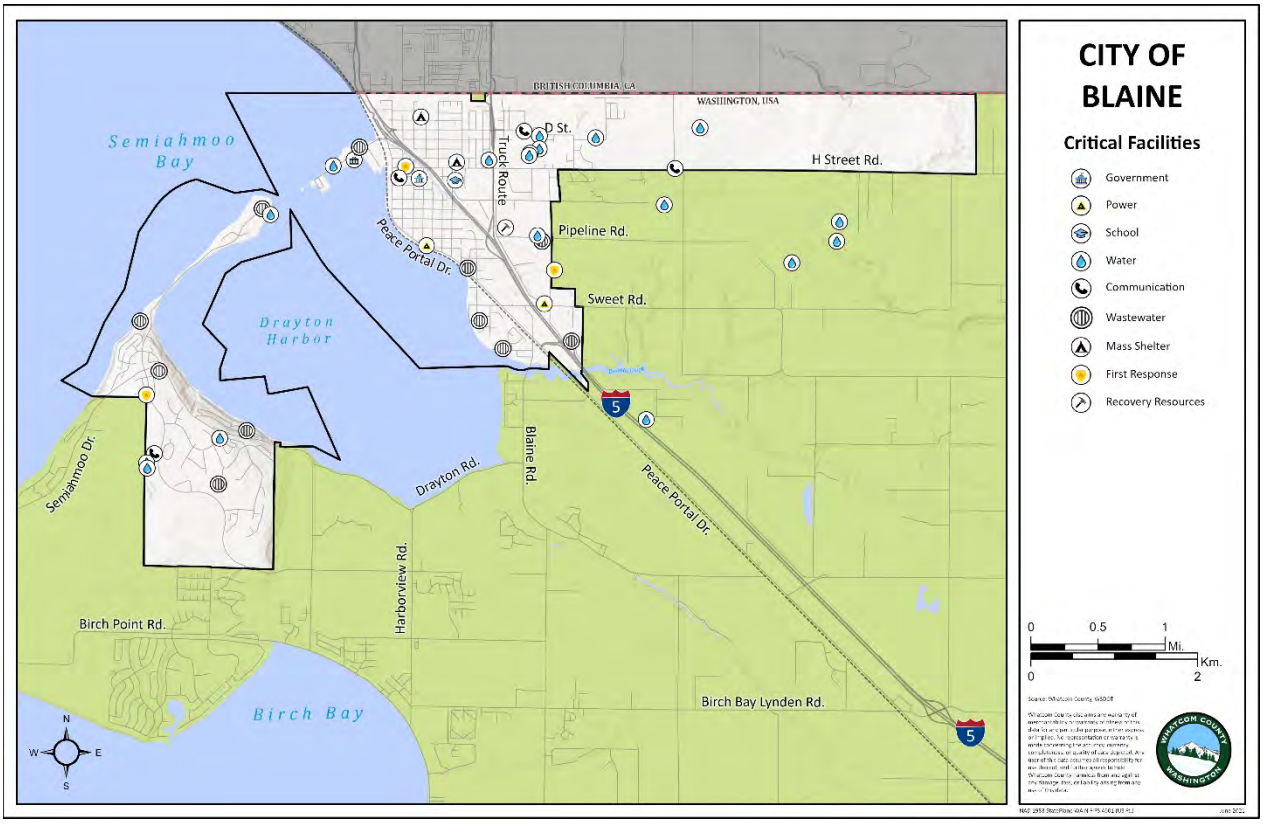
City of Blaine Critical Facility List

Facility Name	Facility Type	Signi-ficance	Location	Assessed Dollar Value	Notes
AT&T (US/Canada fiber optic vault)	LUS	2	1715 D Street		Communications
Blaine City Hall	EF	1	435 Martin		Government
Blaine Community Center	EF	1	763 G Street		EOC
Blaine Lighthouse Point Water Reclamation Facility	LUS	2	272 Marine Drive		Water
Blaine Police Department	EF	3	322 H Street		Law Enforcement
Blaine Public Works	EF	3	1200 Yew Street		Emergency Services
Cascade Natural Gas Facility	LUS	2	1400 blk. Peace Portal Way		Utilities-Power
Elementary School - Dist. 503	EF	1	Refer to WC GIS Data Layer		Evacuation Center
Good Samaritan Rest Home	EF	1	456 C Street		Evacuation Center
Lift Stations	LUS	2	9 Lift Stations Total		Sewer
Nextel/AT&T Wireless	LUS	2	8800 Blk Semiahmoo Parkway		Communications
Nextel/FARS Repeater	LUS	2	9800 blk Harvey Road		Communications
Port of Bellingham	EF	3	250 Marine Drive		Government
Puget Power	LUS	2	Sweet Road & W. of Odell Road		Power
Pump Station	LUS	2	4 Pump Stations		Sewer

			Total		
Reservoir Tanks	LUS	2	5 Reservoirs Total		Water
Verizon Central Office	LUS	2	259 Martin Street		Communications
Well Head	LUS	2	7 Well Heads Total		Water
Whatcom County Fire District 21	EF	3	1510 Odell Road		Fire Station
Whatcom County Fire District 21	EF	3	9001 Semiahmoo Parkway		First Station

Facility Type: **EF** = Essential Facility; **HMF** = Hazardous Materials Facility; **HPL** = High Potential Loss; **LUS** = Lifeline Utility System

Significance to community function: **1**=Moderate; **2**= High; **3** =Very High



Map of critical facilities identified by the City of Blaine. Across Whatcom County, critical facilities fell into 15 categories. Unique categories developed for this plan update include mass shelter, assisted living, and recovery resources. Mass shelter includes facilities such as fairgrounds and community centers. Recovery resources are facilities that are required post-hazard event, for example public works and private construction companies. Not all judications identified or included critical facilities in each category.

Critical Facility Rankings for the City of Blaine

The table below indicates whether each critical facility falls within known hazard zones for earthquake, liquefaction, landslide, tsunami, volcano, riverine flooding, coastal flooding and wildfire zones. A rank assessment in the last column indicates how the relative risk of community impact. This ranking considers the significance of the facility to the community and the number of hazard zones the facility is within. The frequency of each hazard is also considered, such that being in a low frequency hazard zone would receive a lower ranking than that same facility being in a high frequency hazard zone. Ranking is on a scale of 1 to 10, with 1 being the facility with the highest-ranking score, and 10 being a facility with the lowest ranking score in the jurisdiction.

$$\text{Rank} = \text{Significance} * \left[\frac{\text{EQ\_Zone}}{\text{EQ\_Freq}} + \frac{\text{LQ\_Zone}}{\text{LQ\_Freq}} + \frac{\text{LS\_Zone}}{\text{LS\_Freq}} + \ldots + \frac{\text{WF\_Zone}}{\text{WF\_Freq}} \right]$$

Ranking value will be from 0.0 to 1.0, scaled to the highest ranking in jurisdiction.

Significance: 1=moderate; 2=high; 3=very high, as assessed in the critical facilities list in the previous section

Zone: 0=facility not in hazard zone; 1 = facility in the hazard zone

Frequency (e.g. EQ_Freq, LQ_Freq) is the most difficult variable to which to assign a value. Frequency varies based upon the magnitude of a hazard event and varies from one place to another. It was not possible within the time constraints to assess frequency of hazard at each critical facility location. Instead, a qualitative assessment of the hazard frequency across the entire county was made, as shown in the chart below.

Description	Freq Value used in formula	Hazards
Frequent, occurring on the order of decades	3	Riverine flooding (FL); Coastal flooding (COA)
Rare, occurring on the order of centuries	2	Earthquake (EQ); Liquefaction (LQ); Landslide (LS); Wildfire (WF)
Very rare, occurring on the order of millennia	1	Tsunami (TSU); Volcano (VOL)

Note: Severe storm, a very frequent hazard, was omitted because it is ubiquitous and because no hazard map of storm severity was available.

Critical Facilities Ranking Table

Facility Name	Facility Type	Signi-ficance	EQ	LQ	LS	TSU	VOL	FL	COA	WF	Rank Assessment
AT&T (US/Canada fiber optic vault)	LUS	2	1	1	0	0	0	0	0	1	0.4
Blaine City Hall	EF	1	1	0	0	0	0	0	0	0	0.07
Blaine Community Center	EF	1	1	1	0	0	0	0	0	0	0.13
Blaine Lighthouse Point Water Reclamation Facility	LUS	2	1	1	0	1	0	0	0	1	0.67
Blaine Police Department	EF	3	1	0	0	0	0	0	0	0	0.2
Blaine Public Works	EF	3	1	1	0	0	0	0	0	1	0.6
Cascade Natural Gas Facility	LUS	2	1	1	0	0	0	0	0	0	0.27
Elementary School - Dist. 503	EF	1	1	1	0	0	0	0	0	0	0.13
Good Samaritan Rest Home	EF	1	1	0	0	0	0	0	0	0	0.07
Lift Stations	LUS	2	1	1	0	1	0	0	0	1	0.67
Nextel/AT&T Wireless	LUS	2	1	1	0	0	0	0	0	1	0.4
Nextel/FARS Repeater	LUS	2	1	1	0	0	0	0	0	1	0.4
Port of Bellingham	EF	3	1	1	0	1	0	0	0	1	1
Puget Power	LUS	2	1	1	0	0	0	0	0	1	0.4
Pump Station	LUS	2	1	1	0	1	0	0	0	1	0.67
Reservoir Tanks	LUS	2	1	1	0	0	0	0	0	0	0.27
Verizon Central Office	LUS	2	1	1	0	0	0	0	0	0	0.27
Well Head	LUS	2	1	1	0	0	0	0	0	1	0.4
Whatcom County Fire District 21	EF	3	1	0	0	0	0	0	0	1	0.4

Whatcom County Fire District 21	EF	3	1	0	0	0	0	0	0	1	0.4

Notes: **EQ** = Earthquake; **LQ** =Liquefaction; **LS** = Landslide; **TSUN** = Tsunami; **VOL** = Volcano; **FL** = Riverine Flooding; **COA** = Coastal Flooding; **WF** = Wildland Fire

Areas and Assets Exposed, Per Hazard

	City of Blaine Exposure to Natural Hazards					
	Hazard Susceptibility	Asset County (% of Total)				Critical Facilities Appraised Value (Million)
		Area (sq.mi.)	Population	Parcels	Critical Facilities	
Geological Hazards	**Earthquake**, Shaking Intensity					
	MMI V	40.8%	66.2%	66.9%	61.4%	$90
	MMI VI	24.8%	33.1%	32.8%	38.6%	$5
	MMI VII	-	-	-	-	-
	MMI VIII - IX	-	-	-	-	-
	TOTAL	65.6%	99.3%	99.7	100%	$95
	Liquefaction					
	Very Low to Low	55.3%	81.5%	79.6%	68.2%	$48
	Low to Moderate	7.2%	15.9%	15.4%	18.2%	$3
	Moderate	-	-	-	-	-
	Moderate to High	1.9%	1.5%	4.5%	6.8%	-
	High	0.7%	0.6%	0.3%	6.8%	$44
	TOTAL	65.1%	99.5%	99.8%	100%	$95
	Landslide					
	Landslide Low	-	0.2%	-	-	-
	Landslide Moderate	-	-	-	-	-
	Landslide High	0.06%	-	-	-	-
	Fan Low	0.01%	0.01%	-	-	-
	Fan Moderate	-	-	-	-	-

	Fan High	-	-	-	-	-
	Mine Hazard	-	-	-	-	-
	TOTAL	0.07%	0.21%	-	-	-
	Volcanic Eruption					
	Case 1 Debris Flows	-	-	-	-	-
	Case 2 Debris Flows	-	-	-	-	-
	Case M Flows	-	-	-	-	-
	Pyroclastic Flows, Lava Flows, and Ballistic Debris	-	-	-	-	-
	TOTAL	-	-	-	-	-
	Tsunami, Inundation Zone					
	Low to Moderate Inundation Potential	1.4%	0.9%	3.7%	4.5%	-
	Moderate to High Inundation Potential	0.2%	1.9%	0.1%	-	-
	High Inundation Potential	5.6%	8.8%	10.5%	18.2%	$44
	TOTAL	7.2%	11.6%	14.3%	22.7%	$44
Hydrological Hazards	**Flooding**					
	100-year Flood	20.4%	1.3%		-	-
	500-year Flood	0%	-	0.9%	-	-
	Floodway	-	-	-	-	-
	Undetermined (Zone D)	-	-	-	-	-
	TOTAL	20.4%	1.3%	0.9%	-	-
Ne	**Wildfire Zones**					

	Interface Very Low-Low Structure Density	3.6%	1.1%	1.5%	9.1%	$25
	Interface Medium-High Structure Density	17.6%	40.7%	40.4%	20.5%	$2
	Intermix Very Low-Low Structure Density	11.5%	3.1%	4%	22.7%	$4
	Intermix Medium-High Structure Density	12.4%	14.5%	21.2%	22.7%	$3
	TOTAL	45.1%	59.4%	67.1%	75%	$34

Status of Blaine's 2016-2020 and Ongoing Hazard Mitigation Actions

This section describes the status of mitigation actions that were proposed in the 2016 Mitigation Plan and are now 1) currently being implemented and are ongoing, 2) are now completed, or 3) are now discontinued because they are no longer needed. The actions are organized by hazard and indicate the lead agency, funding source, and status.

1	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
2	Funding Source:	Local; State; FEMA; Private; Other
3	Current Status	Action Discontinued / Action Completed / Action ongoing and expected completion date

Education and Outreach

EO-a. Ongoing County-wide Education and Awareness Activities.

Blaine, and other jurisdictions within Whatcom, engage in a range of public awareness activities at public events, in the schools and through media channels.

Action Item	Lead Responsibility	Funding	Estimated Cost
Emergency preparedness education programs for schools.	Whatcom County Sheriff's Office Division of Emergency Management (WCDEM)	State/Local	$15,000
Drills, exercises in homes, workplaces, classrooms, etc.	WCDEM	State/Local	$4,000
Hazard "safety fairs."	WCDEM	State/Local	$4,000

Hazard conferences, seminars.	WCDEM	State/Local	$15,000
Hazard awareness weeks.	WCDEM	State/Local	$15,000
Preparedness handbooks, brochures. Distribution of severe weather guides, homeowner's retrofit guide, etc.	WCDEM	State/Local	$20,000
Newspaper articles.	City of Blaine Administrative Services	Local	$2,000
Direct Mailings	City of Blaine Administrative Services	Local	$12,000
Utility Bill Inserts	City of Blaine Finance / Administrative Services	Local	$6,000
Annual correspondence with residents reminding them of the need to be hazard prepared.	Whatcom County Sheriff's Office Division of Emergency Management	State/Local	$2,000

EO-b. Public Service Announcements The city of Blaine has a robust online presence on Facebook and Twitter.

Lead Agency	City of Blaine Public Safety
Funding Source	State/ Federal
Current Status	Ongoing

Drought/heat wave

D-a. Educate Residents on Water Saving Techniques –

Yearly medial and sign postings about water conservation, especially with lawn watering in the summer.

Lead Agency	City of Blaine Public Works
Funding Source	State/Local
Current Status	Action Ongoing

Earthquake

EQ-a. Acquire Sufficient Power-generating Capacity to Serve Critical Sites During Extended Power Loss There are several sewer lift stations, water well pumps stations, designated emergency shelters, EOC, and Public Works facilities that require backup power generation capacity in the event of a severe storm or other emergency causing widespread extended disruption of power supplies. Sufficient regenerative capacity does not currently exist, and should be purchased, installed, and maintained to provide this capacity.

The City's capital facilities planning anticipates infrastructure projects over a 6-year planning horizon. Yearly work is done on utilities to maintain them. We anticipate a Water System Comprehensive Plan Update to be adopted this year, and extensive sewer repairs in East Blaine beginning in 2022.

Lead Agency	City of Blaine
Funding Source:	Local sources, and state and federal grants and loans
Timeline:	Moderate term (estimate 1 to 3 years after funding)
Current Status	Ongoing

EQ-b. Adopt and enforce building codes–

The City adopts by reference the most updated versions of the ICC suite. Building permits are reviewed pursuant to the IRC/IBC.

Lead Agency	City of Blaine Community Development Services/Public Safety
Funding Source	State/Local
Current Status	Completed, updates when applicable

EQ-c. Incorporate Earthquake Mitigation into Local Planning –

The City has an adopted critical areas ordinance.

Lead Agency	City of Blaine Community Development Services/Public Safety
Funding Source	State/Local
Current Status	Completed, updates when applicable

EQ-d. Conduct Inspections of Building Safety –

As required by the Fire District.

Lead Agency	Fire District 21
Funding Source	State/Local
Current Status	Completed, updates when applicable

EQ-e. Conduct Outreach to Builders, Architects, Engineers, and Inspectors –

The Building Official is a member of WABO and engages with other local officials in outreach.

Lead Agency	City of Blaine Community Development Services
Funding Source	State/Local
Current Status	Action Ongoing

EQ-f. Provide Information on Structural and Non-Structural Retrofitting –

Application of currently adopted building codes to permit applications.

Lead Agency	City of Blaine CDS
Funding Source	State/Local
Current Status	Action Ongoing

Extreme Temp

No actions ongoing, discontinued, or completed for this hazard.

Flooding

FL-a. Incorporate Flood Mitigation in Local Planning –

Adopted in Chapter 17.86 of Blaine Municipal Code (BMC).

Lead Agency	City of Blaine Community Development Services
Funding Source	State/Local
Current Status	Completed

FL-b. Form Partnerships to Support Floodplain Management –

Coordination with the Port of Bellingham and the Semiahmoo Resort Association.

Lead Agency	City of Blaine Community Development Services/Public Works
Funding Source	State/Local
Current Status	Ongoing

FL-c. Limit or Restrict Development in Floodplain Areas –

Development in the Floodplain (mostly the Wharf District and Semiahmoo Spit) is subject to the performance standards in Chapter 17.86 BMC.

Lead Agency	City of Blaine Community Development Services/Public Works
Funding Source	State/Local
Current Status	Ongoing

FL-d. Manage the Floodplain Beyond Minimum Requirements –

The City goes beyond the minimum requirements pursuant to application of Chapter 17.86 BMC.

Lead Agency	City of Blaine Public Safety
Funding Source	Local
Current Status	Action Complete

FL-e. Improve Storm water Drainage System Capacity –

Existing Blaine stormwater facilities will meet the needs of our forecasted population projections of approximately 10,000 people by 2036 (see 2016 Comp Plan, 2021 Budget ORD) pursuant to following the most current version of the ECY Stormwater Management Manual. The City is not considered NPDES Phase II by Ecology, but the City exceeds minimum requirements by adopting the most current version of the Manual to manage all development projects.

Lead Agency	City of Blaine Public Works
Funding Source	State/Local
Current Status	Action Complete, Updating as applicable

FL-f. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures –

Lead Agency	City of Blaine Public Works
Funding Source	Federal
Current Status	Action Ongoing

FL-g. Educate Property Owners about Flood Mitigation Techniques –

City of Blaine Admin: ongoing through education through Facebook, the Northern Light, etc

Lead Agency	City of Blaine City Manager/City Clerk
Funding Source	State/Local
Current Status	Action Ongoing

Landslide/erosion

ER-a. Map and Assess Vulnerability to Erosion –

Maintenance of GIS shapefiles.

Lead Agency	City of Blaine Public Works
Funding Source	State/Local
Current Status	Action Ongoing

ER-b. Manage Development in Erosion Hazard Areas –

Application of Chapters 13.01 (stormwater), 17.82 (CAO) and 15 (Building) of the BMC.

Lead Agency	City of Blaine Community Development Services
Funding Source	State/Local
Current Status	Action Complete, update when applicable.

ER-c. Promote or Require Site and Building Design Standards to Minimize Erosion Risk –

Lead Agency	City of Blaine Community Development Services / Public Works
Funding Source	State/Local
Current Status	Action Complete, update when applicable.

Landslide Subsidence

No actions ongoing, discontinued, or completed for this hazard.

Lightning

No actions ongoing, discontinued, or completed for this hazard.

Severe Storm

No actions ongoing, discontinued, or completed for this hazard.

Severe Wind

No actions ongoing, discontinued, or completed for this hazard.

Tornadoes

No actions ongoing, discontinued, or completed for this hazard.

Tsunami

TSU-a. Earthquake/Tsunami Warning System –

Blaine has more than 10 miles of shoreline, and significant lowland exposures to Puget Sound coastline. Valuable properties, infrastructure, and populated areas could be at risk in the event of a tsunami. Installation of an appropriately sited All Hazards Alert Broadcast tower has been installed.

Lead Agency	City of Blaine
Funding Source	Local sources, and state and federal grants and loans
Current Status	Action Completed, 2017

Wildfire

No actions ongoing, discontinued, or completed for this hazard.

Winter storms/Freezes

WW-a. Protect Power Lines –

Public Works crews keep utilities and travel corridors working and clear throughout the winter.

Lead Agency	Fire District 21/City of Blaine Public Works
Funding Source	Local/ State
Current Status	Ongoing

Multiple Hazards

MU-a. Community Early Warning System –

A community-wide warning system to help provide broad community notice for evacuation in the event of tsunami, large scale hazardous material spills involving rail or truck lines, or Weapon of Mass Effect incidents involving the international border. Such an early warning system typically involve a series of sirens that are triggered in the event the city needs to be evacuated.

Lead Agency	City of Blaine
Funding Source	Local sources, and state and federal grants and loans
Current Status	Action Completed, 2017

Blaine 2021-2025 Hazard Mitigation Strategy

Whatcom County Hazard Mitigation Goals

Whatcom County has identified five overarching hazard mitigation goals, which represent what a community seeks to achieve through mitigation actions.

Goal 1. Protect Life, Property and Public Welfare

Goal 2. Increase Public Awareness

Goal 3. Preserve and Enhance Natural Systems

Goal 4. Encourage Partnership for Implementation

Goal 5. Ensure Continuity of Emergency Services

These countywide goals help guide any prioritization and implementation of mitigation actions, ensuring that the actions contribute to a community's vision for the future.

Blaine-Specific Hazard Mitigation Goals

Blaine supports the above county-wide goals. No additional community-specific mitigation planning goals have been identified at this time.

Mitigation Action Options

Appendix E of the Whatcom County Natural Hazard Mitigation Plan provides a list of mitigation options. Blaine considered mitigation options related to earthquakes, tsunamis, and severe storms, especially those related to coastal flooding, because these hazards have the potential to cause the greatest loss and damage. Not all mitigation options in Appendix E were relevant or a strong priority for Blaine. Some options have already been implemented or are ongoing in Blaine, as documented in the section above on the status of 2016-2020 and ongoing hazard mitigation actions.

Mitigation Action Prioritization

The mitigation actions in this section are new actions that Blaine has prioritized for the 2021-2025 planning period and beyond. Mitigation options were prioritized based upon review of the following two criteria: 1) The action's Overall Feasibility based on engineering, environmental, financial, and political considerations, 2) The Criticality of the action, based upon a

consideration of which actions had the greatest potential to protect life, property, and public welfare. Blaine is working in cooperation with the County and other participating communities and special districts to develop a systematic methodology that would use multiple evaluation criteria to determine mitigation action prioritization. This new methodology will be used in future updates of this Plan.

In the following Identified Mitigation Actions 2021-2025 table, each priority action is listed by hazard. Each action is followed by planning goals, lead agency, the priority evaluation, timeline, funding source and estimated cost, where such information is available. This information can be used by local decision makers in pursuing strategies for implementation.

1	Goals	Indicates the hazard mitigation planning goal or goals this action addresses; countywide and/or community-specific
2	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
3	Priority:	H (High); M (Medium); L (Low)
4	Timeline:	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years)
5	Funding Source:	Local; State; FEMA; Private; Other
6	Estimated Cost:	Actual; Estimated

Blaine Identified Mitigation Actions 2021-2025

CITY OF BLAINE IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Education and Outreach Education and Awareness Actions	**These are actions that inform and educate citizens, elected officials, and property owners about hazards and ways to mitigate them.**						
	EO-a Ongoing -- Ongoing County-Wide Education and Awareness Activities	2	WCDEM	M	O	State/Local	$95,000
	EO-b Ongoing – Public Service Announcements	2	City of Blaine Public Safety	M	O	State/Federal	Staff
	G-1 Partner with neighboring jurisdictions and public and private entities to ensure adequate emergency shelter capacity and utility infrastructure during severe storms and other natural disasters.	4,5	City of Blaine		S	Local sources, and state and federal grants and loans	Staff
Hazard Specific (Reference: Whatcom County Mitigation Ideas)	**Actions communities should consider to identify and evaluate a range of potential mitigation actions for reducing risk to natural hazards and disasters.**						
Dam/Levee							

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF BLAINE IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Failures (See: Flooding)							
Droughts/Heat Waves	***D-a Ongoing – Educate Residents on Water Saving Techniques***	2,3	Public Works	M	O	State/Local	Staff
	D-1 Assess Vulnerability to Drought Risk	1,2	City of Blaine Public Works	M	M	Federal	
	D-2 Plan for Drought	1,3	City of Blaine Public Works/ Public Safety	L	M	Federal	
Earthquakes	***EQ-a Ongoing -- Acquire Sufficient Power-generating Capacity to Serve Critical Sites During Extended Power Loss***	1, 5	City of Blaine	M	O	Local, State, Federal	
	EQ-e Ongoing – Conduct Outreach to Builders, Architects, Engineers, and Inspectors	1	Community Development Services	M	O	State, Local	
	EQ-f Ongoing – Provide Information on Structural and Non-Structural Retrofitting	1	Community Development Services	M	O	State, Local	
	EQ-1 Police Station	1,5	City of Blaine		L	Local sources, and state and	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF BLAINE IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	Studies have repeatedly indicated that the police service bays would suffer significant damage and casualties in the event of an earthquake. These facilities should be retrofitted, replaced, or relocated so that they can survive a 6.0 magnitude or greater earthquake event. The City is tentatively planning to demolish the Old City Hall, but leave a portion to provide room for Police storage.					federal grants and loans	
	EQ-2 Semiahmoo Spit Commercial and Marina Areas The Semiahmoo Marina, Inn at Semiahmoo, several condominium developments, a Whatcom County Park, and Blaine's former wastewater treatment plant site constitute several tens of millions of dollars in buildings with a daily occupancy and use rate in the hundreds, year-round. It is served by a single point of ingress/egress along the lowland spit northward from Drayton Harbor Road.	1	City of Blaine		S	Local sources, and state and federal grants	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF BLAINE IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	Significant storm driven tidal action can, and does, compromise the Semiahmoo Parkway roadway along this spit on occasion. Storm winds place the marina facilities at increased risk. A natural event such as earthquake, tsunami, or wind driven tidal surge could damage property and strand civilians in the spit area and deny access to emergency responders. A plan needs to be developed and provisioned to provide prompt notification to people along Semiahmoo spit, and to provide alternative means for their escape from the area if the roadway is compromised or if quick evacuation is essential. The plan should include contingency planning should a blocked roadway prevent access by emergency vehicles.					and loans	
	EQ-3 Map and Assess Community Vulnerability to Seismic Hazards Use of GIS mapping can help inform city	1,2	Public Works	L	S	State/Local	

CITY OF BLAINE IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	decisions and protect the welfare of residents and critical infrastructure.						
Extreme Temperatures	No current ongoing or future planned actions for extreme temperatures.						
Flooding	***FL-b Ongoing – Form Partnerships to Support Floodplain Management***	1	Community Development Services/Public Works	M	O	State/Local	
	FL-c Ongoing – Limit or Restrict Development in Floodplain Areas	1	Community Development Services/Public Works	M	O	State/Local	
	FL-f Ongoing -- Conduct Regular Maintenance for Drainage Systems and Flood Control Structures	1	Public Works	M	O	Federal	
	FL-g. Ongoing -- Educate Property Owners about Flood Mitigation Techniques	2	City Manager/City Clerk	M	O	State/Local	
	FL-1 Improve Flood Risk Assessment	1,3	City of Blaine Public Works	M	S	State/Local	Existing staff time and

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF BLAINE IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	Critical Areas Ordinance update scheduled for 2022		CDS				capacity.
	FL-2 Elevate or Retrofit Structures and Utilities Includes the Resort, and some pump stations.	1,5	City of Blaine Public Works	L	L	Federal	$2,000,000
	FL-3 Protect and Restore Natural Flood Mitigation Features – Coastal berms and dunes.	3	City of Blaine Public Works	L	L	Federal	$10,000,000
	FL-4 Increase Awareness of Flood Risk and Safety	2	City of Blaine Public Safety	L	M	Federal	Consultant
Landslide/Erosion	***ER-a Ongoing -- Map and Assess Vulnerability to Erosion***	1	City of Blaine Public Works	M	O	State/Local	Staff
	ER-1 Stabilize Erosion Hazard Areas Stabilize Semiahmoo spit and road/utility corridor. Continued work to stabilize the Marine Shoreline.	1,5	City of Blaine Public Works	M	M	Federal	$5,000,000
	ER-2 Increase Awareness of Erosion	2	City of Blaine	L	L	Federal	Consultant

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF BLAINE IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	Hazards		Community Development Services				
Land Subsidence	No current ongoing or future planned actions for Land Subsidence. No known risk of land subsidence within Blaine						
Lightning	No current ongoing or future planned actions for Land Subsidence. Whatcom County has County-wide mitigation actions in place.						
Severe Storms	**SS-1 Community-wide Education and Preparation** A plan should be developed to work with community faith-based, educational, and public services to educate the residents of Blaine about the weather-related events that place them at risk, and provide planning tools that they can use to	2	City of Blaine		M	Local sources, and state and federal grants and loans	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF BLAINE IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	mitigate those risks in their homes and businesses. A similar planning and preparation procedure should be adopted within the departments of city government.						
Severe Wind	**SW-1 Assess Vulnerability to Severe Wind**	1	City of Blaine Public Works	M	M	Federal	$4,000
Tornadoes	No current ongoing or future actions for tornadoes.						
Tsunami	**TSU-1 Manage Development in Tsunami Hazard Areas** Critical areas updates scheduled for 2022	1	City of Blaine Community Development Services	L	L	State/Local	Existing staff capacity and time
	TSU-2 Build Tsunami Shelters	1	City of Blaine Public Safety	L	L	Federal	$6,000,000
Wildfires	**WF-1 Map and Assess Vulnerability to Wildfire**	1	Fire District 21/City of Blaine Public Safety	L	M	Federal	Existing staff capacity and time
	WF-2 Incorporate Wildfire Mitigation in the Comprehensive Plan	1,4	Fire District 21 / City of Blaine	L	L	State/Local	Existing staff capacity and

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF BLAINE IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	Comprehensive Plan update in 2025		Public Safety				time
	WF-3 Reduce Risk through Land Use Planning Application of vegetative buffers pursuant to the BMC.	1,3	City of Blaine Community Development Services	L	L	State/Local	Existing staff capacity and time
	WF-4 Require or Encourage Fire-Resistant Construction Techniques	1,2	Fire District 21 / City of Blaine Community Development Services	L	L	Federal	$165,500
	WF-5 Retrofit At-Risk Structures with Ignition-Resistant Materials	1	Fire District 21 and City of Blaine Community Development Services	L	L	Federal	$865,500
	WF-6 Create Defensible Space Around Structures and Infrastructure	1	Fire District 21 / City of Blaine Community Development Services	L	L	Federal	$500,500

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF BLAINE IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	WF-7 Conduct Maintenance to Reduce Risk	5	Public Works	L	L	State/Local	$250k
Winter Storms/ Freezes (Severe Winter Weather)	***WW-a. Protect Power Lines***	1	Fire District 21/Public Works	M	O	State/Local	
	WW-1 Develop Plan to Assist Vulnerable Populations	1	City of Blaine Public Safety/ Fire District 21	M	L	City of Blaine	$100,000
Multiple Hazards	All future actions are focused on mitigating specific hazards.						
Advanced Mitigation Projects (Dream List)	**Marine Drive Commercial and Marina Areas Emergency Plan** A natural event such as earthquake, tsunami, or derailment would strand civilians in the harbor and deny access to emergency responders. A plan needs to be developed and provisioned to provide prompt notification to people in the harbor area, and to provide alternative means for their escape from the area if Marine Drive is closed. The plan should	1,2,5	City of Blaine		L	Local sources, and state and federal grants and loans	

CITY OF BLAINE IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	include contingency planning should a blocked roadway prevent access by emergency vehicles.						
	Earthquake Early Warning System These systems are envisioned to warn residents of an impending earthquake. Technology does not currently exist for early detection with sufficient accuracy, but will likely be available in the future.	1,2	City of Blaine		L	Local sources, and state and federal grants and loans	
	Retrofit Residential Buildings For severe wind and other hazards.	1	City of Blaine Community Development Services		L	Federal	$4,000,000
	Retrofit Public Buildings and Critical Facilities For severe wind and other hazards.	1,5	City of Blaine Community Development Services/ Public Works		L	Federal	$8,000,000

CITY OF BLAINE IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	Install sufficient regenerative power capacity for critical sites-Power Generating Capacity	5	City of Blaine Public Works	M	O	State/ Local funding	TBD
	Well field Backup Power	5	City of Blaine Public Works	M	O	State/ Local funding	$500,000.00
	Natural Hazard Early Warning Systems	1,2	City of Blaine Public Safety/ Public Works	L	O	State/ Local funding	$155,000.00
	Tone Radio Based Early Warning System Natural Hazard Early Warning Systems	1,2	City of Blaine Public Safety/ Public Works	L	O	State/ Local funding	$75,000.00

Blaine Annual Review and Progress for Hazard-Specific Mitigation Actions 2021-2025

Progress monitoring means tracking the implementation of the hazard specific mitigation actions over time. Each jurisdiction must identify how, when, and by whom action items will be monitored. The responsible agency assigned to each mitigation action is responsible for tracking and reporting on each of their actions.

Annual review and progress reporting includes the following:

Step One: Identify mitigation actions that your planning team has identified for the annual review. The planning team has the option to address ALL action items, or only those that should be acted on during each review cycle.

Step Two: Use the table below to track annual progress. For each action item selected for annual review insert the appropriate letter that indicates the status of that action item.

Step Three: Complete a progress report form as illustrated in Appendix G for each mitigation action item selected for annual review

Step Four: Submit the completed form(s) to the Whatcom County DEM.

City of Blaine Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Education and Outreach						
EO-a. Ongoing County-wide Education and Awareness Activities.						
EO-b. Public Service Announcements.						
G-1 Partner with neighboring jurisdictions and public and private entities to ensure adequate emergency shelter capacity and utility infrastructure during severe storms and other natural disasters						
Add New Action Items if Applicable						
DAM/LEVEE FAILURES						
Add New Action Items if Applicable						
DROUGHTS/HEAT WAVES						
D-a. Educate Residents on Water Saving Techniques						
D-1 Assess Vulnerability to Drought Risk						
D-2 Plan for Drought						
Add New Action Items if Applicable						
EARTHQUAKES						
EQ-a. Acquire Sufficient Power-generating Capacity to Serve Critical Sites During Extended Power Loss						

City of Blaine Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
EQ-b. Adopt and enforce building codes						
EQ-c. Incorporate Earthquake Mitigation into Local Planning						
EQ-d. Conduct Inspections of Building Safety						
EQ-e. Conduct Outreach to Builders, Architects, Engineers, and Inspectors						
EQ-f. Provide Information on Structural and Non-Structural Retrofitting						
EQ-1 Police Station						
EQ-2 Semiahmoo Spit Commercial and Marina Areas						
EQ-3 Map and Assess Community Vulnerability to Seismic Hazards						
Add New Action Items if Applicable						
FLOODING						
FL-a. Incorporate Flood Mitigation in Local Planning						
FL-b. Form Partnerships to Support Floodplain Management						
FL-c. Limit or Restrict Development in Floodplain Areas						
FL-d. Manage the Floodplain Beyond Minimum Requirements						
FL-e. Improve Storm water Drainage System Capacity						
FL-f. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures						
FL-g. Educate Property Owners about Flood Mitigation Techniques						

City of Blaine Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
FL-1 Improve Flood Risk Assessment						
FL-2 Elevate or Retrofit Structures and Utilities						
FL-3 Protect and Restore Natural Flood Mitigation Features – Coastal berms and dunes.						
FL-4 Increase Awareness of Flood Risk and Safety						
Add New Action Items if Applicable						
LANDSLIDES/EROSION						
ER-a. Map and Assess Vulnerability to Erosion						
ER-b. Manage Development in Erosion Hazard Areas						
ER-c. Promote or Require Site and Building Design Standards to Minimize Erosion Risk						
ER-1 Stabilize Erosion Hazard Areas						
ER-2 Increase Awareness of Erosion Hazards						
Add New Action Items if Applicable						
LAND SUBSIDENCE						
Add New Action Items if Applicable						
TORNADOES						
Add New Action Items if Applicable						
TSUNAMI						
TSU-a. Earthquake/Tsunami Warning System						

City of Blaine Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
TSU-1 Manage Development in Tsunami Hazard Areas						
TSU-2 Build Tsunami Shelters						
Add New Action Items if Applicable						
WILDFIRES						
WF-1 Map and Assess Vulnerability to Wildfire						
WF-2 Incorporate Wildfire Mitigation in the Comprehensive Plan						
WF-3 Reduce Risk through Land Use Planning						
WF-4 Require or Encourage Fire-Resistant Construction Techniques						
WF-5 Retrofit At-Risk Structures with Ignition-Resistant Materials						
WF-6 Create Defensible Space Around Structures and Infrastructure						
WF-7 Conduct Maintenance to Reduce Risk						
Add New Action Items if Applicable						
WINTER STORMS/FREEZES (SEVERE WINTER WEATHER)						
WW-a. Protect Power Lines						
WW-1 Develop Plan to Assist Vulnerable Populations						
Add New Action Items if Applicable						
SEVERE STORMS						

City of Blaine Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
SS-1 Community-wide Education and Preparation						
Add New Action Items if Applicable						
EXTREME TEMPERATURES						
Add New Action Items if Applicable						
LANDSLIDE						
Add New Action Items if Applicable						
LIGHTNING						
Add New Action Items if Applicable						
SEVERE WIND						
SW-1 Assess Vulnerability to Severe Wind						
Add New Action Items if Applicable						
MULTIPLE HAZARDS						
MU-a. Community Early Warning System						
Add New Action Items if Applicable						

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CITY OF EVERSON

Contact Information	**Dan MacPhee** Police Chief P.O. Box 315 Everson, WA 98247 (360) 966-4212
Approving Authority	**Mayor John Perry & City Council Members** P.O. Box 315 Everson, WA 98247 (360) 966-3411

Planning Process

The City of Everson process of reviewing, updating, and adopting the 2021 update of the Whatcom County Natural Hazards Mitigation Plan (NHMP or Plan) included review by multiple City departments and formal adoption by the City Council. Review of the prior plan began in early 2021. The City Planner reviewed the previous plan and met with the Public Works Director and Chief of Police to identify portion of the plan that might need to be updated. From February through April of 2021 the City Planner attended a series of coordination meetings hosted by the County Division of Emergency Management (DEM). Initial guidance was received from DEM regarding the update schedule and the main areas to focus on as part of the update.

In early March 2021, the City provided public notice in the Lynden Tribune regarding the planned update of the NHMP and posted information regarding the update on the City website. Information regarding opportunities to provide public comment was also posted to the City website. During March and April of 2021, the City Planner prepared draft revisions to the NHMP and met with the Public Works Director and the Chief of Police to review the draft revisions and receive additional input. During the same time period, City staff participated in two virtual public meetings hosted by DEM where the public was invited to receive information and ask questions regarding the 2021 update of the NHMP.

The draft revisions to the NHMP addressing the city of Everson, incorporating input received from the Public Works Director, Mayor and Chief of Police, were submitted to DEM in late April 2021. In May of 2021, DEM notified the public regarding the availability of draft revisions to the full Plan and hosted a third virtual public meeting to receive comments from the public. Following review by the City Council in May 2021, the City Council passed a motion supporting the updates contained in the Everson section of draft NHMP. Prior to the Plan being submitted to the Federal Emergency Management Agency for review, the City Council expects to formally adopted the draft Plan in summer 2021. It is anticipated that formal adoption by ordinance will follow approval from FEMA.

Key Contributor List

- Rollin Harper, City Planner
- Dave Schoonover, Public Works Director
- Police Chief Dan MacPhee
- Mayor John Perry

Meeting Dates and Attendees

- February 23, 2021 – Harper, Schoonover and MacPhee
- April 15, 2021 – Harper, Schoonover and MacPhee
- April 30, 2021 – Harper and Schoonover

The information contained in the Natural Hazards Mitigation Plan update regarding hazards, risks, vulnerability, and potential mitigation is based on the best available science and technology currently available. This information and related data on natural hazards potentially impacting Everson will be used as a tool when the City updates other plans and programs, such as the following:

- Comprehensive plan required by the Growth Management Act (GMA);
- Development regulations required by the GMA;
    - Critical areas ordinance;
    - Capital improvement program;
    - Capital facilities planning; and
    - Water Resource Inventory Area planning.

As additional information becomes available from other planning sources that can enhance this Plan, that information will be incorporated through the periodic update process.

Plan Maintenance for the City of Everson

The City of Everson will maintain and update the Natural Hazards Mitigation Plan as needed to respond to changed circumstances, to incorporate best available science and to address changing community priorities. The Plan update process will include community engagement through public meetings and opportunities for public comment. Formal updates of the Plan will be reviewed by the City Council prior to adoption.

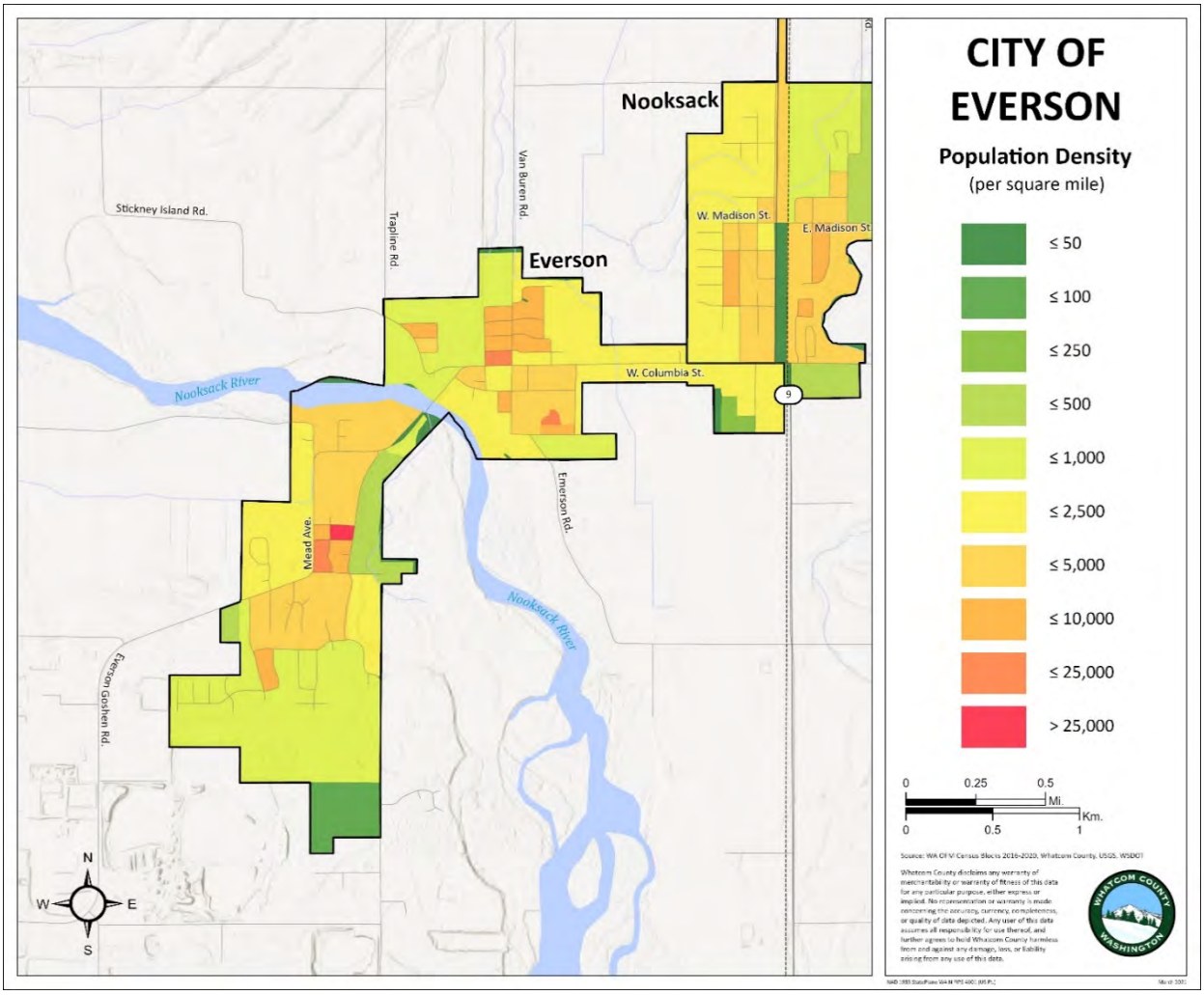
Public Outreach and Education

Program	Yes/No, Year Adopted	Description
Nonprofit organizations or local residents groups focused on hazard mitigation, emergency preparedness, vulnerable populations, etc.	No	
Ongoing public education or information programs	Yes 2008-CRS mailings 2010-Newsleters 2018-City website postings	Repetitive loss information Floodplain preparedness and water conservation information
School-related programs for natural hazard safety	Yes 2005	Semi-annual in-school drills regarding responses to natural disasters
Public education or information program	Yes 2008-CRS mailings 2010-Newsleters 2018-City website postings	Repetitive loss information Floodplain preparedness and water conservation information
StormReady certification	No	Whatcom County is StormReady certified.
Firewise Community certification	No	N/A
Public-Private Partnership initiatives addressing disaster-related issues	No	
Other		

Overview of Everson, Hazards, and Assets

Geography of Everson

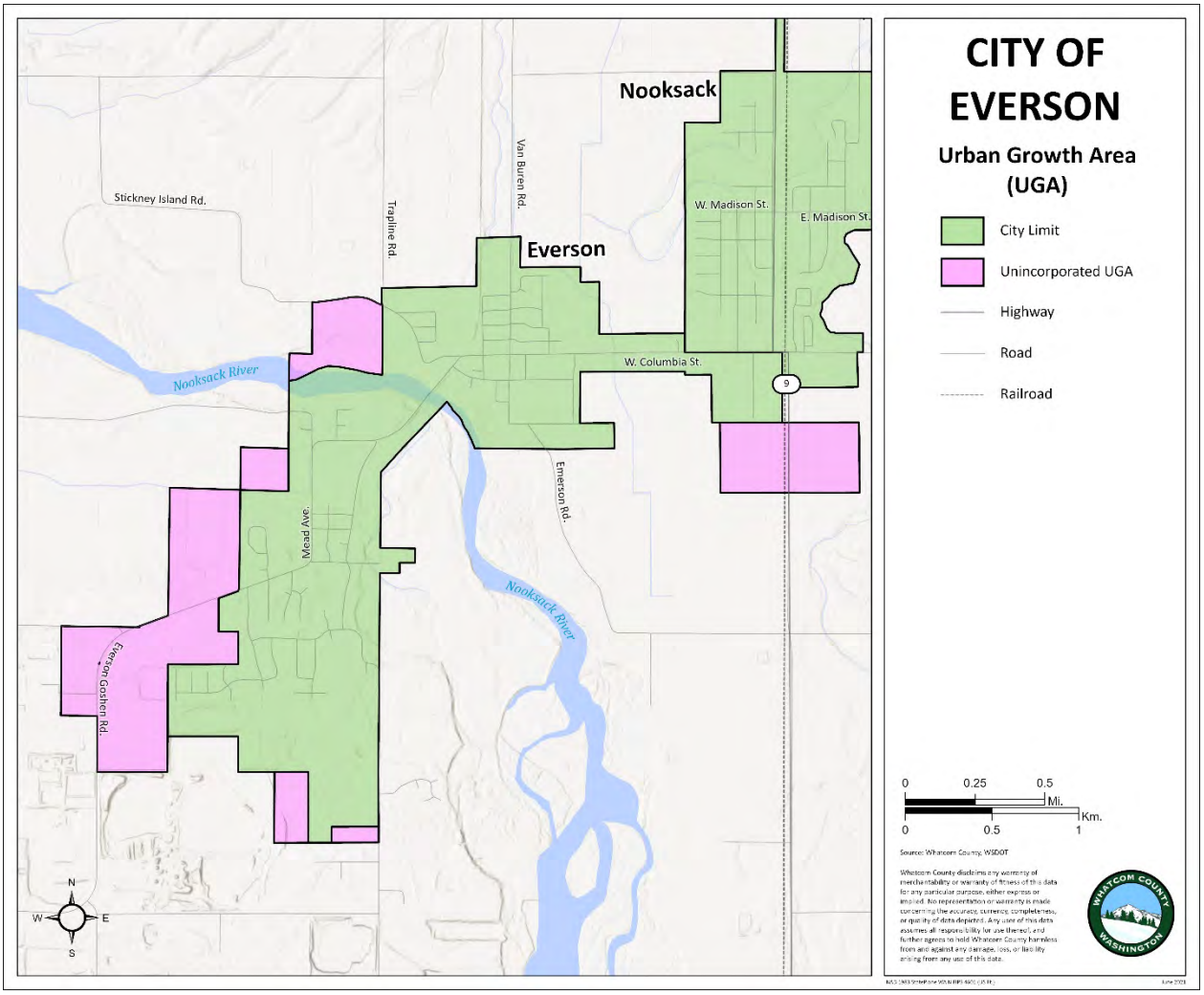
Everson Population	2,860 (2020 estimate)
Total area	1.36 sq. mi. (within city limits)



Washington State Office of Financial Management (OFM) 2020 population and housing estimates for 2010-2020 census block data. This map uses the 2016-2020 average population to show population density per square mile.

Growth Trends

This map displays the UGA for the City of Everson, as designated by the Whatcom County Comprehensive Plan.



Presence of Hazards and their Impacts in Everson

Flooding from the Nooksack River is the most significant hazard that affects the City of Everson, with moderate to major events occurring every five to ten years. The most recent event occurred in February 2020 when the Nooksack River overflowed its banks to the south of Everson and flowed away from the river and into the "Nooksack Overflow Corridor," which carries floodwaters to the north, through rural Whatcom County, the City of Sumas and into Canada. The flowing of floodwaters through the Overflow Corridor resulted in closure of E. Main Street (State Route 9), which is the main connecting route between the cities of Everson and neighboring Nooksack. This closure temporarily interrupted access police, fire and other emergency services to the eastern portions of Everson and the City of Nooksack that are located on the east side of the Overflow Corridor.

Since the 2016 NHMP was adopted, the City of Everson has grown by roughly 260 people. Nearly all of this growth occurred in the southern half of Everson, south of the Nooksack River and outside the 100-year floodplain. The Everson City Council has adopted increased densities in select non-floodplain areas, and the City is in the process of annexing an over 100-acre area that is entirely outside the floodplain. The local fire district is currently planning to relocate its Everson fire station from its current downtown location within the floodplain to a new location within the pending annexation area. In addition, over the past several years the City has completed projects to elevate critical facilities one to three feet above the elevation of the floodplain.

In the table below is a list of the major hazards that effect Whatcom County. The second column provides the percentage of Everson's total area that is exposed to each hazard. The third column indicates the severity of anticipated impacts to community function, considering the credible worst-case hazard scenario. Severity of anticipated impacts considers effects on basic community function such as shelter, transportation, utilities, commerce, industry, agriculture, education, health, recreation, and cultural identity. Severity ranges from none to extreme, as shown in the key below the table. Finally, the last column of the table describes where the hazard impacts the community and which services the hazard would most significantly impact.

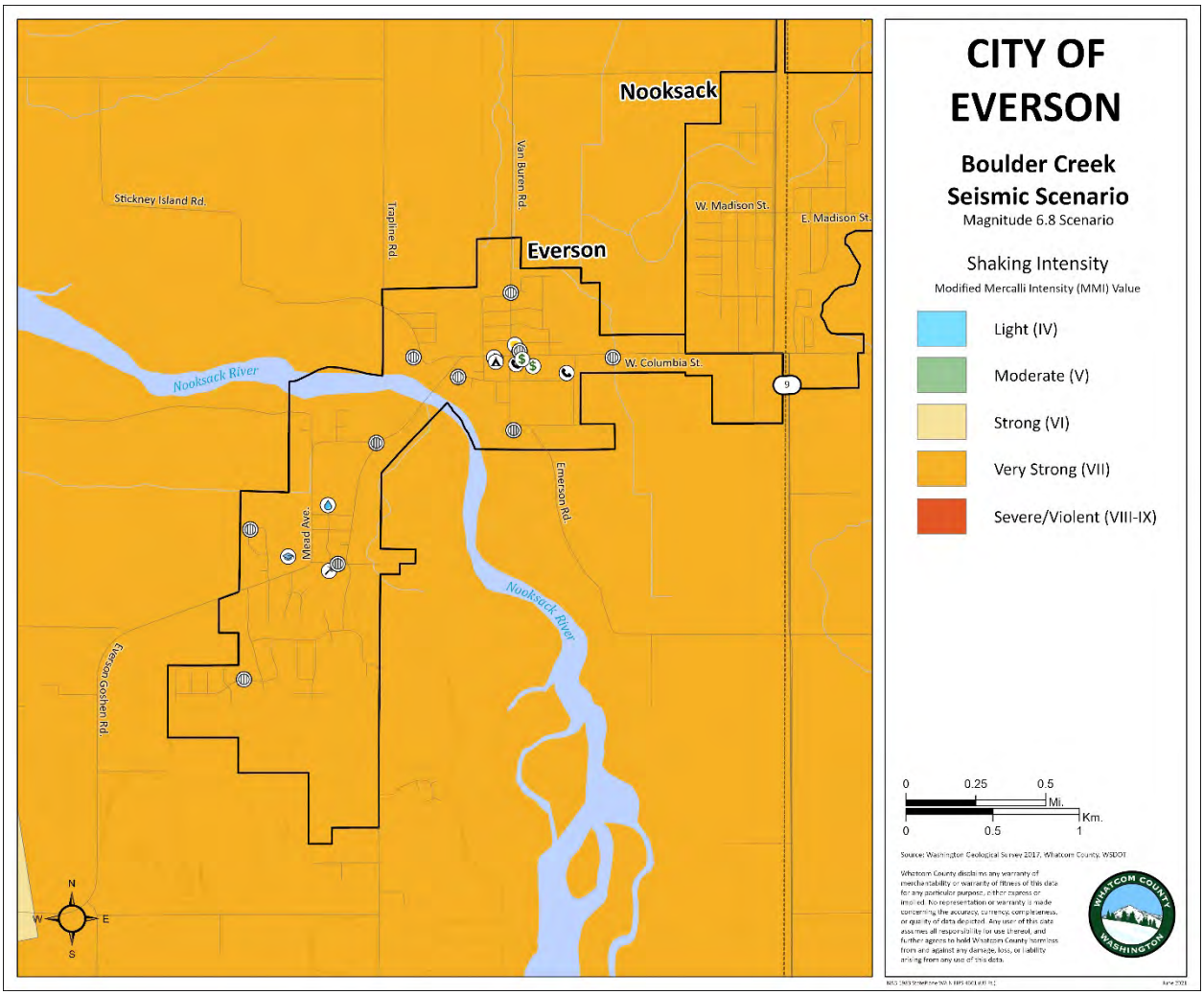
	Hazard	% area Exposed	Severity of Anticipated Impacts	Hazard Descriptions
Geological	**Earthquake**	100%	Moderate	The City of Everson is subject to earthquakes. Seismically sensitive soils present.
	Liquefaction	95.8%	Low	Part of the city, east of Strandel Road, has known clay soil called phixatropic. Phixatropic liquefies when moved, causing landslides and flow.
	Landslide	0%	None	N/A
	Volcano	53.7%	Low	All of the downtown area, adjacent to the Nooksack River, and north and east to the City Limits are vulnerable to a Mount Baker lahar.
	Tsunami	0%	None	N/A
	Mine Hazards	0%	None	N/A
Hydro-logical	**Flooding**	42.1%	High	Hazard presents a frequent and severe risk due to isolated areas. Major flooding occurred in 1989, 1990, and 1995. Flooding begins on the west side of the City and moves east and north up Highway 9 toward Sumas. A 1991 dike was extended with money from mitigation. A dike runs parallel to the river on the west side, and ends on Emerson Road, which prevents water from going to Washington Street and on through to Main Street. This dike diverts Nooksack River overflow to the floodway. The Sumas River can flood east of the city, but does not cause severe problems.

Meteorological	**Wildfire**	22.7%	Low	Various residential homes at risk. The city has multiple 1970s apartments and duplexes and two senior living facilities. Two mobile home parks are present with a total of 71 units.

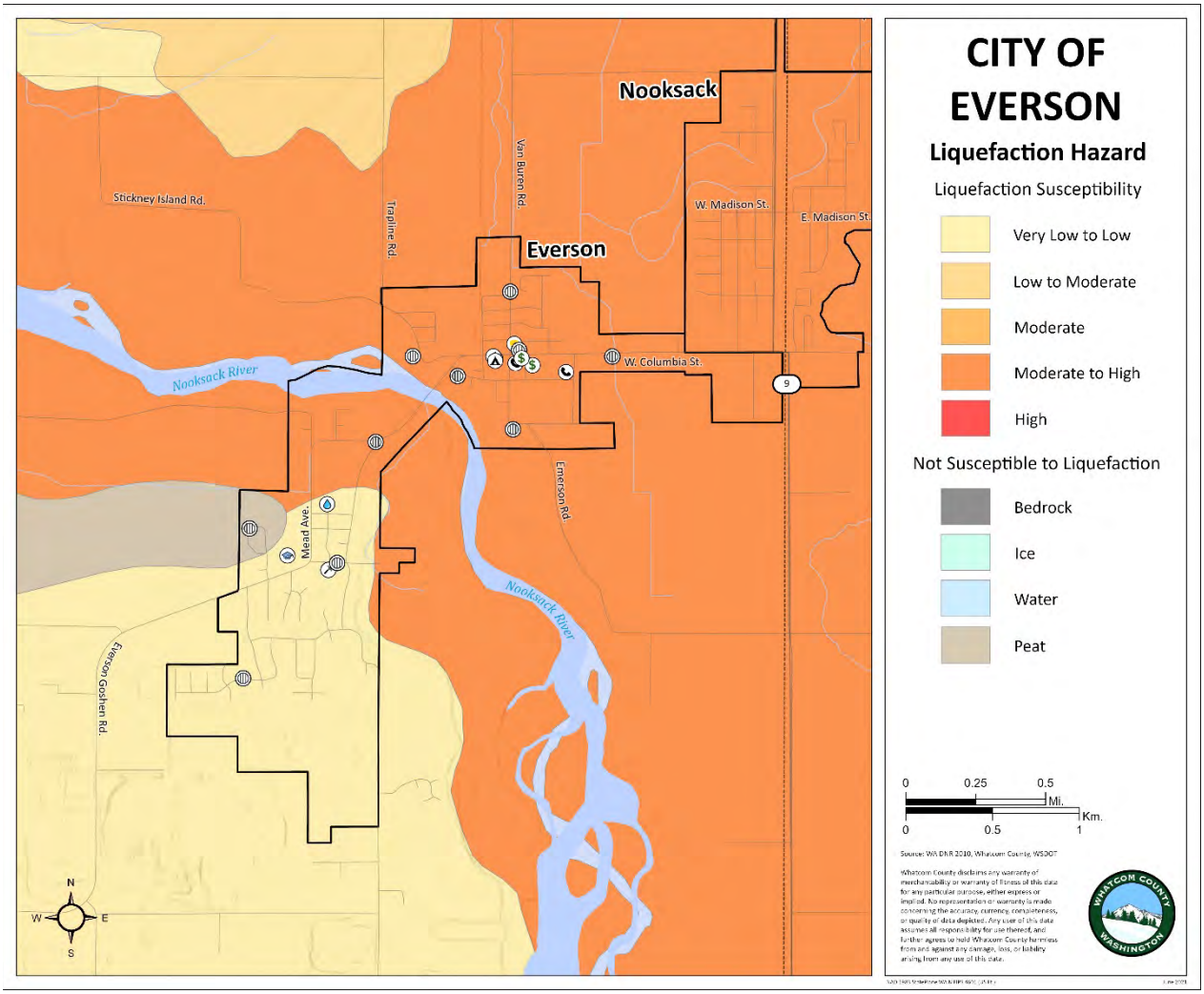
Severity Scale: **None** = no impact to community function
Low = minor degradation of community functions, not widespread
Moderate = moderate degradation over multiple weeks or widespread
High =degradation or loss over many weeks, widespread

Natural Hazard Maps

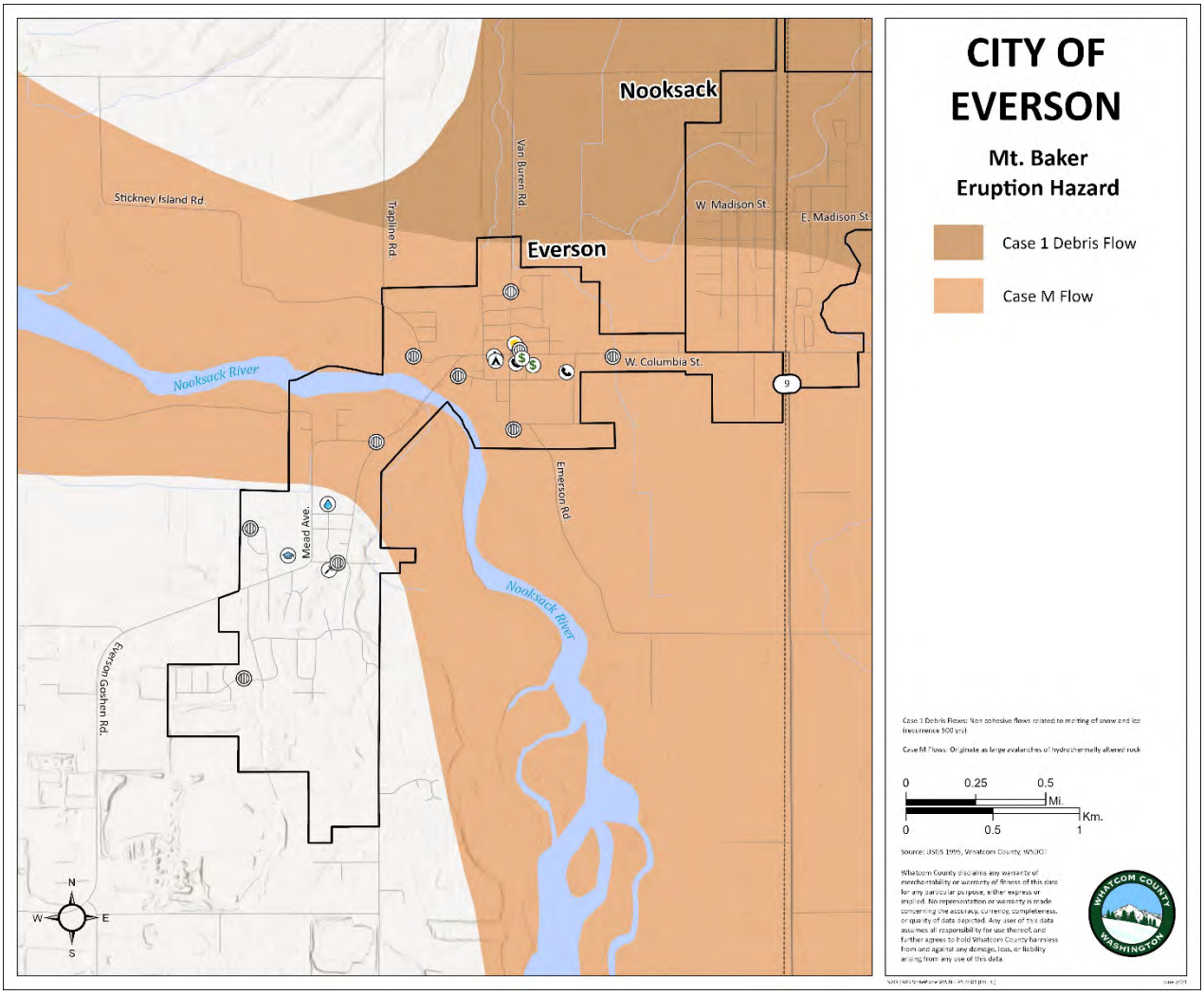
The following figures depict the natural hazards present within the jurisdiction.



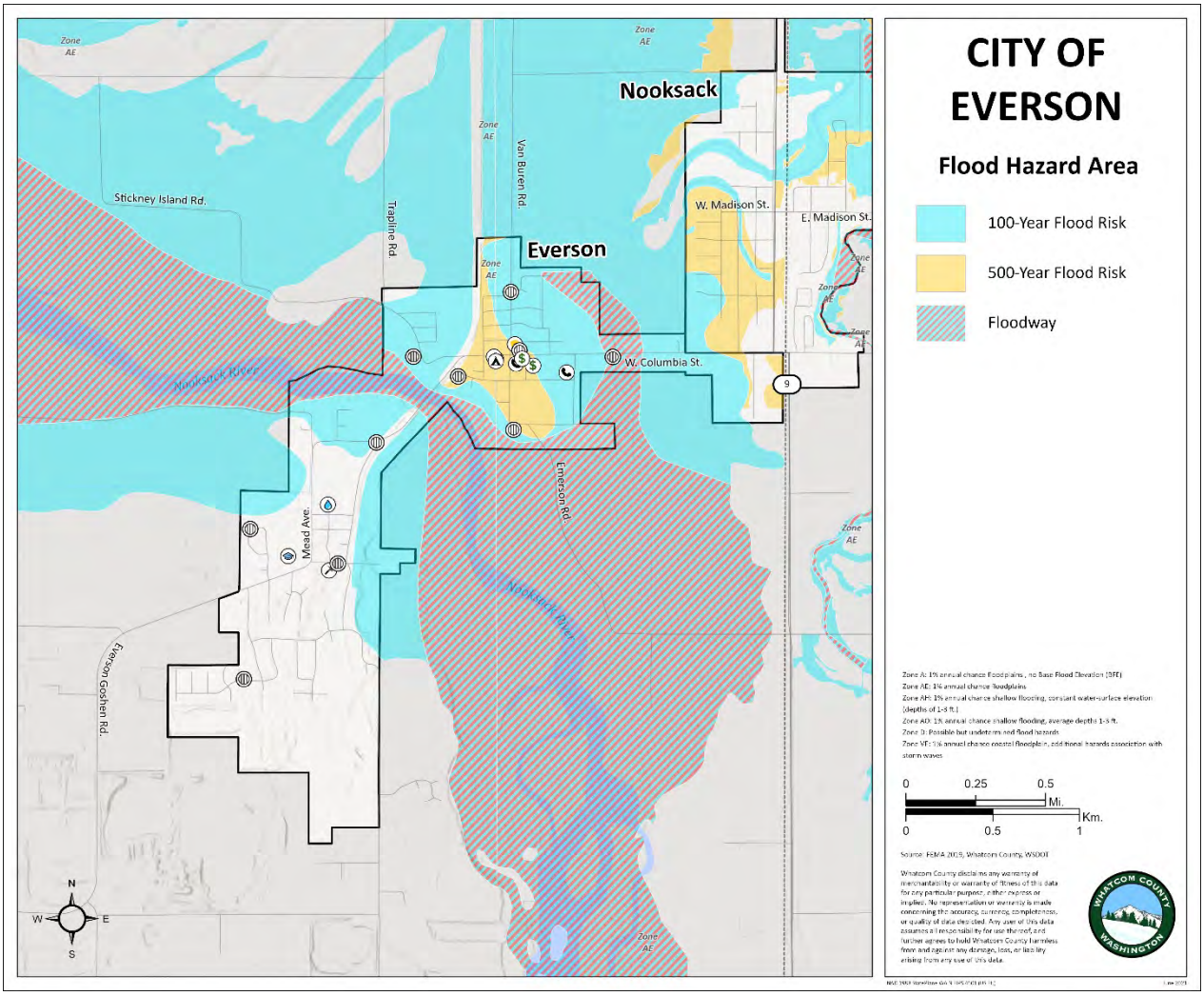
Washington Department of Natural Resources (WA DNR) 2017 Boulder Creek Fault Zone seismic scenario of magnitude 6.8 data. Displays extent and severity of the modeled earthquake in the Modified Mercalli Intensity (MMI) scale.



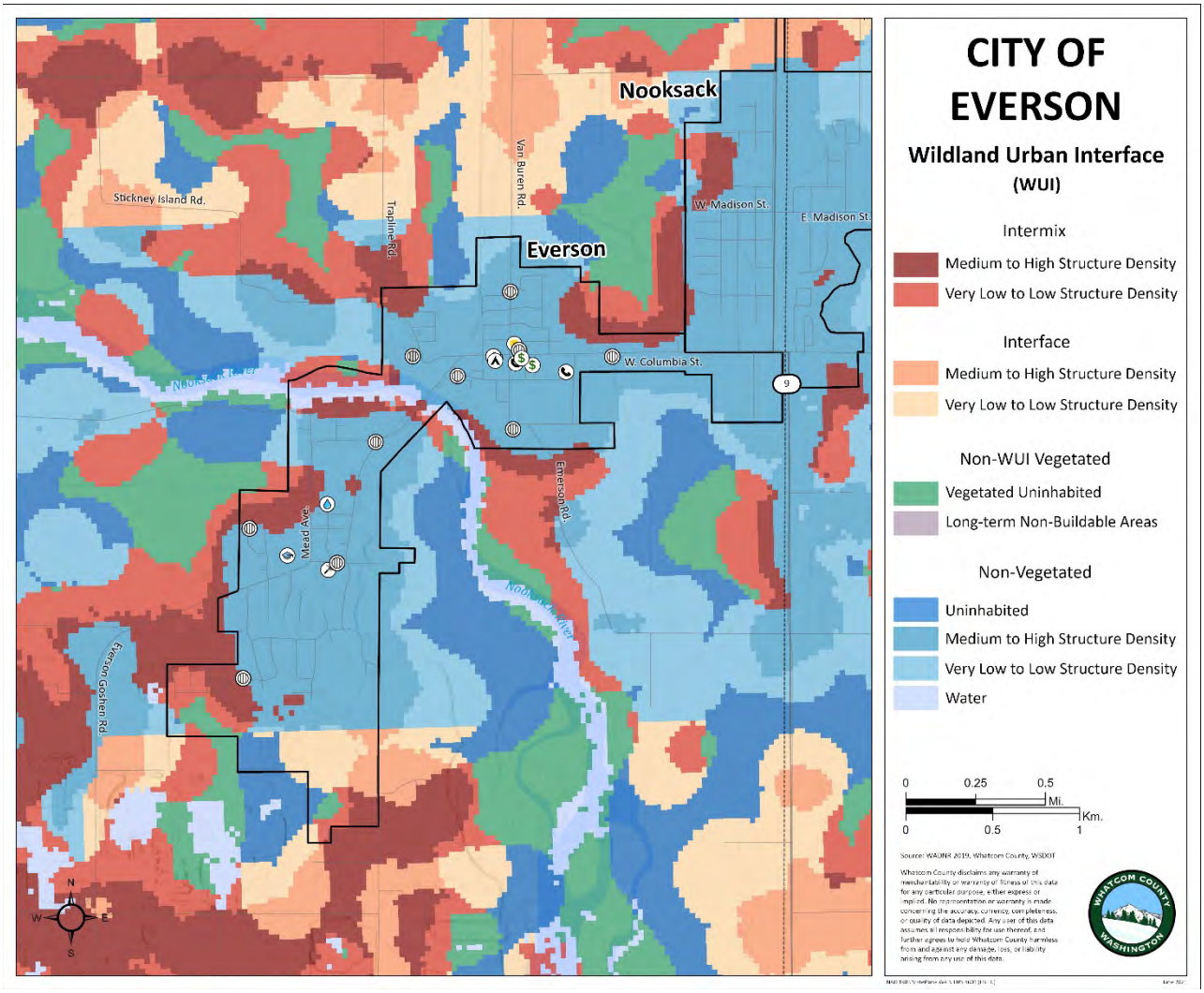
Washington Department of Natural Resources (WA DNR) 2010 liquefaction susceptibility data. This feature class is part of a geodatabase that contains statewide ground response data for Washington State.



USGS Hazards from Future Activity of Mount Baker, WA (1995) data shows different volcanic flows. Case M flows originate as large avalanches of hydrothermally altered rock. Case 1 debris flows are non-cohesive flows related to melting of snow and ice, with a recurrence of 500 years. Case 2 debris flows are cohesive flows from small debris avalanches, with a recurrence of 100 years.



FEMA 2019 flood hazard data showing 100-year flooding, 500-year flooding, floodways, and flood zones. FEMA flood data includes both riverine and coastal flooding.



Washington Department of Natural Resources (WA DNR) 2019 mapped data of Washington's Wildland Urban Interface (WUI). The WUI displays areas of WA where structures and wildland overlap with specific structure densities

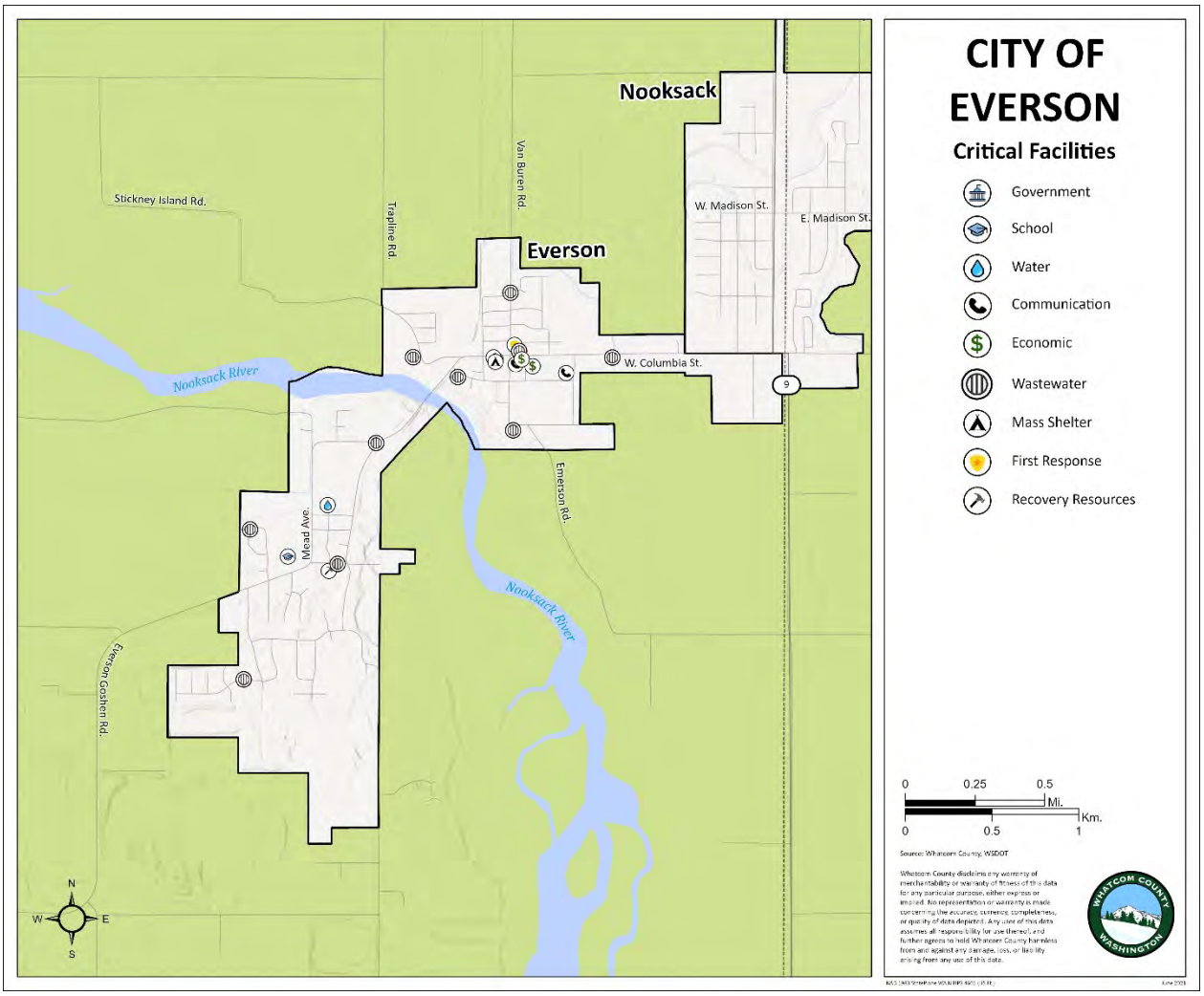
Everson Critical Facility List

Facility Name	Facility Type	Signi-ficance	Location	Assessed Dollar Value	Notes
Elementary School - Dist. 506	EF	2	216 Everson-Goshen Road		Evacuation Center
Everson City Hall	EF	3	111 W. Main Street		Government
Everson Police Dept.	EF	3	109 W. Main Street		Law Enforcement
Everson Community Center	EF	1	111 W. Main Street		Evacuation Center
Everson Water Production Facility	LUS	3	610 Freda Street		Utility: Water
People's Bank	EF	1	200 E. Main Street		Economic
Post Office	EF	2	108 Blair Drive		Mail
Public Works Strandell Shop	EF	1	603 Robinson Street		Public Works
Pump Station #11	LUS	2	716 Red Maple Loop		Utility: Sewer
Pump-Station - Evergreen	LUS	2	116 Evergreen Way		Utility: Sewer
Pump-Station #10	LUS	2	605 Robinson Street		Utility: Sewer
Pump-Station #4 (Interceptor)	LUS	3	506 E. Main Street		Utility: Sewer
Pump-Station #5	LUS	2	103 E. Main Street		Utility: Sewer
Pump-Station #6	LUS	2	208 Everson Road		Utility: Sewer
Pump-Station #7	LUS	2	401 Lincoln Street		Utility: Sewer
Pump-Station #8	LUS	2	102 Reeds Lane		Utility: Sewer
Pump-Station #13	LUS	2	1117 Cashmere Lane		Utility: Sewer
Verizon Communications	LUS	1	107 S. Washington Street		Utility: Communication
Waste Water Treatment Plant	HMF	3	101 Park Drive		Utility: Sewer
Whatcom County Fire District 1	EF	3	101 E. Main Street		Fire Station

Whatcom Educational Credit Union	EF	1	106 E. Main Street		Economic

Facility Type: **EF** = Essential Facility; **HMF** = Hazardous Materials Facility; **HPL** = High Potential Loss; **LUS** = Lifeline Utility System

Significance to community function: 1=Moderate; **2**= High; **3** =Very High



Map of critical facilities identified by the City of Everson. Across Whatcom County, critical facilities fell into 15 categories. Unique categories developed for this plan update include mass shelter, assisted living, and recovery resources. Mass shelter includes facilities such as fairgrounds and community centers. Recovery resources are facilities that are required post-hazard event, for example public works and private construction companies. Not all judications identified or included critical facilities in each category.

Critical Facility Rankings for the City of Everson

The table below indicates whether each critical facility falls within known hazard zones for earthquake, liquefaction, landslide, tsunami, volcano, riverine flooding, coastal flooding and wildfire zones. A rank assessment in the last column indicates how the relative risk of community impact. This ranking considers the significance of the facility to the community and the number of hazard zones the facility is within. The frequency of each hazard is also considered, such that being in a low frequency hazard zone would receive a lower ranking than that same facility being in a high frequency hazard zone. Ranking is on a scale of 1 to 10, with 1 being the facility with the highest-ranking score, and 10 being a facility with the lowest ranking score in the jurisdiction.

$$\text{Rank} = \text{Significance} * \left[\frac{\text{EQ\_Zone}}{\text{EQ\_Freq}} + \frac{\text{LQ\_Zone}}{\text{LQ\_Freq}} + \frac{\text{LS\_Zone}}{\text{LS\_Freq}} + \ldots \frac{\text{WF\_Zone}}{\text{WF\_Freq}} \right]$$

Ranking value will be from 0.0 to 1.0, scaled to the highest ranking in jurisdiction.

Significance: 1=moderate; 2=high; 3=very high, as assessed in the critical facilities list in the previous section

Zone: 0=facility not in hazard zone; 1 = facility in the hazard zone

Frequency (e.g. EQ_Freq, LQ_Freq) is the most difficult variable to which to assign a value. Frequency varies based upon the magnitude of a hazard event and varies from one place to another. It was not possible within the time constraints to assess frequency of hazard at each critical facility location. Instead, a qualitative assessment of the hazard frequency across the entire county was made, as shown in the chart below.

Description	Freq Value used in formula	Hazards
Frequent, occurring on the order of decades	3	Riverine flooding (FL); Coastal flooding (COA)
Rare, occurring on the order of centuries	2	Earthquake (EQ); Liquefaction (LQ); Landslide (LS); Wildfire (WF)
Very rare, occurring on the order of millennia	1	Tsunami (TSU); Volcano (VOL)

Note: Severe storm, a very frequent hazard, was omitted because it is ubiquitous and because no hazard map of storm severity was available.

Critical Facilities Ranking Table

Facility Name	Facility Type	Signi-ficance	EQ	LQ	LS	TSU	VOL	FL	COA	WF	Rank Assessment
Elementary School - Dist. 506	EF	2	1	1	0	0	0	0	0	0	0.29
Everson City Hall	EF	3	1	1	0	0	1	1	0	0	1
Everson Police Dept.	EF	3	1	1	0	0	1	1	0	0	1
Everson Community Center	EF	1	1	1	0	0	1	1	0	0	0.33
Everson Water Production Facility	LUS	3	1	1	0	0	0	0	0	0	0.43
People's Bank	EF	1	1	1	0	0	1	1	0	0	0.33
Post Office	EF	2	1	1	0	0	1	1	0	0	0.66
Public Works Strandell Shop	EF	1	1	1	0	0	0	0	0	0	0.14
Pump Station #11	LUS	2	1	0	0	0	0	0	0	0	0.14
Pump-Station - Evergreen	LUS	2	1	1	0	0	1	1	0	0	0.66
Pump-Station #10	LUS	2	1	1	0	0	0	0	0	0	0.29
Pump-Station #4 (Interceptor)	LUS	3	1	1	0	0	1	1	0	0	1
Pump-Station #5	LUS	2	1	1	0	0	1	1	0	0	0.66
Pump-Station #6	LUS	2	1	1	0	0	1	1	0	0	0.66

Pump-Station #7	LUS	2	1	1	0	0	1	1	0	0	0.66
Pump-Station #8	LUS	2	1	1	0	0	1	1	0	0	0.66
Pump-Station #13	LUS	2	1	1	0	0	0	0	0	0	0.29
Verizon Communications	LUS	1	1	1	0	0	1	1	0	0	0.33
Waste Water Treatment Plant	HMF	3	1	1	0	0	1	1	0	0	1
Whatcom County Fire District 1	EF	3	1	1	0	0	1	1	0	0	1
Whatcom Educational Credit Union	EF	1	1	1	0	0	1	1	0	0	0.33

Notes: **EQ** = Earthquake; **LQ** =Liquefaction; **LS** = Landslide; **TSUN** = T0sunami; **VOL** = Volcano; **FL** = Riverine Flooding; **COA** = Coastal Flooding; **WF** = Wildland Fire

Areas and Assets Exposed, Per Hazard

	City of Everson Exposure to Natural Hazards					
	Hazard Susceptibility	**Asset County (% of Total)**				**Critical Facilities Appraised Value (Million)**
		Area (sq.mi.)	**Population**	**Parcels**	**Critical Facilities**	
Geological Hazards	**Earthquake**, Shaking Intensity					
	MMI V	-	-	-	-	-
	MMI VI	-	-	0.1%	-	-
	MMI VII	100%	100%	99.8%	100%	$12
	MMI VIII - IX	-	-	-	-	-
	TOTAL	100%	100%	99.9%	100%	$12
	Liquefaction					
	Very Low to Low	42.9%	38.6%	44.4%	23.8%	$6
	Low to Moderate	-	-	-	-	-
	Moderate	-	-	-	-	-
	Moderate to High	52.9%	59.5%	50.9%	71.4%	$6
	High	-	-	-	-	-
	TOTAL	95.8%	98.1%	95.3%	95.2%	$12
	Landslide					
	Landslide Low	-	-	-	-	-
	Landslide Moderate	-	-	-	-	-

	Landslide High	-	-	-	-	-
	Fan Low	-	-	-	-	-
	Fan Moderate	-	-	-	-	-
	Fan High	-	-	-	-	-
	Mine Hazard	-	-	-	-	-
	TOTAL	-	-	-	-	-
	Volcanic Eruption					
	Case 1 Debris Flows	0.2%	0.01%	-	-	-
	Case 2 Debris Flows	-	-	-	-	-
	Case M Flows	53.5%	58.9%	49.8%	71.4%	$6
	Pyroclastic Flows, Lava Flows, and Ballistic Debris	-	-	-	-	-
	TOTAL	53.7%	58.91%	49.8%	71.4%	$6
	Tsunami, Inundation Zone					
	Low to Moderate Inundation Potential	-	-	-	-	-
	Moderate to High Inundation Potential	-	-	-	-	-
	High Inundation Potential	-	-	-	-	-
	TOTAL	-	-	-	-	-
Hydrological Hazards	**Flooding**					
	100-year Flood	33.9%	35.9%	33.9%	9.5%	$3
	500-year Flood	7.5%	14.1%	13.2%	38.1%	$3

	Floodway	0.7%	6.3%	2.2%	4.8%	-
	Undetermined (Zone D)	-	-	-	-	-
	TOTAL	42.1	56.3%	49.3%	52.4%	$6
Meteorological Hazards	**Wildfire Zones**					
	Interface Very Low-Low Structure Density	3.9%	1.6%	1%	-	-
	Interface Medium-High Structure Density	1.4%	0.5%	0.5%	-	-
	Intermix Very Low-Low Structure Density	5.5%	2.3%	3.9%	-	-
	Intermix Medium-High Structure Density	11.9%	9%	10.2%	-	-
	TOTAL	22.7	13.4%	15.6%	-	-

Status of Everson's 2016-2020 and Ongoing Hazard Mitigation Actions

This section describes the status of mitigation actions that were proposed in the 2016 Mitigation Plan and are now 1) currently being implemented and are ongoing, 2) are now completed, or 3) are now discontinued because they are no longer needed. The actions are organized by hazard and indicate the lead agency, funding source, and status.

Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
Funding Source	Local; State; FEMA; Private; Other
Current Status	Action Discontinued / Action Completed / Action ongoing and expected completion date

General: All Hazards

G-a. Adopt and enforce building codes. This applies to earthquakes, flooding, winter storms/freezes, and severe winds. The City Planning, Building and Public Works Departments continue to adopt and enforce building codes and development regulations that address natural hazards mitigation.

Lead Agency	Everson Planning, Building and Public Works Department
Funding Source	Local
Current Status	Ongoing

Drought/heat wave

D-a. Assess Vulnerability to Drought Risk. The City Planning Department continues to assess risks related to drought, including as part of the 2016 update to the City's critical areas ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

D-b. Monitor Drought Conditions. The City Public Works Department continues to monitor

drought conditions on annual basis and implements water-related mitigation strategies as appropriate.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

D-c. Monitor Water Supply. The City Public Works Department continues to monitor the public water supply and implement water conservation strategies as appropriate.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

D-d. Plan for Drought. The City Planning Department continues to plan for droughts, including as part of the 2016 update of the city comprehensive land use plan.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

D-e. Require Water Conservation During Drought Conditions. The City Public Works Department continues to monitor drought conditions and implement water conservation measures as appropriate.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

D-f. Educate Residents on Water Saving Techniques. The City Administration continues to support education of residents regarding water conservation efforts, including through information provided with quarterly newsletters.

Lead Agency	City Administration
Funding Source	Local
Current Status	Ongoing

Earthquake

EQ-a. Incorporate Earthquake Mitigation into Local Planning. The City Planning Department continues to incorporate planning related to earthquakes, including as part of the 2016 update

to the city comprehensive plan.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

EQ-b. Map and Assess Community Vulnerability to Seismic Hazards. The City Planning Department continues to map and assess vulnerability to seismic hazards, including as part of the 2016 update of the city critical areas ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

EQ-c. Conduct Inspections of Building Safety. The City Building Department continues to conduct inspections related to building safety as required by City building codes.

Lead Agency	City Building Dept.
Funding Source	Local
Current Status	Ongoing

EQ-d. Protect Critical Facilities and Infrastructure. The City Building and Public Works Departments continue to protect critical facilities and infrastructure, including elevating wastewater treatment plant control systems, operational buildings and back-up power generation systems three feet above the FEMA base flood elevation.

Lead Agency	City Building and Public Works Depts.
Funding Source	Local
Current Status	Ongoing

Extreme Temp

No actions ongoing, discontinued, or completed for this hazard.

Flooding

FL-a. Incorporate Flood Mitigation in Local Planning. The City Planning Department continues to incorporate flood mitigation into local planning, including as part of the 2016 update of the city critical areas ordinance, the 2019 adoption of new FEMA flood insurance rate maps, and updates to the County comprehensive flood hazard management plan currently underway.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

FL-b. Form Partnerships to Support Floodplain Management. The City Planning and Public Works Departments continue to work to form partnerships that support floodplain management, including working closely with County long-range and current planning divisions and the County Public Works River and Flood Division.

Lead Agency	City Planning and Public Works Depts.
Funding Source	Local
Current Status	Ongoing

FL-c. Limit or Restrict Development in Floodplain Areas. The City Planning, Building and Public Works Departments continue to limit development in floodplain areas through amendment and enforcement of City critical areas ordinance regulations, flood damage prevention regulations, and city building codes.

Lead Agency	City Planning, Building and Public Works Depts.
Funding Source	Local
Current Status	Ongoing

FL-d. Improve Stormwater Management Planning. The City Planning Department continues to improve planning, regulation and enforcement related to stormwater management, including through 2016 updates to the City comprehensive plan and the 2016 adoption of the state stormwater management manual for Western Washington.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

FL-e. Improve Flood Risk Assessment. The City Public Works Department continues to assess risks related to flooding, including through participation in the federal CRS Program and RISK Map assessment efforts.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

FL-f. Join or Improve Compliance with NFIP. The City continues to participate in the National Flood Insurance Program (NFIP). The City Planning, Building and Public Works Departments continue to work to improve compliance with the NFIP, including through adoption of 2019 amendments to the City's flood damage prevention ordinance that included updated flood insurance rate maps.

Lead Agency	City Planning, Building and Public Works Depts.
Funding Source	Local
Current Status	Ongoing

FL-g. Manage the Floodplain Beyond Minimum Requirements. The City Planning and Building Departments continue to manage floodplains beyond minimum requirements, including through amendment of critical areas and floodplain management regulations that require extra elevation of critical facilities and prohibit the placement of fill within floodplains except under certain conditions.

Lead Agency	City Planning and Building Depts.
Funding Source	Local
Current Status	Ongoing

FL-h. Establish Local Funding Mechanisms for Flood Mitigation. The County Flood Control Zone District continues to make locally generated district funds available for local projects, including the purchase of open space areas located in designated floodways within Everson.

Lead Agency	County Flood Control Zone District
Funding Source	County
Current Status	Ongoing

FL-i. Improve Stormwater Drainage System Capacity. The City Public Works Department continues to work to improve stormwater drainage system capacity through annual system upgrades and maintenance projects.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

FL-j. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures. The City Public Works Department continues to work to improve stormwater drainage system

capacity through annual maintenance projects, such as inspection and clearing of stormwater conveyance systems.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

FL-k. Preserve Floodplains as Open Space. The City Planning Department continues to work to preserve floodplains as open space, including through the recording of restrictive covenants required in conjunction with approved subdivisions.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing; Bi-annual

FL-l. Mitigate Riverside Park from flooding. Riverside Park is located at the west city limits, and adjacent to the Nooksack River and Everson Wastewater Treatment Plant. When flooded, this site is littered with debris from the floodwaters.

Lead Agency	City Public Works Dept.
Funding Source	Local/State/Federal
Current Status	Discontinued

Landslide/erosion

No actions ongoing, discontinued, or completed for this hazard.

Landslide Subsidence

SU-a. Map and Assess Vulnerability to Subsidence. The City Planning Department continues to map and assess vulnerability to subsidence, including through 2016 updates to the City critical areas ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

SU-b. Manage Development in High-Risk Areas. The City Building Department continues to manage development in high risk areas, including through required geologically hazardous area site assessment reports.

Lead Agency	City Building Dept.
Funding Source	Local
Current Status	Ongoing

Lightning

No actions ongoing, discontinued, or completed for this hazard.

Severe Storm

No actions ongoing, discontinued, or completed for this hazard.

Severe Wind

SW-a. Protect Power Lines and Infrastructure. The City Public Works Department continues to work to protect power lines and infrastructure through as-needed inspections following major wind events and coordination with Puget Sound Energy.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

SW-b. Retrofit Public Buildings and Critical Facilities. The City Public Works Department continues work to protect public buildings and infrastructure, including through undergrounding of power lines and provision of back-up power generation at critical facilities.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

Tornadoes

No actions ongoing, discontinued, or completed for this hazard.

Tsunami

No actions ongoing, discontinued, or completed for this hazard.

Wildfire

No actions ongoing, discontinued, or completed for this hazard.

Winter storms/Freezes

WW-a. Protect Buildings and Infrastructure. The City Public Works Department continues to work to protect public buildings and infrastructure from severe winter storms, including through replacing and upgrading all City water meters to increase system resiliency.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

WW-b. Protect Power Lines. The City Public Works Department continues to work to protect power lines through as-needed inspections following major winter storm events and coordination with Puget Sound Energy.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

WW-c. Reduce Impacts to Roadways. The City Public Works Department continues to work to reduce impacts to roadways, including through implementation of road closures during major freeze/thaw events.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

Multiple Hazards

MU-a. Assess Community Risk. The City Planning and Public Works Departments continue to assess risks to the public from natural hazards, including through review of repetitive loss properties and review and adoption of updated hazard maps.

Lead Agency	City Planning and Public Works Depts.
Funding Source	Local
Current Status	Ongoing

MU-b. Map Community Risk. The City Planning Department continues to work to map natural hazard areas and assess the risks associated with such areas, including through the 2016 update of the City's critical areas ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

MU-c. Prevent Development in Hazard Areas. The City Building and Planning Departments continue to prevent development in hazard areas, including through enforcement of floodway, steep slopes and erosion hazard area regulations.

Lead Agency	City Building and Planning Depts.
Funding Source	Local
Current Status	Ongoing

MU-d. Adopt Development Regulations in Hazard Areas. The City Building and Planning Departments continue to work to adopt regulations addressing hazard areas, including through the 2016 update to the City's critical areas ordinance and the 2019 adoption of updated FEMA flood insurance rate maps and Flood Damage Prevention ordinance.

Lead Agency	City Building and Planning Depts.
Funding Source	Local
Current Status	Ongoing

MU-e. Limit Density in Hazard Areas. The City Planning Department continues to work to limit density in hazard areas, including through adoption of floodway regulations and establishment of low-density zones in hazard areas, such as Agriculture and Recreational Open Space.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

MU-f. Integrate Mitigation into Local Planning. The City Planning Department continues to integrate mitigation into local planning, including through establishment and enforcement of mitigation requirements under the City's critical areas regulations.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

MU-g. Strengthen Land Use Regulations. The City Planning Department continues to work to strengthen local land use regulations, including through the 2016 update of the City's critical areas ordinance and 2019 updates to the City's Flood Damage Prevention ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

MU-h. Monitor Mitigation Plan Implementation. The City Planning and Public Works Departments continue to monitor implementation of the Natural Hazards Mitigation Plan through the required annual review process.

Lead Agency	City Planning and Public Works Depts.
Funding Source	Local
Current Status	Ongoing

MU-i. Protect Structures. The City Building and Public Works Departments continue to work to protect structures within the City through enforcement of local building codes and critical areas regulations.

Lead Agency	City Building and Public Works Depts.
Funding Source	Local
Current Status	Ongoing

MU-j. Protect Infrastructure and Critical Facilities. The City Public Works Department continues to work to protect infrastructure and critical facilities, including through regular inspections, annual maintenance projects and capital improvement projects, such as elevating critical facilities above minimum standards.

Lead Agency	Public Works Dept.
Funding Source	Local
Current Status	Ongoing

MU-k. Increase Hazard Education and Risk Awareness. The City Public Works Department continues to work to increase hazard education and risk awareness, including through informational materials included in quarterly newsletters and posted on the City website.

Lead Agency	Public Works Dept.
Funding Source	Local
Current Status	Ongoing

Everson 2021-2025 Hazard Mitigation Strategy

Whatcom County Hazard Mitigation Goals

Whatcom County has identified five overarching hazard mitigation goals, which represent what a community seeks to achieve through mitigation actions.

Goal 1. Protect Life, Property and Public Welfare

Goal 2. Increase Public Awareness

Goal 3. Preserve and Enhance Natural Systems

Goal 4. Encourage Partnership for Implementation

Goal 5. Ensure Continuity of Emergency Services

These countywide goals help guide any prioritization and implementation of mitigation actions, ensuring that the actions contribute to a community's vision for the future.

Everson-Specific Hazard Mitigation Goals

Everson supports the above county-wide goals. No additional community-specific mitigation planning goals have been identified at this time.

Mitigation Action Options

Appendix E of the Whatcom County Natural Hazard Mitigation Plan provides a list of mitigation options. Everson considered mitigation options related to earthquakes, drought, land subsidence, winter storms, severe wind, and erosion; and especially those related to flooding because these hazards have the potential to cause the greatest loss and damage. Not all mitigation options in Appendix E were relevant or a strong priority for Everson. Some options have already been implemented or are ongoing in Everson, as documented in the section above on the status of 2016-2020 and ongoing hazard mitigation actions.

Mitigation Action Prioritization

The mitigation actions in this section are new actions that Everson has prioritized for the 2021-2025 planning period and beyond. Mitigation options were prioritized based upon review of the following two criteria: 1) The action's Overall Feasibility based on engineering, environmental, financial, and political considerations, 2) The Criticality of the action, based upon a consideration of which actions had the greatest potential to protect life, property, and public

welfare. Everson is working in cooperation with the County and other participating communities and special districts to develop a systematic methodology that would use multiple evaluation criteria to determine mitigation action prioritization. This new methodology will be used in future updates of this Plan.

In the following Identified Mitigation Actions 2021-2025 table, each priority action is listed by hazard. Each action is followed by planning goals, lead agency, the priority evaluation, timeline, funding source and estimated cost, where such information is available. This information can be used by local decision makers in pursuing strategies for implementation.

1	Goals	Indicates the hazard mitigation planning goal or goals this action addresses; countywide and/or community-specific
2	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
3	Priority:	H (High); M (Medium); L (Low)
4	Timeline:	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years)
5	Funding Source:	Local; State; FEMA; Private; Other
6	Estimated Cost:	Actual; Estimated

Everson Hazard Mitigation Strategy 2021-2025

CITY OF EVERSON IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
GENERAL: ALL HAZARDS Education and Awareness Actions	**These are actions that inform and educate citizens, elected officials, and property owners about hazards and ways to mitigate them.**						
	G-a Ongoing – Adopt and Enforce Building Codes	1	Everson Planning, Building, and Public Works Department	M	O	Local	Staff
Hazard Specific (Reference: Whatcom County Mitigation Ideas)	**Actions communities should consider to identify and evaluate a range of potential mitigation actions for reducing risk to natural hazards and disasters.**						
Dam/Levee Failures	No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF EVERSON IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
(See: Flooding)							
Droughts/Heat Waves	***D-a Ongoing – Assess Vulnerability to Drought Risk***	1, 5	Planning	M	O	Local	Staff
	D-b Ongoing – Monitor Drought Conditions	1	Public Works	M	O	Local	Staff
	D-c Ongoing – Monitor Water Supply	1	Public Works	M	O	Local	Staff
	D-d Ongoing – Plan for Drought	1, 5	Planning	M	O	Local	Staff
	D-e Ongoing – Require Water Conservation During Drought Conditions	1, 3	Public Works	M	O	Local	Staff
	D-f Ongoing – Educate Residents on Water Saving Techniques	2	City Administration	M	O	Local	Staff
Volcano	**VOL-1 Lahar Early Warning System** The USGS has designed a number of systems that automatically detect lahars as they descend neighboring valleys. These systems then automatically trigger various types of early warning systems, such as sirens or telephone-based warning systems.	1, 2, 5	Whatcom County Fire District 1, Everson Police Department, Whatcom County Department of Emergency Management,	L	L	Local sources, and state and federal grants	Unknown

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF EVERSON IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
			Whatcom County Public Works				
Earthquakes	***EQ-a Ongoing – Incorporate Earthquake Mitigation into Local Planning***	1	Planning	M	O	Local	Staff
	EQ-2 Ongoing – Map and Assess Community Vulnerability to Seismic Hazards	1	Planning	M	O	Local	Staff
	EQ-c Ongoing – Conduct Inspections for Building Safety	1	City Building Department	M	O	Local	Staff
	EQ-d Ongoing – Protect Critical Facilities and Infrastructure	1	City Buillding and Public Works	M	O	Local	Staff
	EQ-1 Retrofit or Relocate City Hall, Police Station and Fire District Station The Everson City Hall, Police Station and Whatcom County Fire District 1's station would suffer significant damage in the event of an earthquake. These facilities should be retrofitted, replaced, or relocated so that they can survive a 6.0 magnitude or greater earthquake event.	1, 5	Everson City Councils, Whatcom County Building Department, Whatcom County Fire District 1 Commissioners	H	M	Local sources, and state and federal grants	$7 Million

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF EVERSON IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Extreme Temperatures	ET-1 No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						
Flooding	***FL-a Ongoing – Incorporate Flood Mitigation into Local Planning***	1, 3	Planning	M	O	Local	Staff
	FL-b Ongoing -- Form Partnerships to Support Floodplain Management	1, 5	Planning and Public Works	M	O	Local	Staff
	FL-c Ongoing -- Limit or Restrict Development in Floodplain Areas	1, 3	City Planning, Building and Public Works Depts.	M	O	Local	Staff
	FL-d Ongoing – Improve Stormwater Management Planning	1, 3	City Planning	M	O	Local	Staff
	FL-e Ongoing -- Improve Flood Risk Assessment	1	Public Works	M	O	Local	Staff
	FL-f Ongoing -- Join or Improve Compliance with NFIP	1	City Planning, Building and Public Works Depts.	M	O	Local	Staff
	FL-g Ongoing -- Manage the Floodplain Beyond	1, 3	City Planning	M	O	Local	Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF EVERSON IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	Minimum Requirements		and Building Depts				
	FL-h Ongoing -- Establish Local Funding Mechanisms for Flood Mitigation	1, 3	County Flood Control Zone District	M	O	County	Staff
	FL-i Ongoing -- Improve Stormwater Drainage System Capacity	1, 3	Public Works	M	O	Local	Staff
	FL-j Ongoing -- Conduct Regular Maintenance for Drainage Systems and Flood Control Structures	1, 3	Public Works	M	O	Local	Staff
	FL-k Ongoing -- Preserve Floodplains as Open Space	1, 2, 4	Planning	M	O	Local	Staff
	FL-1 Mitigate critical facilities in the 100-year floodplain. The Everson City Hall, Police Station and Whatcom County Fire District 1's station are located in the 100-year floodplain. These should be mitigated in place or moved out of the floodplain.	1, 5	Everson City Councils Whatcom County Public Works Department, Whatcom County Fire District 1	H	M	Local sources, and state and federal grants	$7 Million

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF EVERSON IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
			Commissioners				
	FL-2 Purchase Repetitive Loss Properties in the Floodplain There are several properties in the floodplain that have been repeatedly damaged by past flood events. Most of these repetitive loss properties were in Whatcom County's jurisdiction and were purchased by the County.	1, 2, 3, 4	Whatcom County, Everson City Council	M	L	Local sources, and state and federal grants	$2 Million
Landslide/Erosion/Land Subsidence	***SU-a Ongoing -- Map and Assess Vulnerability to Subsidence***	1	Planning	M	O	Local	Staff
	SU-b Ongoing -- Manage Development in High-Risk Areas	1	Building Department	M	O	Local	Staff
Lightning	No actions are currently being considered/All mitigation actions are ongoing, discontinued, or						

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF EVERSON IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	complete.						
Severe Storms	No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						
Severe Wind	***SW-a Ongoing -- Protect Power Lines and Infrastructure***	1	City Public Works Department	M	O	Local	Staff
	SW-b Ongoing -- Retrofit Public Buildings and Critical Facilities	1	City Public Works Dept	M	O	Local	Staff
Tornadoes	No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						
Tsunami	No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						
Wildfires	No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						
Winter Storms/	***WW-a Ongoing -- Protect Buildings and Infrastructure***	1	Public Works	M	O	Local	Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF EVERSON IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Freezes (Severe Winter Weather)	***WW-b Ongoing -- Protect Power Lines***	1	Public Works	M	O	Local	Staff
	WW-c Ongoing – Reduce Impacts to Roadways	1	Public Works	M	O	Local	Staff
Multiple Hazards	***MU-a Ongoing -- Assess Community Risk***	1	Public Works/Planning	M	O	Local	Staff
	MU-b Ongoing -- Map Community Risk	1	Planning	M	O	Local	Staff
	MU-c Ongoing -- Prevent Development in Hazard Areas	1, 3	Planning and Building Depts.	M	O	Local	Staff
	MU-d Ongoing -- Adopt Development Regulations in Hazard Areas	1	Planning and Building Depts	M	O	Local	Staff
	MU-e Ongoing -- Limit Density in Hazard Areas	1	Planning and Building Depts	M	O	Local	Staff
	MU-f Ongoing -- Integrate Mitigation into Local Planning	1	Planning	M	O	Local	Staff
	MU-g Ongoing -- Strengthen Land Use Regulations	1	Planning	M	O	Local	Staff
	MU-h Ongoing -- Monitor Mitigation Plan Implementation	1	Planning and Public Works	M	O	Local	Staff
	MU-I Ongoing -- Protect Structures	1	Building and	M	O	Local	Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF EVERSON IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
			Public Works Depts				
	MU-j Ongoing -- Protect Infrastructure and Critical Facilities	1	Public Works	M	O	Local	Staff
	MU-k Ongoing -- Increase Hazard Education and Risk Awareness	1	Public Works	M	O	Local	Staff
	MU-1 Mitigate the wastewater treatment plant from hazards. Construct a ring dike, flood wall or otherwise mitigate the wastewater treatment plant against a 100-year flood event or volcanic lahars.	1	Everson Public Works Department	H	S	Local, State, and Federal	$250,000
	MU-2 Community Early Warning System The City of Everson has an outdated civil defense siren that has not been in service or activated in several years. A new audible warning system located in Everson downtown, Strandell neighborhood, and also the City of Nooksack needs to be constructed. Such an early warning system would typically be a series of sirens that could be triggered in the event the Cities needed to be evacuated, or	1, 2, 5	Whatcom County Fire District 1, Everson Police Department, Everson/Nooksack Public Works	M	L	Local sources, and state and federal grants	$150,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF EVERSON IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	emergency information disseminated.						
	MU-3 Tone Radio Based Early Warning System Tone Radios turn on when triggered by a central transmitter and then information or instructions are announced over the radio. Such a system is currently used for various types of weather radios, for tornados and severe storms hazard areas. A similar system could be put into place for warning of flooding, lahars, and other related natural hazards.	1, 2, 5	Whatcom County Department of Emergency Management, NOAA Radio		L	Local sources, and state and federal grants	
Advanced Mitigation Projects (Dream List)	**Earthquake Early Warning System** Such a system could warn residence of an impending earthquake. Technology doesn't currently exist for such a system, but will likely be possible in the future.	1, 2, 5	Federal, State, County, and local entities	L	L	Local sources, and state and federal grants	Unknown
	Cell Phone-Based Early Warning System. A computerized early warning system that automatically dials each landline telephone number within a specified area, and play a recorded message when the phone is answered is currently provided to the City by the Whatcom County Sheriff's Office Division of	1, 2, 5	WCDEM/LFD	M	M	Local sources, and state and federal grants	Unknown

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF EVERSON IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	Emergency Management. A larger capacity system that can also contact cell phones through the use of a federally licensed COG would help to address a variety of natural and manmade problems.						
	Purchase Repetitive Loss Properties	1, 2, 4	Whatcom County, Everson City Council	M	L	Local sources and state and federal grants	$2 Million
	Mitigate City Hall, Police Station and Fire Station against 100-year flood event or volcanic lahar	1, 5	Everson City Councils, Whatcom County Building Department, Whatcom County Fire District 1 Commissioners	H	M	Local sources, and state and federal grants	$7 Million

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

Everson Annual Review and Progress for Hazard-Specific Mitigation Actions 2021-2025

Progress monitoring means tracking the implementation of the hazard specific mitigation actions over time. Each jurisdiction must identify how, when, and by whom action items will be monitored. The responsible agency assigned to each mitigation action is responsible for tracking and reporting on each of their actions.

Annual review and progress reporting includes the following:

Step One: Identify mitigation actions that your planning team has identified for the annual review. The planning team has the option to address ALL action items, or only those that should be acted on during each review cycle.

Step Two: Use the table below to track annual progress. For each action item selected for annual review insert the appropriate letter that indicates the status of that action item.

Step Three: Complete a progress report form as illustrated in Appendix G for each mitigation action item selected for annual review

Step Four: Submit the completed form(s) to the Whatcom County DEM.

City of Everson Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
GENERAL: ALL HAZARDS						
G-a. Adopt and enforce building codes.						
Add New Action Items if Applicable						
DAM/LEVEE FAILURES						
Add New Action Items if Applicable						
DROUGHTS/HEAT WAVES						
D-a. Assess Vulnerability to Drought Risk.						
D-b. Monitor Drought Conditions.						
D-c. Monitor Water Supply.						
D-d. Plan for Drought.						
D-e. Require Water Conservation During Drought Conditions.						
D-f. Educate Residents on Water Saving Techniques.						
EARTHQUAKES						
EQ-a. Incorporate Earthquake Mitigation into Local Planning.						
EQ-b. Map and Assess Community Vulnerability to Seismic Hazards.						
EQ-c. Conduct Inspections of Building Safety.						
EQ-d. Protect Critical Facilities and Infrastructure.						
EQ-1 Retrofit City Hall						
Add New Action Items if Applicable						
VOLCANO						

City of Everson Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
VOL-1 Lahar Early Warning System						
Add New Action Items if Applicable						
FLOODING						
FL-a. Incorporate Flood Mitigation in Local Planning.						
FL-b. Form Partnerships to Support Floodplain Management.						
FL-c. Limit or Restrict Development in Floodplain Areas.						
FL-d. Improve Stormwater Management Planning.						
FL-e. Improve Flood Risk Assessment.						
FL-f. Join or Improve Compliance with NFIP.						
FL-g. Manage the Floodplain Beyond Minimum Requirements.						
FL-h. Establish Local Funding Mechanisms for Flood Mitigation.						
FL-i. Improve Stormwater Drainage System Capacity						
FL-j. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures.						
FL-k. Preserve Floodplains as Open Space.						
FL-l. Mitigate Riverside Park from flooding.						
FL-1 Mitigate critical facilities in the 100-year floodplain.						
FL-2 Purchase Repetitive Loss Properties in the Floodplain						
Add New Action Items if Applicable						

City of Everson Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
LANDSLIDES/EROSION						
Add New Action Items if Applicable						
LAND SUBSIDENCE						
SU-a. Map and Assess Vulnerability to Subsidence.						
SU-b. Manage Development in High-Risk Areas.						
Add New Action Items if Applicable						
TORNADOES						
Add New Action Items if Applicable						
TSUNAMI						
Add New Action Items if Applicable						
WILDFIRES						
Add New Action Items if Applicable						
WINTER STORMS/FREEZES (SEVERE WINTER WEATHER)						
WW-a. Protect Buildings and Infrastructure.						
WW-b. Protect Power Lines.						
WW-c. Reduce Impacts to Roadways.						
Add New Action Items if Applicable						
EXTREME TEMPERATURES						
Add New Action Items if Applicable						
LANDSLIDE						
Add New Action Items if Applicable						

City of Everson Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
LIGHTNING						
Add New Action Items if Applicable						
SEVERE WIND						
SW-a. Protect Power Lines and Infrastructure.						
SW-b. Retrofit Public Buildings and Critical Facilities.						
Add New Action Items if Applicable						
MULTIPLE HAZARDS						
MU-a. Assess Community Risk.						
MU-b. Map Community Risk.						
MU-c. Prevent Development in Hazard Areas.						
MU-d. Adopt Development Regulations in Hazard Areas.						
MU-e. Limit Density in Hazard Areas.						
MU-f. Integrate Mitigation into Local Planning.						
MU-g. Strengthen Land Use Regulations.						
MU-h. Monitor Mitigation Plan Implementation.						
MU-i. Protect Structures.						
MU-j. Protect Infrastructure and Critical Facilities.						
MU-k. Increase Hazard Education and Risk Awareness.						
MU-1 Mitigate the wastewater treatment plant from hazards.						
MU-2 Community Early Warning System						
MU-3 Tone Radio Based Early Warning System						

City of Everson Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Add New Action Items if Applicable						

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CITY OF FERNDALE

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(360) 685-2376

Approving Authority

Mayor Greg Hansen & City Council Members
2095 Main Street
Ferndale, WA 98248
(360) 685-2350

Planning Process

The City of Ferndale process of reviewing, updating, and adopting the 2021 update of the Whatcom County Natural Hazard Mitigation Plan (NHMP or Plan) included review by the Public Information Officer, the Ferndale Police Department, and the City Administrator, in addition to consultation with other relevant City personnel. The City Administrator audited Ferndale's existing emergency planning material relating to Natural Hazard Mitigation and sought feedback from other City resources prior to adoption.

Ferndale always seeks to use the best possible information when planning for capital facilities, growth management and emergency planning. The material provided in the NHMP can be used as part of the decision-making process to ensure that our public facilities, city residents and private businesses are as safe as possible, and the public is aware of potential impacts of natural hazards.

Key Contributor List

- Jori Burnett, City Administrator
- Tim Orsino, Public Works and Community Development Department Clerk

The information contained in the Natural Hazards Mitigation Plan update regarding hazards, risks, vulnerability, and potential mitigation is based on the best available science and technology currently available. This information and related data on natural hazards potentially impacting the City of Ferndale will be used as a tool when the City updates other plans and programs, such as the following:

- Comprehensive Plan;
- Critical areas ordinance;
- Comprehensive Stormwater Plan;
- Comprehensive Emergency Management Plant (CEMP)
- Geographic Information Systems (GIS) mapping
- City Facility Planning

As additional information becomes available from other planning sources that can enhance this Plan, that information will be incorporated through the periodic update process.

Plan Maintenance for City of Ferndale

The City of Ferndale will continue to engage with the public to update and improve their Natural Hazard Mitigation Plan. The City has organized a volunteer citizen group, the Ferndale Emergency Response Network (FERN) that meets on a regular basis r to receive training and provide feedback on our emergency hazard response.

The City also engages with the public through social media network where one in every four Ferndale residents is following the City's updates. The City regularly distributes emergency preparedness information through these channels and have been recognized by neighboring jurisdictions as a model for the distribution of electronic information in real time.

The feedback the City receives through its volunteer groups and engagement on social media will be used to update and maintain the Natural Hazard Mitigation Plan.

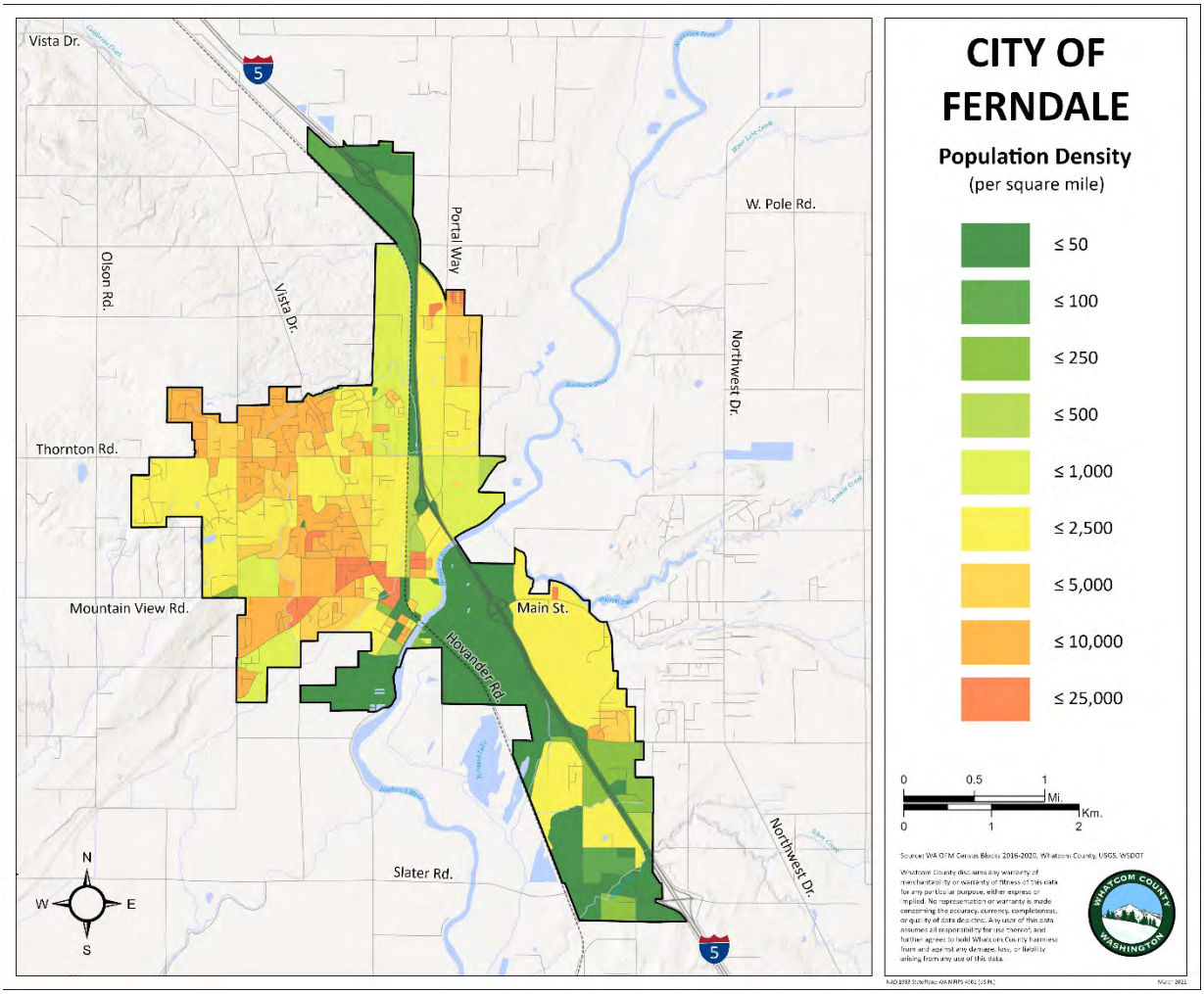
Public Outreach and Education

Program	Yes/No, Year Adopted	Description
Nonprofit organizations or local residents groups focused on hazard mitigation, emergency preparedness, vulnerable populations, etc.	Yes	FERN (Ferndale Emergency Response Network) is a group of community members focused on community emergency response and training.
Ongoing public education or information programs	Yes	Educate property owners about flood mitigation techniques. The City produces educational videos on a regular basis and distributes them online via social media and the City's website.
School-related programs for natural hazard safety		
Public education or information program	Yes	The City provides seasonal videos, utility bill inserts, and social media campaigns associated with natural hazards such as flood, snow, etc.
StormReady certification	No	
Firewise Community certification	No	
Public-Private Partnership initiatives addressing disaster-related issues	No	
Other		

Overview of Ferndale, Hazards, and Assets

Geography of the City of Ferndale

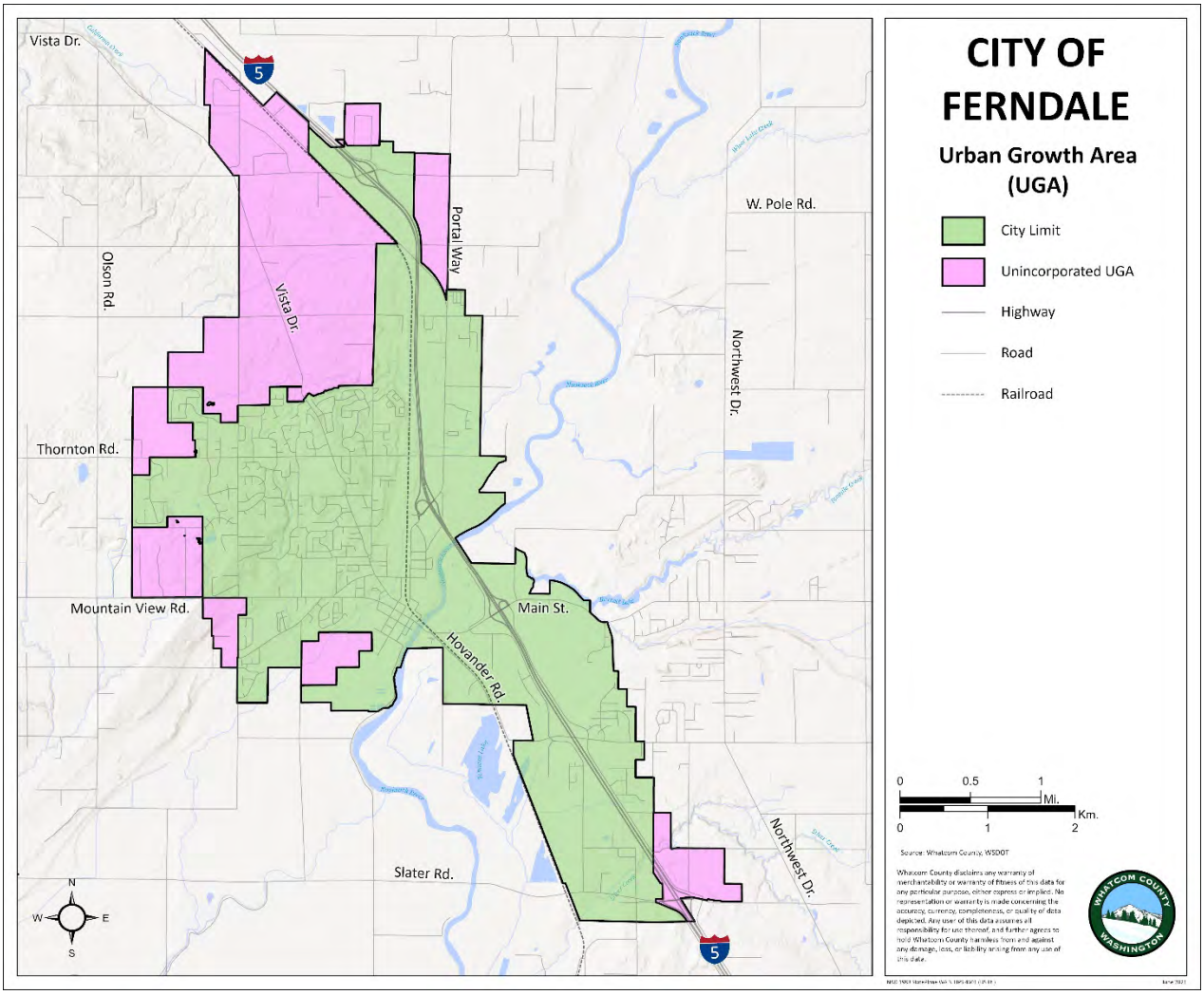
Ferndale Population	14,600 (2020 estimate)
Total area	7.1 sq. mi. (within city limits)



Washington State Office of Financial Management (OFM) 2020 population and housing estimates for 2010-2020 census block data. This map uses the 2016-2020 average population to show population density per square mile.

Growth Trends

This map displays the UGA for the City of Ferndale, as designated by the Whatcom County Comprehensive Plan.



Presence of Hazards and their Impacts in the City of Ferndale

The City of Ferndale continues to grow at a rapid rate, gaining nearly 2,000 residents in the last five years. While much of this growth continues to follow historic trends of single-family residential development in the northwestern portion of the City, significant increases in both single family and multifamily construction along Portal Way, LaBounty Drive, and surrounding the Downtown core have also contributed to this growth.

From a hazards planning perspective, this increased density makes some hazard mitigation easier, as emergency services have easier access to larger populations, and multifamily development near the city core means that City services are accessible by foot or mass transit in the event of a large-scale weather event.

As the community moves forward, the Hazard Mitigation plan will be considered in land use decisions to better-ensure that the City's population is adequately protected from, and has the means to escape, natural hazards.

In the table below is a list of the major hazards that affect Whatcom County. The second column provides the percentage of Ferndale's total area that is exposed to each hazard. The third column indicates the severity of anticipated impacts to community function, considering the credible worst-case hazard scenario. Severity of anticipated impacts considers effects on basic community function such as shelter, transportation, utilities, commerce, industry, agriculture, education, health, recreation, and cultural identity. Severity ranges from none to extreme, as shown in the key below the table. Finally, the last column of the table describes where the hazard impacts the community and which services the hazard would most significantly impact.

	Hazard	% area Exposed	Severity of Anticipated Impacts	Hazard Descriptions
Geological	**Earthquake**	100%	Moderate	The majority of the City of Ferndale is expected to experience strong shaking intensity during an earthquake. Properties within the historic stream channel of the Nooksack River may experience additional damage due to the nature of soils in the area (see liquefaction, below), and there is the potential that hillside properties may experience localized landslides due to topography and high clay content in soils. However, the relatively low profile of existing buildings in these areas, combined with higher earthquake protection standards for new, taller buildings, is expected to limit overall damage as compared to high density areas with a significant stock of tall, older (brick and masonry) structures.
	Liquefaction	99.3%	Moderate	The Nooksack River valley (the historic stream channel of the Nooksack River) includes deposits of soils that are considered seismically sensitive and are conducive to liquefaction in a significant seismic event. While liquefaction may be mitigated through various design approaches, the brick and masonry construction of the City's downtown makes these structures more-susceptible to liquefaction, as compared to wood-frame construction or deep-foundation/pier foundation construction, which provides additional flexibility during a seismic event, and/or is anchored to deeper, stable soils and rock. The low-profile construction of the City's downtown significantly (but does not totally) mitigates the overall risk of liquefaction, though individual structures may be highly susceptible.
	Landslide	0.08%	Low	Localized landslides are possible during significant rain events and seismic activity, but will generally be limited to portions of individual properties adjacent to steep slopes.

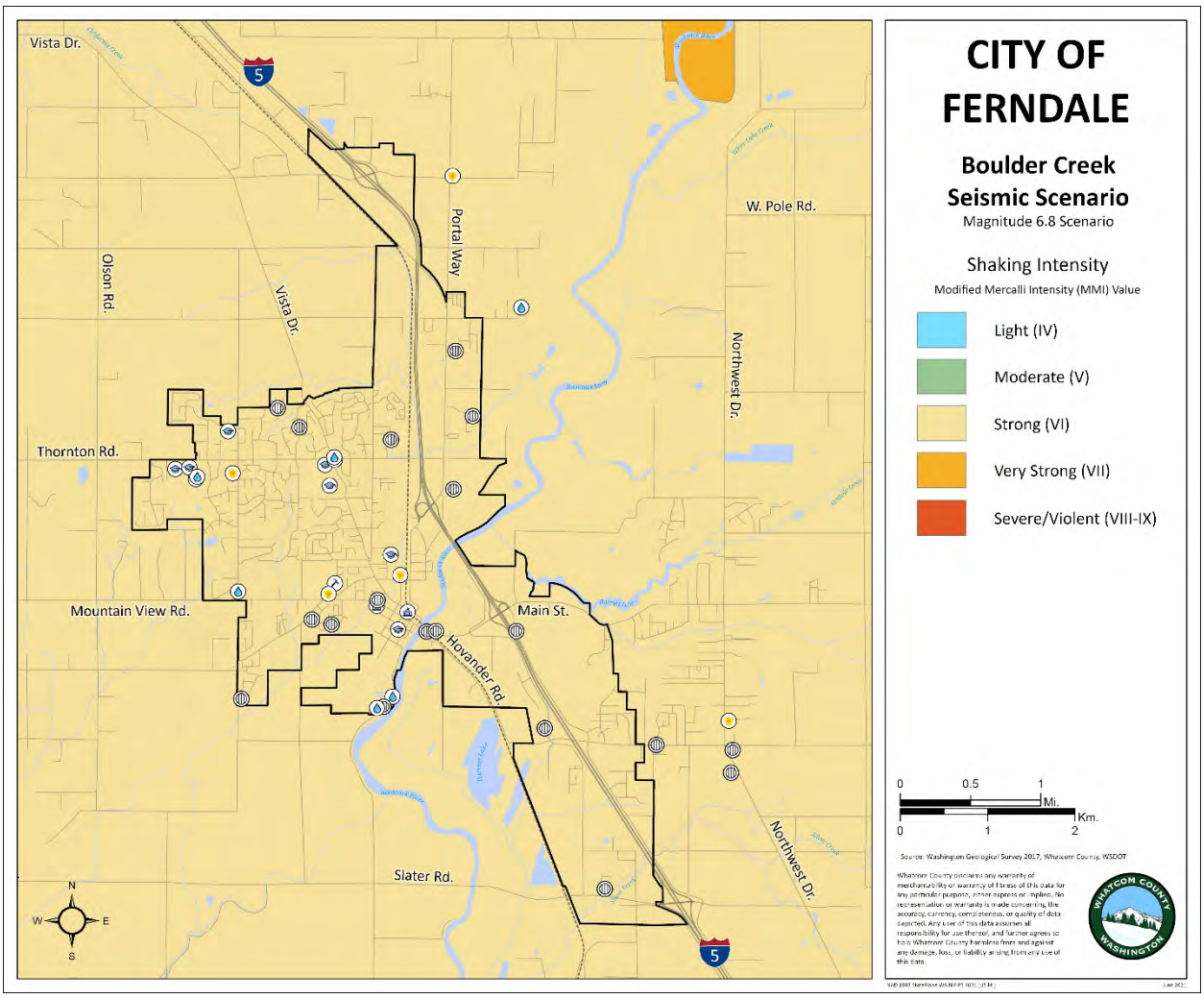
	Volcano	27.5%	High	Low-lying areas adjacent to the Nooksack River are at risk from a Mount Baker lahar. While such an event is expected to be exceedingly rare, it also has the potential to be extraordinarily impactful on a regional level. Direct impacts to the City of Ferndale will likely occur at or around the Nooksack River as a result of a lahar. However, additional impacts to transportation networks, emergency services, weather, climate, and tourism may all have an impact on Ferndale and surrounding areas.
	Tsunami	13.6%	Low	The southern portion of Ferndale, outside the city limits, is subject to tsunami risk. Tsunamis in this region are exceedingly rare but could be extraordinarily damaging. A major tsunami may impact low-lying areas to the south and west of Ferndale and may disrupt transportation networks. Further, the City may be asked to provide temporary shelter for displaced persons from affected areas.
	Mine Hazards	0%	None	There are no historic mine locations within the City limits.
Hydro-logical	**Flooding**	19.9%	High	Portions of the City are subject to Nooksack River floods, causing temporary and limited disruptions on an annual or near-annual basis. Moderate flood events causing limited but not necessarily repetitive private property damage have occurred approximately four times from 1990-2021, and have the potential to occur multiple times in one flood season. More-significant (modeled 50-year or higher) flood events will cause major transportation disruptions and moderate damage to private property. 100-year or higher flood events have the potential to cause major transportation disruptions and potential damage to

				transportation corridors, as well as widespread damage within the modeled floodplain, generally impacting the Main Street corridor, Downtown Ferndale, the southern portion of the Griffintown Neighborhood, Smith Road, and other localized areas. The near-annual closer of Slater Road for flood-related reasons has a significant impact on Ferndale traffic as well as the mainline of Interstate Five, though these detours are usually temporary in nature. Coastal flooding or storm surges will not impact the City of Ferndale, although displaced persons from these events may choose to shelter in Ferndale.
Meteoro logical	**Wildfire**	63.1%	Low	Residential homes are at moderate risk of wildfires.

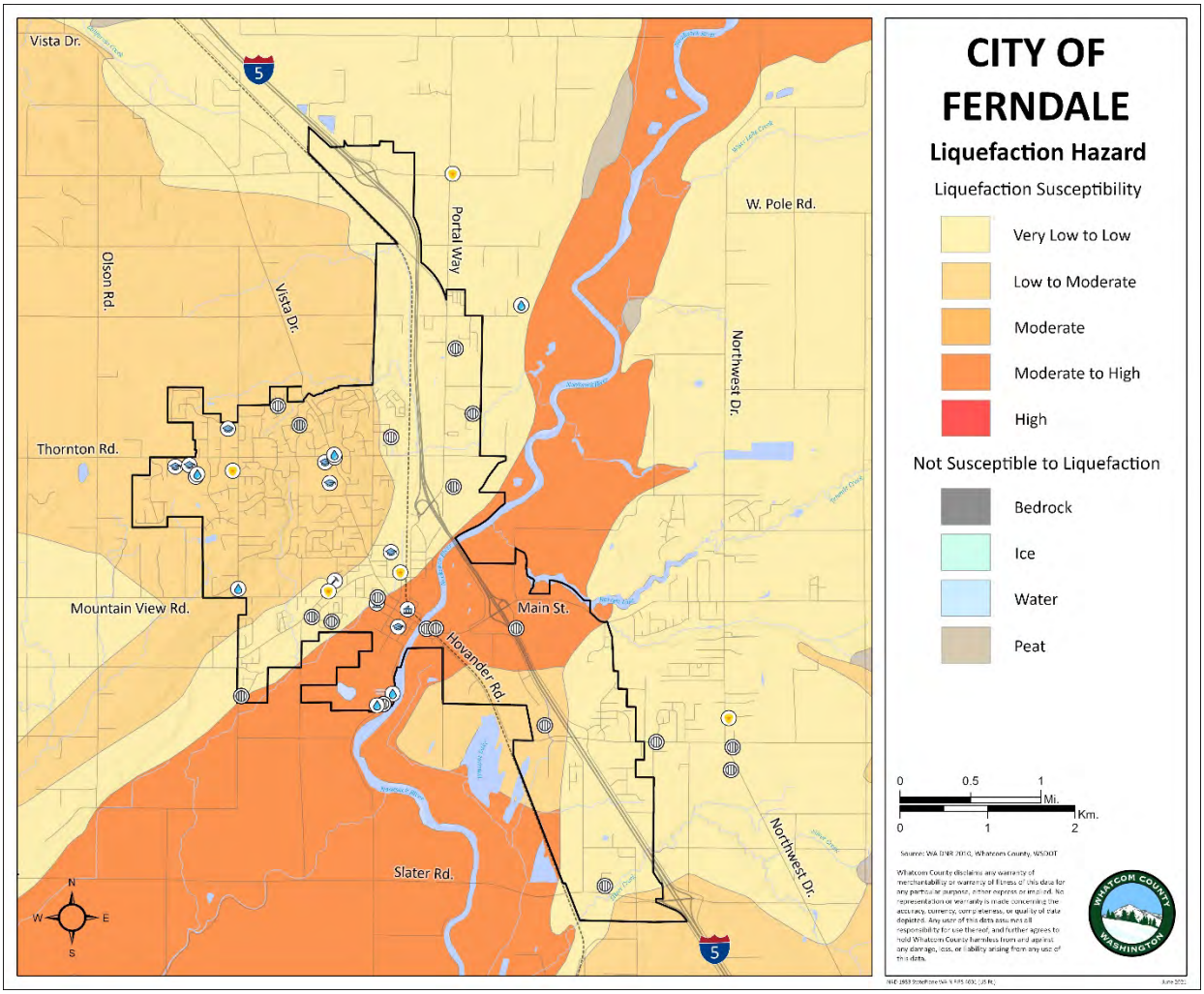
Severity Scale: **None** = no impact to community function
Low = minor degradation of community functions, not widespread
Moderate = moderate degradation over multiple weeks or widespread
High =degradation or loss over many weeks, widespread

Natural Hazard Maps

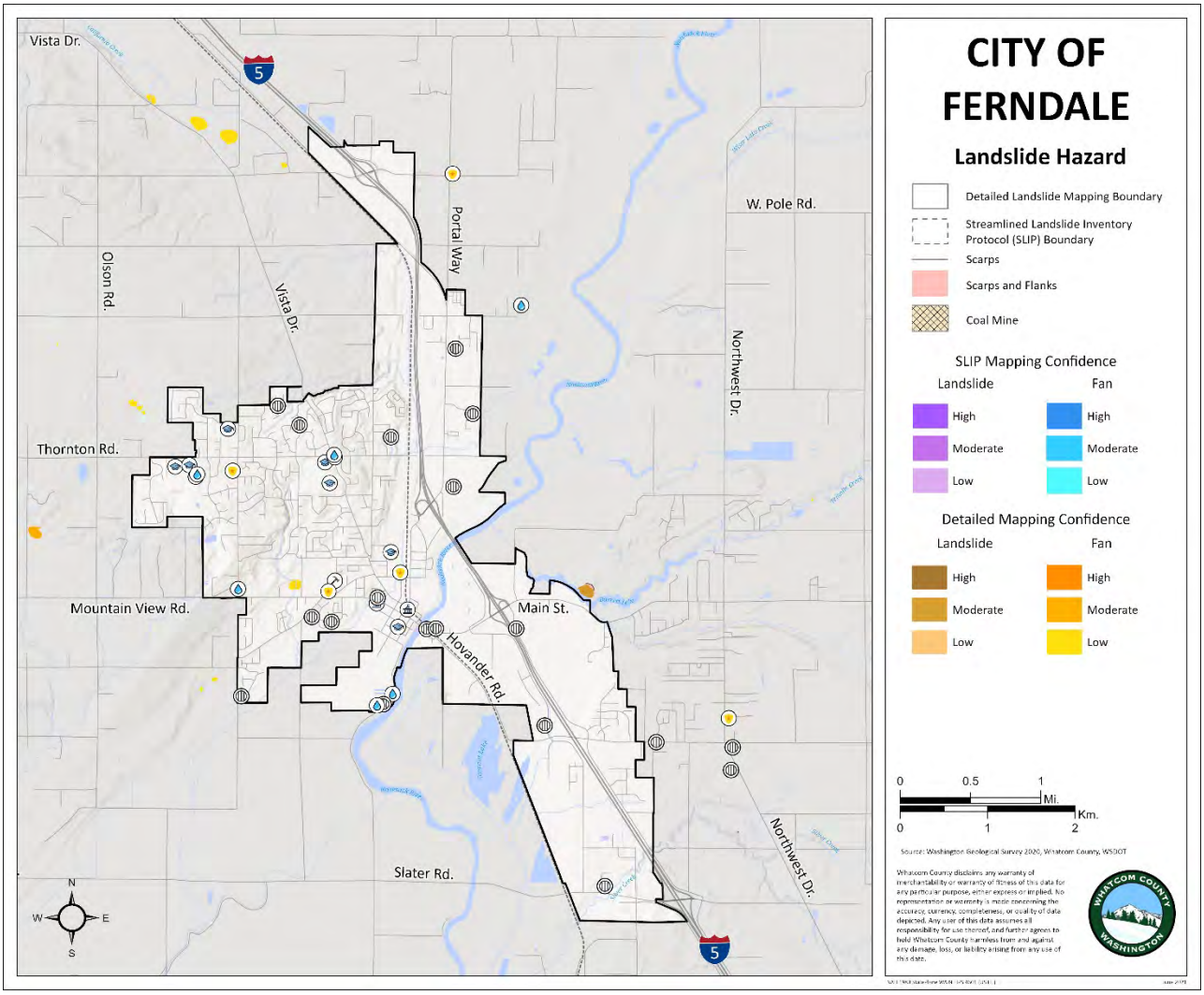
The following figures depict the natural hazards present within the jurisdiction.



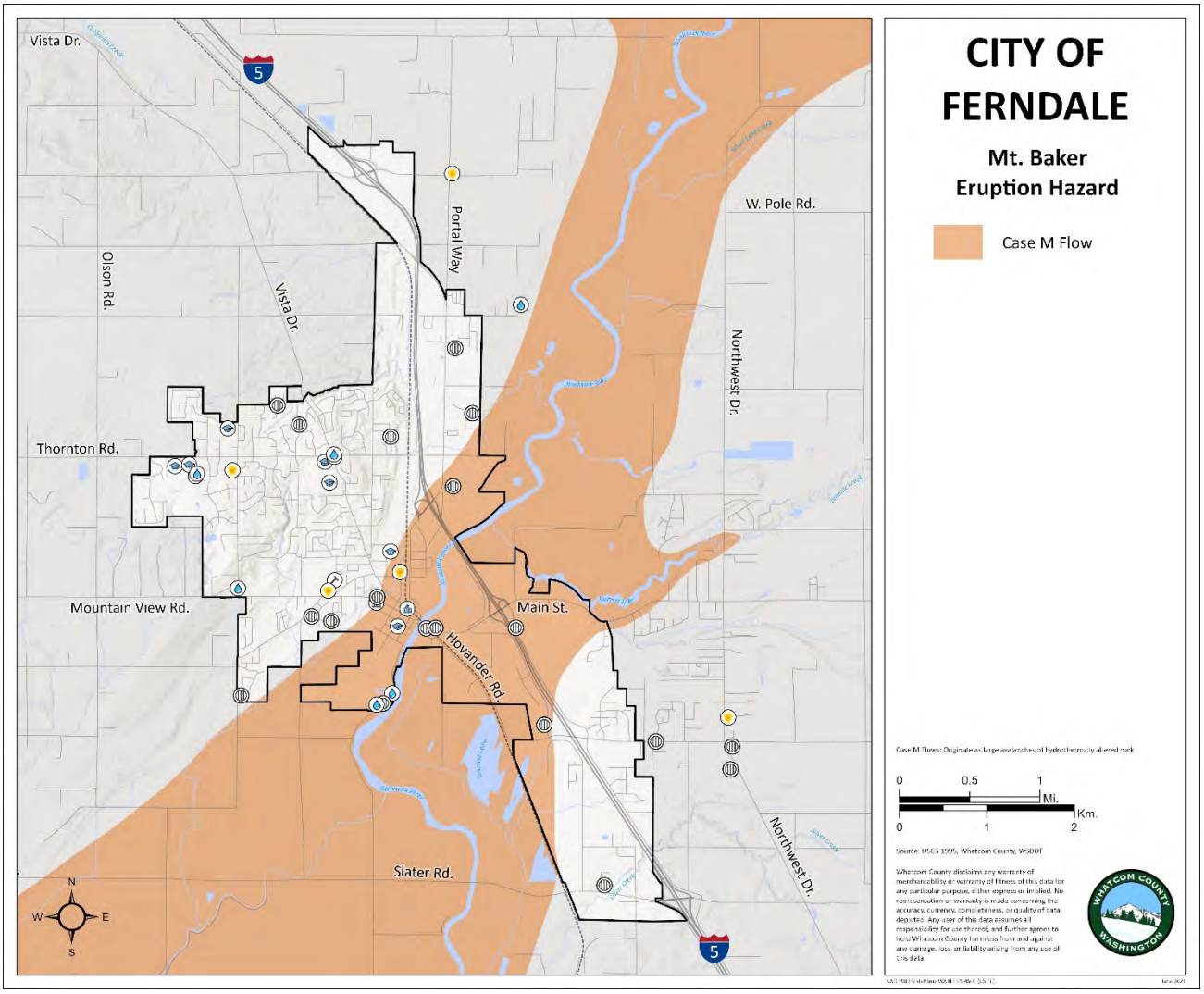
Washington Department of Natural Resources (WA DNR) 2017 Boulder Creek Fault Zone seismic scenario of magnitude 6.8 data. Displays extent and severity of the modeled earthquake in the Modified Mercalli Intensity (MMI) scale.



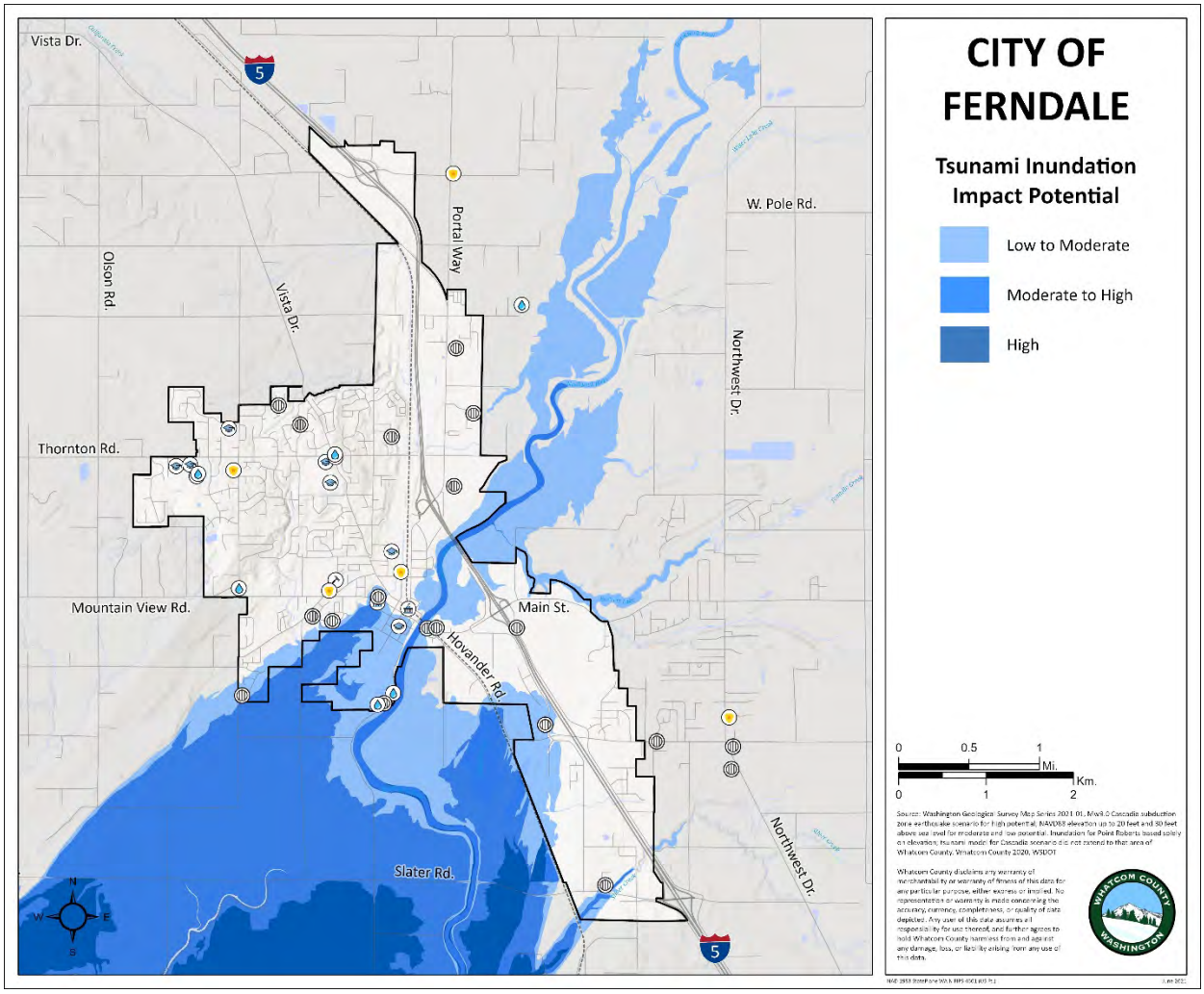
Washington Department of Natural Resources (WA DNR) 2010 liquefaction susceptibility data. This feature class is part of a geodatabase that contains statewide ground response data for Washington State.



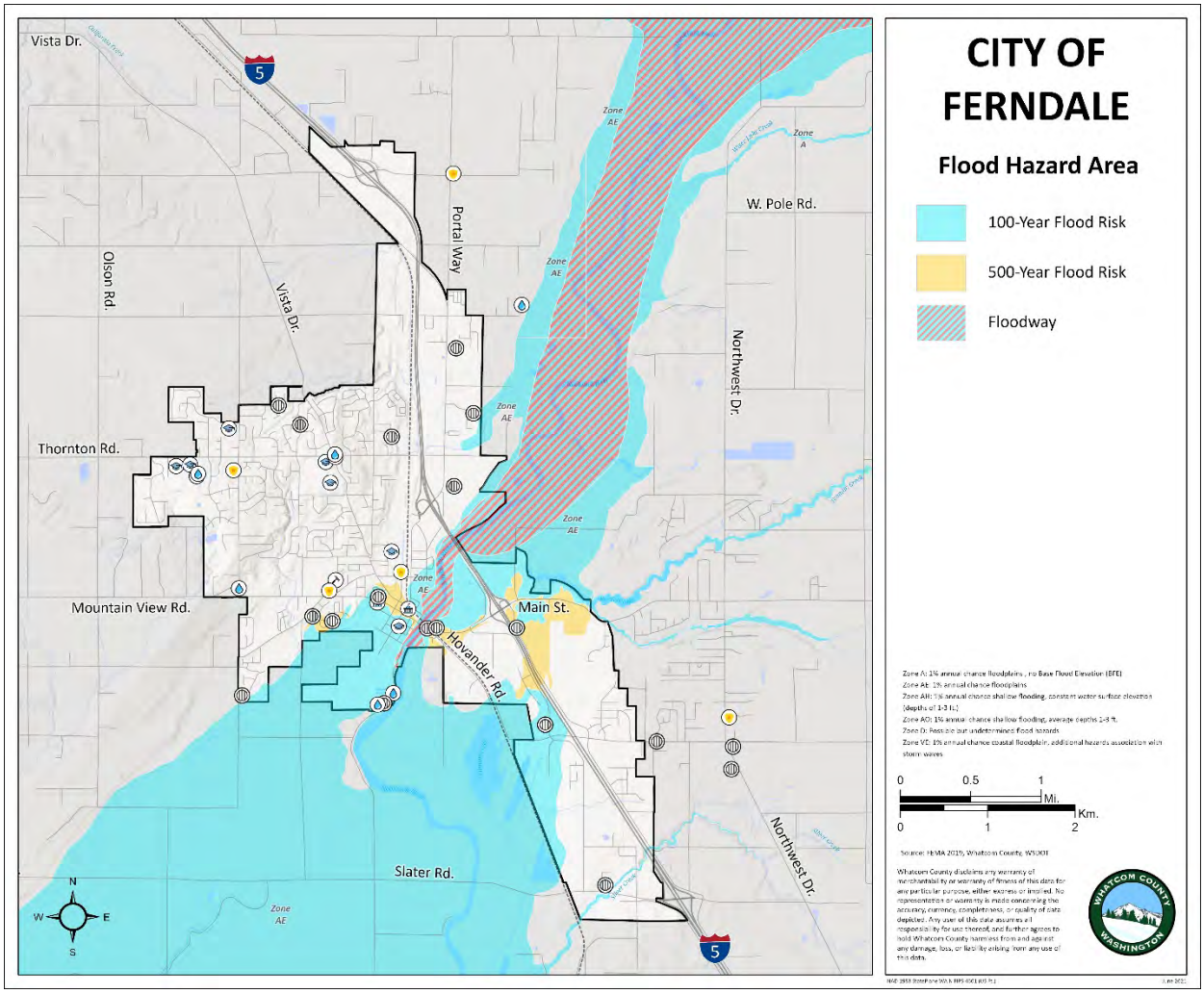
Washington Geological Survey (WGS) 2020 Washington landslide inventory data compiled following streamline landslide mapping protocol (SLIP). SLIP was developed by the WGS's Landslide Hazards Program to help geologists rapidly map landslide landforms from lidar. This data shows both detailed mapping and SLIP landslide data.



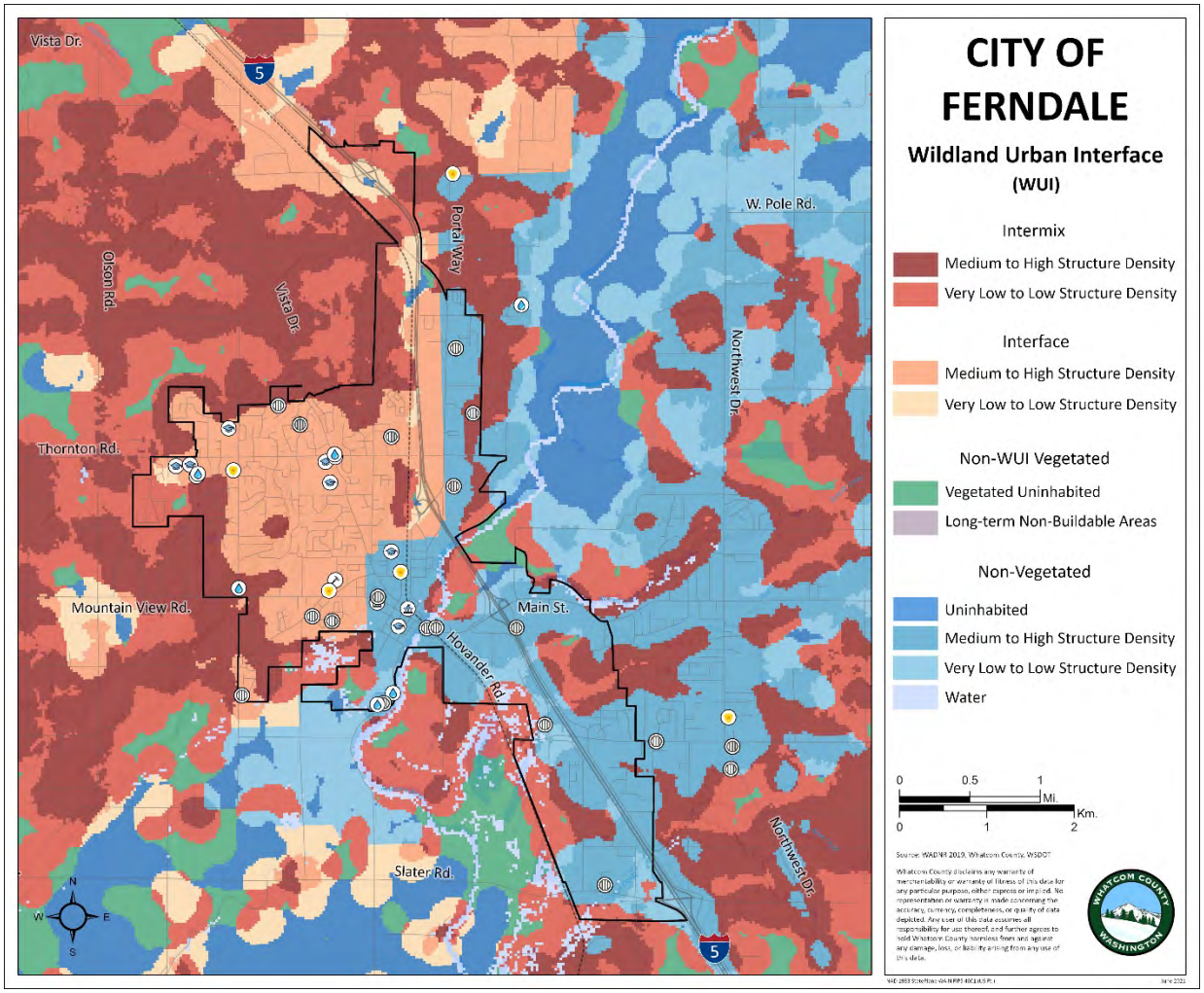
USGS Hazards from Future Activity of Mount Baker, WA (1995) data shows different volcanic flows. Case M flows originate as large avalanches of hydrothermally altered rock. Case 1 debris flows are non-cohesive flows related to melting of snow and ice, with a recurrence of 500 years. Case 2 debris flows are cohesive flows from small debris avalanches, with a recurrence of 100 years.



Map of Ferndale tsunami inundation impact potential. The high impact potential zone is based upon Washington Geological Survey Map Series 2021-01, Mw9.0 Cascadia subduction zone earthquake scenario occurring at mean high tide. The moderate to high and the low to moderate impact potential areas are based upon elevation of up to 20 feet and 30 feet, respectively, above mean sea level (NAVD88). Inundation for Point Roberts is based solely on elevation; tsunami model for the Cascadia subduction zone scenario did not extend to Point Roberts.



FEMA 2019 flood hazard data showing 100-year flooding, 500-year flooding, floodways, and flood zones. FEMA flood data includes both riverine and coastal flooding.



Washington Department of Natural Resources (WA DNR) 2019 mapped data of Washington's Wildland Urban Interface (WUI). The WUI displays areas of WA where structures and wildland overlap with specific structure densities.

The City of Ferndale's Critical Facility List

Facility Name	Facility Type	Signi-ficance	Location	Assessed Dollar Value	Notes
Phillips 66 Refinery	HPL	3	3901 Unick Road		The Phillips 66 Refinery is located to the west of the City of Ferndale and is one of the major west coast refineries, producing gasoline and diesel fuels for distribution across the Pacific Northwest and beyond. The facility is also one of the major sources of employment in Northwest Washington. Damage or destruction of the facility has the potential for impacts to the environment, the local economy, and the regional economy, should the production of fuel be interrupted or significantly reduced for an extended period of time. The machinery and equipment is considered of very high dollar value.
Ferndale City Hall	EF	2	2095 Main Street		With the exception of police and Municipal Court services, City Hall is the location for the operational control of all other City functions for the City of Ferndale, including undigitized current records storage. With sufficient advance notice, all or most City Hall functions may be performed remotely for an extended period of time.
Ferndale City Shop	LUS	3	5735 Legoe Avenue		Acts as the location for City maintenance crews, maintenance fleet, and maintenance supplies. The maintenance fleet and equipment itself are considered high value. Damage or destruction of the

					facility and the fleet would significantly limit the City's ability to respond to infrastructure maintenance, including repairs caused by natural disasters.
City Hall Annex	EF	2	5694 Second Avenue		The City Hall Annex/ Ferndale Municipal Court/ City Council Chambers serves as the location for a variety of City and community functions. The space acts as the location for the Ferndale Municipal Court and jury trials, is utilized by the City Council and other boards and commissions for meetings and hearings, and provides space for the Community Service Cooperative. The Annex is also used for long-term storage of City records.
Ferndale Police Station	EF	3	2220 Main Street		The Ferndale Police Station is the location for the City's law enforcement services, including police vehicles, records storage, municipal court offices and storage, and the City's Emergency Operations Center. The police department fleet is considered to be of high value. Damage or destruction to the facility, particularly the EOC, would limit the City's ability to operate an EOC.
PUD #1 Water Plant #2	LUS	3	1705 Trigg Road		Between its two water plants, the Public Utilities District provides industrial grade (non-potable) water to the Cherry Point Industrial Area as well as irrigation water to approximately 50 customers. The PUD also provides potable water and fire protection to large light-industrial users at

					Grandview Road and Interstate Five. In total the PUD treats and delivers approximately 5.4 billion gallons of water per year. Disruption to the PUD's treatment facilities as the result of a natural disaster would have a direct and immediate impact on its customers, with the most significant impact occurring at Cherry Point. Additionally, disruption to the PUD's conveyance system as a result of a major disaster could have a similar impact.
PUD #2 Water Plant #1	LUS	3	5431 Ferndale Road		Between its two water plants, the Public Utilities District provides industrial grade (non-potable) water to the Cherry Point Industrial Area as well as irrigation water to approximately 50 customers. The PUD also provides potable water and fire protection to large light-industrial users at Grandview Road and Interstate Five. In total the PUD treats and delivers approximately 5.4 billion gallons of water per year. Disruption to the PUD's treatment facilities as the result of a natural disaster would have a direct and immediate impact on its customers, with the most significant impact occurring at Cherry Point. Additionally, disruption to the PUD's conveyance system as a result of a major disaster could have a similar impact.
Ferndale High School	EF	2	5830 Golden Eagle Drive		Largest school in Whatcom County

			PO Box 428 Ferndale WA 98248		Grades 9-12
Horizon Middle School	EF	2	2671 Thornton Road PO Box 1769 Ferndale WA 98248		Grades 6-8
Vista Middle School	EF	2	6051 Vista Drive PO Box 1328 Ferndale WA 98248		Grades 6-8
Beach Elementary School	EF	2	3786 Centerview Road, Lummi Island, WA 98262		Outside of Ferndale's city limits.
Cascadia Elementary School	EF	2	6175 Church Road PO Box 2009 Ferndale WA 98248		
Central Elementary School	EF	2	5610 Second Avenue PO Box 187 Ferndale WA 98248		Within the 100-year floodplain.
Custer Elementary School	EF	2	7660 Custer School Road Custer WA 98240		Outside of Ferndale's city limits.
North Bellingham Elementary	EF	2	5275 Northwest Dr, Bellingham, WA 98226		Outside of Ferndale's city limits.
Eagleridge Elementary School	EF	2	2651 Thornton Road PO Box 1127 Ferndale WA 98248		
Skyline Elementary School	EF	2	2225 Thornton Road PO Box 905 Ferndale WA 98248		
Sewer Pump Station #21	LUS	2	(Ariel Court)		The pump station facilitates the conveyance of wastewater (sewer) from low lying areas in the southwestern portion of the City to the City's wastewater treatment plant

					on Ferndale Road.
Sewer Pump Station #10	LUS	2	NW Corner of Aquarius & Apollo Drive		The pump station facilitates the conveyance of wastewater (sewer) from residential neighborhoods west of the hillside summit in north-central Ferndale to the City's wastewater treatment plant on Ferndale Road.
Sewer Pump Station #11	LUS	2	6156 Unrein Drive		The pump station facilitates the conveyance of wastewater (sewer) from low lying residential and commercial/industrial areas north of Thornton Street to the City's wastewater treatment plant on Ferndale Road.
Sewer Pump Station #12	LUS	2	5217 Northwest Drive		The pump station facilitates the conveyance of wastewater (sewer) from unincorporated areas east of the City limits to the City's wastewater treatment plant on Ferndale Road. The City's extension of utilities to this area serves public (Whatcom County) uses and is not intended for the use of additional private customers, consistent with the Growth Management Act (GMA).
Sewer Pump Station #15	LUS	2	Smith Road & Bellaire		The pump station facilitates the conveyance of wastewater (sewer) from unincorporated areas east of the City limits to the City's wastewater treatment plant on Ferndale Road. The City's extension of utilities to this area serves public (Whatcom County) uses and is not intended for the use of additional private customers, consistent with the Growth Management Act (GMA).

Sewer Pump Station #16	LUS	2	6006 Portal Way		The pump station facilitates the conveyance of wastewater (sewer) from areas east of Portal Way that are below the elevation of the sewer mainline within Portal Way.
Sewer Pump Station #17	LUS	2	1350 Slater Road		The pump station facilitates the conveyance of wastewater (sewer) from commercial and industrial properties on Slater Road.
Sewer Pump Station #18	LUS	2	Nicholas Drive		The pump station facilitates the conveyance of wastewater (sewer) from residential properties in low-lying areas north of Thornton Street.
Sewer Pump Station #2	LUS	3	N. of 1951 Main Street & Nooksack River		The pump station facilitates the conveyance of wastewater (sewer) from Main Street properties east of the Nooksack River. In a flood event, Pump Station #2 also serves to pump water from the immediate vicinity for the purpose of preserving Main Street as a navigable roadway during a flood event.
Sewer Pump Station #3	LUS	2	N. of 5610 Barrett Road		The pump station facilitates the conveyance of wastewater (sewer) from commercial and industrial properties along Barrett Road.
Sewer Pump Station #4	LUS	2	5345 LaBounty Drive		The pump station facilitates the conveyance of wastewater (sewer) from commercial and industrial properties on LaBounty Drive.
Sewer Pump Station #5	LUS	2	5280 Northwest Road		The pump station facilitates the conveyance of wastewater (sewer) from unincorporated areas east of the City limits to the City's wastewater treatment plant on Ferndale Road. The City's extension of utilities to this area serves public (Whatcom County) uses

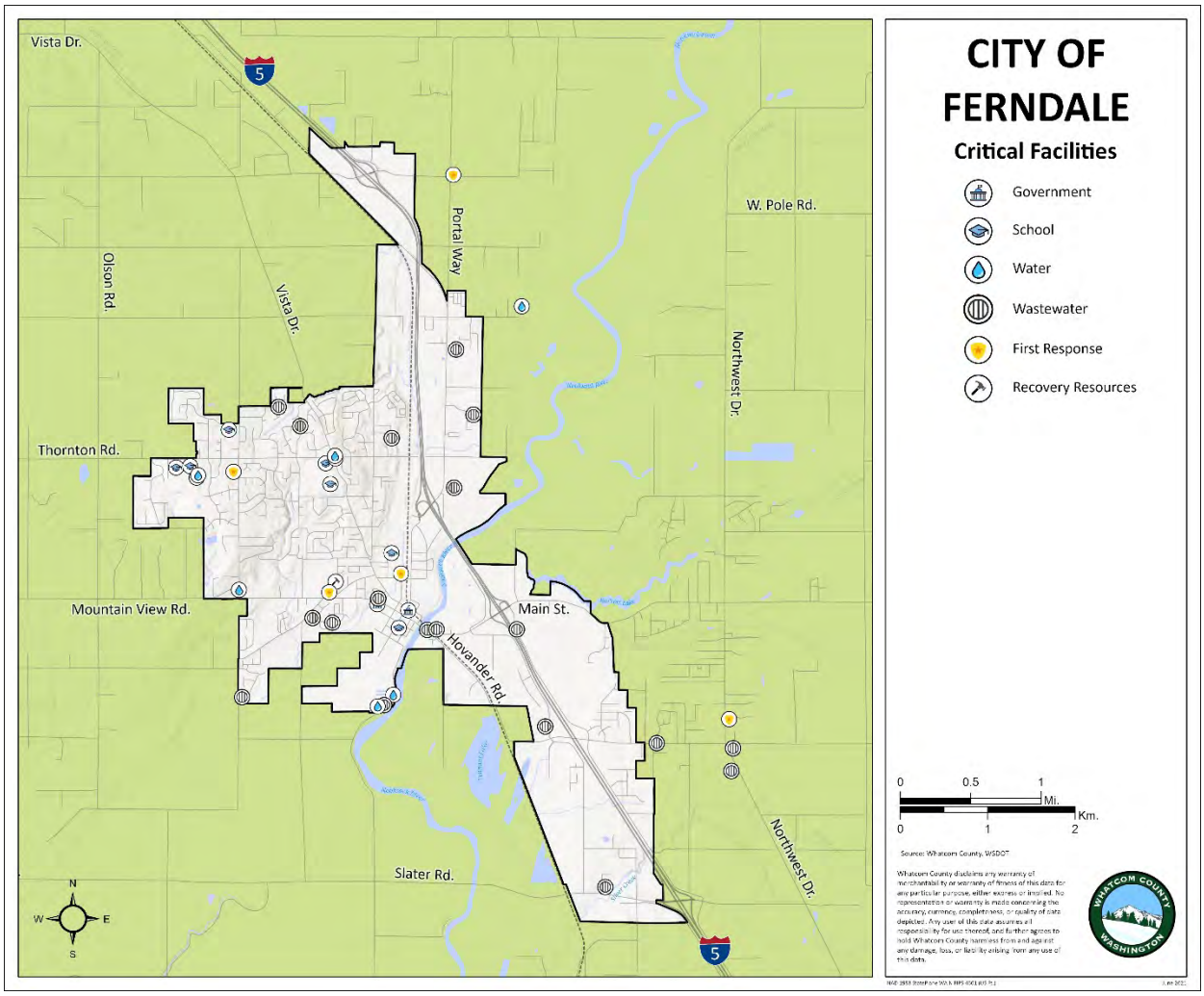
					and is not intended for the use of additional private customers, consistent with the Growth Management Act (GMA).
Sewer Pump Station #6	LUS	2	5336 Poplar Drive		The pump station facilitates the conveyance of wastewater (sewer) from low-lying residential properties in a residential neighborhood.
Sewer Pump Station #7	LUS	2	2090 Main Street		The pump station facilitates the conveyance of wastewater (sewer) from low-lying commercial properties on Main Street.
Storm Sewer Pump Station #8	LUS	2	1920 Main Street		The pump station facilitates the conveyance of wastewater (sewer) from commercial and industrial properties on LaBounty Drive.
Sewer Pump Station #20	LUS	2	1820-1821 McKinley Court		The pump station facilitates the conveyance of wastewater (sewer) from residential properties east of Portal Way
Sewer Pump Station # 9	LUS	2	6400 Portal Way		The pump station facilitates the conveyance of wastewater (sewer) from residential and commercial properties east of Portal Way
Tenaska Cogeneration Plant	LUS	2	5105 Lake Terrell Road		The facility, located adjacent to the Phillips 66 Refinery, utilizes natural gas-power turbines as well as a steam-driven turbine generating power from the steam exhaust resulting from the gas-powered turbines. The resulting power is then distributed through Puget Sound Energy's distribution system.
Petro Gas	LUS	2	4100 Unick Road		The Ferndale Terminal including a deep water dock serves as a storage and distribution facility for bulk shipments of LPG by railcar,

					tank truck, pipeline, and ship.
Waste Water Treatment Plant	LUS	3	5389 Ferndale Road		The City's wastewater (sewer) treatment plant is located west of the Nooksack River and was significantly expanded 2020-2022. The treatment plant serves all City utility customers and has the capacity to serve planned growth within the twenty-year period. The plant is located adjacent to the Nooksack River, and treated wastewater is discharged to the river. The plant is within the 100-year floodplain of the Nooksack River and is susceptible to flood events. The redesign and expansion of the plant has raised the interior of structures above the Base Flood Elevation, but settling ponds and other equipment remain below the Base Flood Elevation. This means that the plant is susceptible to flood damage and that there is the potential for impacts to the environment as a result of flooding, and an interruption of service. For these reasons, the City's wastewater and water treatment plants are considered the highest priority for City facilities, especially in response to hazards originating from the Nooksack River.
City's Water Treatment Plant	LUS	3	5389 Ferndale Road		The City's Water Treatment Plant is located adjacent/on the same property as the aforementioned Waste Water Treatment Plant.
Water Pump Station #1	LUS	2	2195 Thornton Street		The pump station facilitates the conveyance of wastewater (sewer) from residential and

					school district properties in the vicinity of Thornton Street and Vista Drive
Water Pump Station #2	LUS	2	2601 Thornton Street		The pump station facilitates the conveyance of wastewater (sewer) from residential properties in the vicinity of Church Street and Thornton Street
Water Pump Station #3	LUS	2	5727 Church Street		The pump station facilitates the conveyance of wastewater (sewer) from residential and school district properties in the vicinity of Church Street
Water Tank #1	LUS	2	Vista Drive & Thornton Street		Water Tank 1 provides potable water to the surrounding community at a strategic location owned by the City, utilizing gravity to feed nearby water consumers.
Water Tank #2	LUS	2	2601 Thornton Street		Water Tank 2 provides potable water to the surrounding community at a strategic location owned by the City, utilizing gravity to feed nearby water consumers.
WCFD 7 St. 1 Ferndale	EF	3	2020 Washington Street		
WCFD7 St. 2 Whitehorn	EF	3	4047 Brown Road		
WCFD7 St. 3 N. Bellingham	EF	3	5368 Northwest Road		
WCFD7 St. 4 Kohen Road	EF	3	5491 Grandview Road		
WCFD7 St. 5 Enterprise	EF	3	1886 Grandview Road		
WCFD7 St. 6 Church Road	EF	3	6081 Church Road		

Facility Type: **EF** = Essential Facility; **HMF** = Hazardous Materials Facility; **HPL** = High Potential Loss; **LUS** = Lifeline Utility System

Significance to community function: **1**=Moderate; **2**= High; **3** =Very High



Map of critical facilities identified by the City of Ferndale. Across Whatcom County, critical facilities fell into 15 categories. Unique categories developed for this plan update include mass shelter, assisted living, and recovery resources. Mass shelter includes facilities such as fairgrounds and community centers. Recovery resources are facilities that are required post-hazard event, for example public works and private construction companies. Not all judications identified or included critical facilities in each category.

Critical Facility Rankings for the City of Ferndale

The table below indicates whether each critical facility falls within known hazard zones for earthquake, liquefaction, landslide, tsunami, volcano, riverine flooding, coastal flooding and wildfire zones. A rank assessment in the last column indicates how the relative risk of community impact. This ranking considers the significance of the facility to the community and the number of hazard zones the facility is within. The frequency of each hazard is also considered, such that being in a low frequency hazard zone would receive a lower ranking than that same facility being in a high frequency hazard zone. Ranking is on a scale of 1 to 10, with 1 being the facility with the highest-ranking score, and 10 being a facility with the lowest ranking score in the jurisdiction.

$$\text{Rank} = \text{Significance} * \left[\frac{\text{EQ\_Zone}}{\text{EQ\_Freq}} + \frac{\text{LQ\_Zone}}{\text{LQ\_Freq}} + \frac{\text{LS\_Zone}}{\text{LS\_Freq}} + \ldots \frac{\text{WF\_Zone}}{\text{WF\_Freq}} \right]$$

Ranking value will be from 0.0 to 1.0, scaled to the highest ranking in jurisdiction.

Significance: 1=moderate; 2=high; 3=very high, as assessed in the critical facilities list in the previous section

Zone: 0=facility not in hazard zone; 1 = facility in the hazard zone

Frequency (e.g. EQ_Freq, LQ_Freq) is the most difficult variable to which to assign a value. Frequency varies based upon the magnitude of a hazard event and varies from one place to another. It was not possible within the time constraints to assess frequency of hazard at each critical facility location. Instead, a qualitative assessment of the hazard frequency across the entire county was made, as shown in the chart below.

Description	Freq Value used in formula	Hazards
Frequent, occurring on the order of decades	3	Riverine flooding (FL); Coastal flooding (COA)
Rare, occurring on the order of centuries	2	Earthquake (EQ); Liquefaction (LQ); Landslide (LS); Wildfire (WF)
Very rare, occurring on the order of millennia	1	Tsunami (TSU); Volcano (VOL)

Note: Severe storm, a very frequent hazard, was omitted because it is ubiquitous and because no hazard map of storm severity was available.

Critical Facilities Ranking Table

Facility Name	Facility Type	Signi-ficance	EQ	LQ	LS	TSU	VOL	FL	COA	WF	Rank Assessment
Phillips 66 Refinery	HPL	3	1	1	0	0	0	0	0	1	0.39
Ferndale City Hall	EF	2	1	1	0	1	0	1	0	0	0.41
Ferndale City Shop	LUS	3	1	1	0	0	0	0	0	1	0.39
City Hall Annex	EF	2	1	1	0	0	0	0	0	0	0.17
Ferndale Police Station	EF	3	1	1	0	0	0	0	0	1	0.39
PUD #1 Water Plant #2	LUS	3	1	1	0	0	0	0	0	0	0.26
PUD #2 Water Plant #1	LUS	3	1	1	0	1	1	1	0	0	0.86
Ferndale High School	EF	2	1	1	0	0	0	0	0	0	0.17
Horizon Middle School	EF	2	1	1	0	0	0	0	0	1	0.26
Vista Middle School	EF	2	1	1	0	0	0	0	0	1	0.26
Beach Elementary School	EF	2	1	1	0	0	0	0	0	1	0.26
Cascadia Elementary School	EF	2	1	1	0	0	0	0	0	1	0.26
Central Elementary School	EF	2	1	1	0	1	1	1	0	0	0.58
Custer Elementary School	EF	2	1	1	0	0	0	0	0	1	0.26
North Bellingham Elementary	EF	2	1	1	0	0	0	0	0	0	0.17
Eagleridge Elementary School	EF	2	1	1	0	0	0	0	0	1	0.26
Skyline Elementary School	EF	2	1	1	0	0	0	0	0	1	0.26
Sewer Pump Station #21	LUS	2	1	1	0	0	0	0	0	1	0.26

Sewer Pump Station #10	LUS	2	1	1	0	0	0	0	0	1	0.26
Sewer Pump Station #11	LUS	2	1	1	0	0	0	0	0	1	0.26
Sewer Pump Station #12	LUS	2	1	1	0	0	0	0	0	0	0.17
Sewer Pump Station #15	LUS	2	1	1	0	0	0	0	0	0	0.17
Sewer Pump Station #16	LUS	2	1	1	0	0	1	0	0	0	0.35
Sewer Pump Station #17	LUS	2	1	1	0	1	0	0	0	0	0.35
Sewer Pump Station #18	LUS	2	1	1	0	0	0	0	0	1	0.26
Sewer Pump Station #2	LUS	3	1	1	0	1	1	1	0	1	1
Sewer Pump Station #3	LUS	2	1	1	0	1	1	1	0	1	0.66
Sewer Pump Station #4	LUS	2	1	1	0	1	1	1	0	0	0.58
Sewer Pump Station #5	LUS	2	1	1	0	0	0	0	0	0	0.17
Sewer Pump Station #6	LUS	2	1	1	0	1	0	1	0	1	0.49
Sewer Pump Station #7	LUS	2	1	1	0	1	0	1	0	0	0.41
Storm Sewer Pump Station #8	LUS	2	1	1	0	1	1	1	0	0	0.58
Sewer Pump Station #20	LUS	2	1	1	0	1	0	0	0	1	0.43
Sewer Pump Station # 9	LUS	2	1	1	0	0	0	0	0	0	0.17
Tenaska Cogeneration Plant	LUS	2	1	1	0	0	0	0	0	1	0.26
Petro Gas	LUS	2	1	1	0	0	0	0	0	1	0.26
Waste Water Treatment Plant	LUS	3	1	1	0	1	1	1	0	0	0.87
Water Pump Station #1	LUS	2	1	1	0	0	0	0	0	1	0.26
Water Pump Station #2	LUS	2	1	1	0	0	0	0	0	0	0.17

Water Pump Station #3	LUS	2	1	1	0	0	0	0	0	0	0.17
Water Tank #1	LUS	2	1	1	0	0	0	0	0	1	0.26
Water Tank #2	LUS	2	1	1	0	0	0	0	0	0	0.17
WCFD 7 St. 1 Ferndale	EF	3	1	1	0	0	1	0	0	0	0.52
WCFD7 St. 2 Whitehorn	EF	3	1	1	0	0	0	0	0	1	0.39
WCFD7 St. 3 N. Bellingham	EF	3	1	1	0	0	0	0	0	0	0.26
WCFD7 St. 4 Kohen Road	EF	3	1	1	0	0	0	0	0	1	0.39
WCFD7 St. 5 Enterprise	EF	3	1	1	0	0	0	0	0	1	0.39
WCFD7 St. 6 Church Road	EF	3	1	1	0	0	0	0	0	1	0.39

Notes: **EQ** = Earthquake; **LQ** =Liquefaction; **LS** = Landslide; **TSUN** = Tsunami; **VOL** = Volcano; **FL** = Riverine Flooding; **COA** = Coastal Flooding; **WF** = Wildland Fire

Areas and Assets Exposed, Per Hazard

	City of Ferndale Exposure to Natural Hazards					
	Hazard Susceptibility	Asset County (% of Total)				Critical Facilities Appraised Value (Million)
		Area (sq.mi.)	Population	Parcels	Critical Facilities	
Geological Hazards						
	MMI V	-	-	-	12.2%	$455
	MMI VI	100%	100%	100%	87.8%	$131
	MMI VII	-	-	-	-	-
	MMI VIII - IX	-	-	-	-	-
	TOTAL	100%	100%	100%	100%	$586
	Very Low to Low	46.4%	40.3%	38.5%	46.9%	$478
	Low to Moderate	35.8%	53.5%	54.1%	34.7%	$73
	Moderate	-	-	-	-	-
	Moderate to High	17.1%	6.2%	7.4%	18.4%	$35
	High	-	-	-	-	-
	TOTAL	99.3%	100%	100%	100%	$586
	Landslide Low	-	-	-	-	-
	Landslide Moderate	-	-	-	-	-
	Landslide High	-	-	-	-	-

	Fan Low	0.08%	0.3%	0.02%	-	-
	Fan Moderate		-	-	-	-
	Fan High	-	-	-	-	-
	Mine Hazard	-	-	-	-	-
	TOTAL	0.08%	0.3%	0.02%	-	-
	Case 1 Debris Flows	-	-	-	-	-
	Case 2 Debris Flows	-	-	-	-	-
	Case M Flows	27.5%	11.6%	11.4%	22.4%	$35
	Pyroclastic Flows, Lava Flows, and Ballistic Debris	-	-	-	-	-
	TOTAL	27.5%	11.6%	11.4%	22.4%	$35
	Low to Moderate Inundation Potential	11.6%	5.9%	5.6%	14.3%	$22
	Moderate to High Inundation Potential	2.1%	4.5%	0.3%	-	-
	High Inundation Potential	-	-	-	-	-
	TOTAL	13.7%	10.4%	5.9%	14.3%	$22
Hydrological Hazards						
	100-year Flood	13.6%	5.1%	6.3%	16.4%	$35
	500-year Flood	4%	3.4%	3.7%	8.2%	$0.4
	Floodway	2.3%	0.6%	0.2%	-	-
	Undetermined (Zone D)	-	-	-	-	-

	TOTAL	19.9%	9.1%	10.2%	24.5%	$35.4
Meteoro-logical	**Wildfire Zones**					
	Interface Very Low-Low Structure Density	2.9%	0.6%	0.8%	4.1%	$2
	Interface Medium-High Structure Density	32.1%	59.6%	54.1%	46.9%	$530
	Intermix Very Low-Low Structure Density	11.5%	0.4%	3.3%	-	-
	Intermix Medium-High Structure Density	16.6%	1.8%	16.2%	6.1%	$0.6
	TOTAL	63.1%	62.4%	74.4%	57.1%	$532.6

Status of Ferndale's 2016-2020 and Ongoing Hazard Mitigation Actions

This section describes the status of mitigation actions that were proposed in the 2016 Mitigation Plan and are now 1) currently being implemented and are ongoing, 2) are now completed, or 3) are now discontinued because they are no longer needed. The actions are organized by hazard and indicate the lead agency, funding source, and status.

1	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
5	Funding Source:	Local; State; FEMA; Private; Other
6	Current Status	Action Discontinued / Action Completed / Action ongoing and expected completion date

Education and Outreach

EO-a. The City strives to continuously improve the safety of its citizens and level of protection for public infrastructure. The City has committed to expand and maintain its first responder capabilities and has sought to upgrade equipment and infrastructure necessary to respond to emergency events. The City has also sought to make use of all available forms of communication in order to distribute information quickly and accurately.

Lead Agency	Ferndale City Council
Funding Source	Local sources, and state and federal grants
Current Status	Ongoing

EO-b. Continue to identify ways the city can improve the protection of public infrastructure. The City has updated and will continue to update its long-range infrastructure plans and considers natural and human-caused impacts to this infrastructure. The City also seeks to identify modifications or improvements to infrastructure that will avoid or mitigate impacts from natural hazards.

Lead Agency	Ferndale City Council
Funding Source	Local sources, and state and federal grants
Current Status	Ongoing

EO-c. Telephone based early warning system. A computerized early warning system that automatically dials each landline telephone number within a specified area, and plays a recorded message when the phone is answered is currently provided to the City by the

Whatcom County Sheriff's Office, Division of Emergency Management. A larger capacity system that can also contact cell phones through the use of a federally licensed COG would help address a variety of natural and manmade problems.

Lead Agency	City of Ferndale/ Whatcom County Sheriff's Office Division of Emergency Management
Funding Source	Local sources, and state and federal grants
Current Status	Complete

EO-d. Utility bill inserts. The City routinely includes information in bi-monthly utility bill inserts related to natural hazards and potential avoidance/mitigation measures. The City has also established a quarterly newsletter (established 2020) that is delivered to all utility customers. This newsletter typically includes at least one natural/environmental topic. The City will be transitioning to online utility bill payment 6/1/2021 and expects to be able to utilize this platform for additional communication efforts.

Lead Agency	City of Ferndale Communications Officer
Funding Source	Local
Current Status	Ongoing

EO-e. Adopt and enforce building codes. The City is required to, and does, adopt and enforce the International Building Codes. The City has committed to continue to fully staff these functions.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local
Current Status	Ongoing

Drought/heat wave

D-a. Water Conservation Schedules. During the summer months, the City has a permanent mandatory water conservation schedule. Information relating to water conservation is distributed as part of a coordinated campaign in late spring/early summer each year.

Lead Agency	Ferndale Communications
Funding Source	Local
Current Status	Ongoing

Earthquake

EQ-a. Conduct inspections of building safety.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local
Current Status	Ongoing

Volcano

Vol-a. Lahar warning through IPAWS alerting.

Lead Agency	WCDEM
Funding Source	FEMA
Current Status	Completed

Extreme Temp

No actions ongoing, discontinued, or completed for this hazard.

Flooding

F-a. Extension of Riverside Dike Reinforcement. The City, working with Whatcom County River and Flood, anticipate that a project to modify the existing levee system north of the treatment plant may provide some flooding benefits. This project would not extend as far as what is described here, but would potentially be close.

Lead Agency	Public Works
Funding Source	Local sources, and state and federal grants
Current Status	Ongoing

F-b. Preparedness handbooks, brochures. Distribution of severe weather guides, homeowner's retrofit guide, etc. The City maintains an inventory of FEMA handbook, brochures, flood-related weather guides, and homeowner's retrofit guides that are available to the public at no cost. The City also provides links to equivalent materials online. The Ferndale Public Library also maintains a collection of these documents that are available to the public.

Lead Agency	WCDEM
Funding Source	Local sources
Current Status	Ongoing

F-c. Incorporate flood mitigation in local planning. Per City Code (FMC 15.24), any development activity within the 100-year floodplain must seek to mitigate flood impacts.

Lead Agency	Ferndale Community Development, Planning Department, and Public Works

Funding Source	Local sources
Current Status	Ongoing

F-d. Form partnerships to support floodplain management. The City, working with the Whatcom County Department of River and Flood and other regional partners frequently participates in planning efforts to address potential flood impacts, floodplain modeling, and more. In 2020 the City worked with River and Flood to produce a video documenting flood characteristics in Ferndale.

Lead Agency	Ferndale Community Development, Planning Department, WCDEM, and Public Works
Funding Source	Local sources
Current Status	Ongoing

F-e. Limit or restrict development in floodway areas. Per the City's Municipal Code a Floodway Zone has been established consistent with FEMA-designated floodways, prohibiting or restricting development within these areas.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Ongoing

F-f. Improve stormwater management planning. The City is required to maintain compliance with stormwater manuals established by the Washington State Department of Ecology. In 2021 the City initiated major updates to its Stormwater Comprehensive Plan. The City has augmented the staffing associated with stormwater and has expanded stormwater education throughout Public Works and Community Development Department staff.

Lead Agency	Ferndale Public Works
Funding Source	Local sources
Current Status	Ongoing

F-g. Adopt policies to reduce stormwater runoff. The City is required to comply with the most recent edition of the Western Washington Stormwater Manual issued by the Washington State Department of Ecology, which seeks to reduce stormwater runoff.

Lead Agency	Ferndale Public Works
Funding Source	Local sources
Current Status	Ongoing

F-h. Improve flood risk assessment. City staff undertake annual floodplain training. In the future the City anticipates enrolling at least one staff member in a comprehensive flood risk assessment course.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Ongoing

F-i. Join or improve compliance with NFIP. Ferndale is compliant with NFIP.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Complete

F-j. Participate in the CRS. The City has maintained participation in CRS since 2016; the City anticipates maintaining this affiliation and to expand its compliance over time.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Ongoing

F-k. Improve stormwater drainage system capacity. Through its update to the Stormwater Comprehensive Plan (initiated 2021), the City anticipates the completion of an analysis of overall stormwater drainage system capacity and projects necessary to achieve this goal. The plan is expected to be completed at the end of 2022.

Lead Agency	Ferndale Public Works
Funding Source	Local sources
Current Status	Ongoing

F-l. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures. The City is obligated to periodically inspect and maintain its various drainage systems and flood control structures, including stormwater and storm drains associated with the City's transportation network. In addition, the City seeks to ensure that private properties and homeowner's associations meet their responsibilities for inspection and maintenance of private structures. The City is fully staffed to accomplish these goals.

Lead Agency	Ferndale Public Works
Funding Source	Local sources
Current Status	Ongoing

F-m. Protect infrastructure. The City is obligated to protect and maintain its infrastructure. In addition to these standard responsibilities, the City in 2021 initiated an Asset Management program to better track infrastructure maintenance, including recurring maintenance obligations that could be indicative of broader challenges. This will enable the City to proactively identify additional steps or projects necessary to maintain the system.

Lead Agency	Ferndale Public Works
Funding Source	Local sources
Current Status	Ongoing

F-n. Protect critical facilities. The City continues to evaluate the condition of all of its critical facilities and anticipates constructing new City Hall/ Municipal Court facilities by the end of the decade that will represent an improvement and be better-protected than the current facilities.

Lead Agency	Ferndale Public Works
Funding Source	Local sources
Current Status	Ongoing

F-o. Preserve pre-designated undeveloped floodways as open space.

Lead Agency	Ferndale Community Development and Planning
Funding Source	Local sources
	Complete

F-p. Increase awareness of flood risk and safety. On at least an annual basis the City distributes information to the community and businesses concerning flood impacts, risks, and mitigation measures.

Lead Agency	Ferndale Community Development, Planning Department, City of Ferndale Communications Officer, and WCDEM
Funding Source	Local sources
Current Status	Ongoing

F-q. Educate property owners about flood mitigation techniques. On at least an annual basis

the City distributes information to the community and businesses concerning flood impacts, risks, and mitigation measures.

Lead Agency	Ferndale Community Development, Ferndale Public Works, City of Ferndale Communications Officer, and WCDEM
Funding Source	Local sources
Current Status	Ongoing

Landslide/erosion

ER-a. Map and assess vulnerability to erosion. The City maintains steep slope and erosion maps on its GIS database, which is available to the public.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Ongoing

ER-b. Manage development in erosion hazard areas. There are no areas of substantial erosion risk in the City that would prevent development from occurring on the property; should there be an erosion hazard risk on the property, the City's codes require that the applicant seek to avoid the area or to mitigate impacts accordingly.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Ongoing

ER-c. Promote or require site and building design standards to minimize erosion risk. The Ferndale Critical Areas Ordinance includes erosion risks as geologic hazards, which must be avoided. If avoidance is not possible, the code identifies several steps to minimize and mitigate potential impacts.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Ongoing

LS-a. Map and assess vulnerability to landslides. The City of Ferndale's GIS maps depict steep slopes and areas of landslide risk.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Ongoing

LS-b. Manage development in landslide hazard areas. The Ferndale Critical Areas Ordinance includes landslide risks as geologic hazards, which must be avoided. If avoidance is not possible, the code identifies several steps to minimize and mitigate potential impacts.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Ongoing

LS-c. Prevent impacts to roadways. The City's development standards, combined with its land use regulations, Critical Areas Ordinance, and Public Works Maintenance division are designed to work collaboratively to prevent impacts to roadways. When necessary the Ferndale Police Department may provide additional traffic control and assistance during emergency events.

Lead Agency	Ferndale Public Works
Funding Source	Local sources
Current Status	Ongoing

Lightning

No actions ongoing, discontinued, or completed for this hazard.

Severe Storm

No actions ongoing, discontinued, or completed for this hazard.

Severe Wind

SW-a. Promote or require site and building design standards to minimize wind damage. The City of Ferndale is required to verify that structures built in the City of Ferndale are designed to meet wind load standards. The City also utilizes Code Enforcement personnel to identify potential risks resulting from wind damage, and to pursue enforcement in order to remove the potential impact.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Ongoing

SW-b. Increase severe wind risk awareness. The City utilizes its public information channels to promote wind awareness prior to anticipated wind event.

Lead Agency	City of Ferndale Communications Officer and WCDEM
Funding Source	Local sources
Current Status	Ongoing

Tornadoes

No actions ongoing, discontinued, or completed for this hazard

Wildfire

No actions ongoing, discontinued, or completed for this hazard.

Winter storms/Freezes

WW-a. Protect buildings and infrastructure. The City designs and operates its facilities and infrastructure to meet the demands of all seasons and weather conditions. The City seeks to ensure adequate funding for normal maintenance, repairs, and system replacement.

Lead Agency	Ferndale Public Works
Funding Source	Local sources
Current Status	Ongoing

WW-b. Reduce impacts to roadways. The City has developed snow plow routes, advance warning of inclement winter weather, and more. As a result, City of Ferndale roadways are widely recognized as the most-navigable roadways in Whatcom County during winter weather events.

Lead Agency	Ferndale Public Works
Funding Source	Local sources
Current Status	Ongoing

WW-c. Conduct winter weather risk awareness activities. Annually, and immediately prior to

forecast winter weather events, the City distributes information concerning priority snow plow routes, shelter opportunities for the homeless and near homeless, appropriate steps to prevent burst pipes, and more.

Lead Agency	City of Ferndale Communications Officer and WCDEM
Funding Source	Local sources
Current Status	Ongoing

Multiple Hazards

MU-a. Assess community risk. The City continually reviews regulations, practices, procedures, and City facilities to determine whether existing conditions are adequate to meet the demands of future growth, change, and hazard impacts. The City has sought to practice rolling code and development changes in order to constantly refresh City expectations and policies. The City is also working with regional partners to augment climate change resiliency planning.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Ongoing

MU-b. Map community risk. The City maintains a comprehensive GIS mapping system available to the general public. Included in this system are additional data layers (maps) depicting community risk.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Ongoing

MU-c. Prevent development in hazard areas. The City's various policies (Critical Areas Ordinance, Zoning, Shoreline Master Program, Floodplain Management, Development Standards, etc.) are designed to provide a higher-level of scrutiny when development is proposed in or near hazard areas; development is generally prohibited in high hazard areas.

Lead Agency	Ferndale Community Development and Planning Department

Funding Source	Local sources
Current Status	Ongoing

MU-d. Adopt development regulations in hazard areas.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Ongoing

MU-e. Integrate mitigation into local planning.

Lead Agency	Ferndale Community Development and Planning Department
Funding Source	Local sources
Current Status	Ongoing

MU-f. Protect structures.

Lead Agency	Ferndale Public Works
Funding Source	Local sources
Current Status	Ongoing

MU-g. Protect infrastructure and critical facilities.

Lead Agency	Ferndale Public Works
Funding Source	Local sources
Current Status	Ongoing

MU-h. Increase hazard education and risk awareness.

Lead Agency	City of Ferndale Communications Officer and WCDEM
Funding Source	Local sources
Current Status	Ongoing

MU-i. Improve household disaster preparedness.

Lead Agency	City of Ferndale Communications Officer and WCDEM

Funding Source	Local sources
Current Status	Ongoing

Ferndale 2021-2025 Hazard Mitigation Strategy

Whatcom County Hazard Mitigation Goals

Whatcom County has identified five overarching hazard mitigation goals, which represent what a community seeks to achieve through mitigation actions.

Goal 1. Protect Life, Property and Public Welfare

Goal 2. Increase Public Awareness

Goal 3. Preserve and Enhance Natural Systems

Goal 4. Encourage Partnership for Implementation

Goal 5. Ensure Continuity of Emergency Services

These countywide goals help guide any prioritization and implementation of mitigation actions, ensuring that the actions contribute to a community's vision for the future.

City of Ferndale-Specific Hazard Mitigation Goals

Ferndale does not add any community specific goals to the county goals.

Mitigation Action Options

Appendix E of the Whatcom County Natural Hazard Mitigation Plan provides a list of mitigation options. Ferndale considered mitigation options related to earthquakes, volcanoes, flooding, landslides/erosion, land subsidence, tsunamis, and winter storms, especially those related to earthquake and flooding, because these hazards have the potential to cause the greatest loss and damage. Not all mitigation options in Appendix E were relevant or a strong priority for Ferndale. Some options have already been implemented or are ongoing in Ferndale, as documented in the section above on the status of 2016-2020 and ongoing hazard mitigation actions.

Mitigation Action Prioritization

The mitigation actions in this section are new actions that Ferndale has prioritized for the 2021-2025 planning period and beyond. Mitigation options were prioritized based upon review of the following two criteria: 1) The action's Overall Feasibility based on engineering, environmental, financial and political considerations, 2) The Criticality of the action, based upon a consideration of which actions had the greatest potential to protect life, property and public welfare.

Ferndale is working in cooperation with the County and other participating communities and special districts to develop a systematic methodology that would use multiple evaluation criteria to determine mitigation action prioritization. This new methodology will be used in future updates of this Plan.

In the following Identified Mitigation Actions 2021-2025 table, each priority action is listed by hazard. Each action is followed by planning goals, lead agency, the priority evaluation, timeline, funding source and estimated cost, where such information is available. This information can be used by local decision makers in pursuing strategies for implementation.

1	Goals	Indicates the hazard mitigation planning goal or goals this action addresses; countywide and/or community-specific
2	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
3	Priority:	H (High); M (Medium); L (Low)
4	Timeline:	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years)
5	Funding Source:	Local; State; FEMA; Private; Other
6	Estimated Cost:	Actual; Estimated

Ferndale's Identified Mitigation Actions 2021-2025

City of Ferndale IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Education and Outreach Education and Awareness Actions	**These are actions that inform and educate citizens, elected officials, and property owners about hazards and ways to mitigate them.**						
	EO-a Ongoing -- The City strives to continuously improve the safety of its citizens and level of protection for public infrastructure	1	Ferndale City Council	M	O	Local/State/Federal	Staff
	EO-b Ongoing -- Continue to identify ways the city can improve the protection of public infrastructure	1	Ferndale City Council	M	O	Local/State/Federal	Staff
	EO-d Ongoing – Utility Bill Inserts	2	City of Ferndale Communications Officer	M	O	Local	Staff
	EO-e Ongoing -- Adopt and enforce building codes	1	Ferndale Community Development and Planning Department	M	O	Local	Staff
	EO-1 Hazard "Safety Fairs"	2	WCDEN	M	L	Local	
	EO-2 Hazard Awareness Weeks	2	WCDEM	M	L	Local	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Ferndale IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	EO-3 Emergency preparedness education programs for schools.	2,1	Ferndale School District	M	S	Local	
	EO-4. Drills, exercises in homes, workplaces, classrooms, etc.	2,1	Ferndale Police Department and WCDEM	M	S	Local	
Hazard Specific (Reference: Whatcom County Mitigation Ideas)	**Actions communities should consider to identify and evaluate a range of potential mitigation actions for reducing risk to natural hazards and disasters.**						
Dam/Levee Failures (See: Flooding)	The City of Ferndale has no planned actions for this hazard that is not already in progress or completed						
Droughts/Heat Waves	***D-a Ongoing -- Water Conservation Schedules***	**1, 3**	**Ferndale Communications**	**M**	**O**	**Local**	**Staff**
Earthquakes	***EQ-a Ongoing -- Conduct inspections of building safety***	1, 5	Ferndale Community Development and Planning Department	M	O	Local	Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Ferndale IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	EQ-1 Construct a new city hall facility to meet requirements to survive a 6.0M_W or greater earthquake event.	1,2	Ferndale Planning Department	H	L	Local sources, and state and federal grants	$12-15 million
	EQ-2 Earthquake Early Warning System	1,2	Ferndale Police Department/Whatcom Fire District 7	M	L	Local sources, and state and federal grants	$500,000
Extreme Temperatures	The City of Ferndale has no planned actions for this hazard that is not already in progress or completed						
Flooding	***F-a Ongoing -- Extension of Riverside Dike Reinforcement***	1	Public Works	M	O	Local, State, and Federal	Staff
	F-b Ongoing -- Preparedness handbooks, brochures	2	WCDEM	M	O	Local	Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Ferndale IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility for Carrying out Measure	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	F-c Ongoing -- Incorporate flood mitigation in local planning	1	Ferndale Community Development, Planning Department, and Public Works	M	O	Local	Staff
	F-d Ongoing -- Form partnerships to support floodplain management	1, 5	Ferndale Community Development, Planning Department, WCDEM, and Public Works	M	O	Local	Staff
	F-e Ongoing -- Limit or restrict development in floodway areas	1, 3	Ferndale Community Development and Planning Department	M	O	Local	Staff
	F-f Ongoing -- Improve stormwater management planning	1, 3	Ferndale Public Works	M	O	Local	Staff
	F-g Ongoing -- Adopt policies to reduce stormwater runoff	1, 3	Ferndale Public Works	M	O	Local	Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Ferndale IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility for Carrying out Measure	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	F-h Ongoing -- Improve flood risk assessment	1	Ferndale Community Development and Planning Department	M	O	Local	Staff
	F-j Ongoing -- Participate in the CRS	1	Ferndale Community Development and Planning Department	M	O	Local	Staff
	F-k Ongoing -- Improve stormwater drainage system capacity	1	Ferndale Public Works	M	O	Local	Staff
	F-l Ongoing -- Conduct Regular Maintenance for Drainage Systems and Flood Control Structures	1	Ferndale Public Works	M	O	Local	Staff
	F-m Ongoing -- Protect infrastructure	1	Ferndale Public Works	M	O	Local	Staff
	F-n Ongoing -- Protect critical facilities	1	Ferndale Public Works	M	O	Local	Staff
	F-p Ongoing -- Increase awareness of flood risk and safety	2	Ferndale Community	M	O	Local	Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Ferndale IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility for Carrying out Measure	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
			Development, Planning Department, City of Ferndale Communications Officer, and WCDEM				
	F-q Ongoing -- Educate property owners about flood mitigation techniques	2	Ferndale Community Development, Ferndale Public Works, City of Ferndale Communications Officer, and WCDEM	M	O	Local	Staff
	FL-1 Purchase Repetitive Loss Properties in the Floodplain		Ferndale Planning Department	M	L	Local sources, and state and federal grants	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Ferndale IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility for Carrying out Measure	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
Landslide/ Erosion/ Land Subsidence	***ER-a Ongoing -- Map and assess vulnerability to erosion***	1	Ferndale Community Development and Planning Department	M	O	Local	Staff
	ER-b Ongoing -- Manage development in erosion hazard areas	1	Ferndale Community Development and Planning Department	M	O	Local	Staff
	ER-c Ongoing -- Promote or require site and building design standards to minimize erosion risk	1	Ferndale Community Development and Planning Department	M	O	Local	Staff
	LS-a Ongoing -- Map and assess vulnerability to landslides	1	Ferndale Community Development and Planning Department	M	O	Local	Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Ferndale IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility for Carrying out Measure	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	LS-b Ongoing -- Manage development in landslide hazard areas	1	Ferndale Community Development and Planning Department	M	O	Local	Staff
	LS-c Ongoing -- Prevent impacts to roadways	1	Ferndale Public Works	M	O	Local	Staff
	LS-1 Survey for potential alluvial fan hazards	1,2	Ferndale Planning Department	M	L	Local sources, and state and federal grants	
Lightning	The City of Ferndale has no planned actions for this hazard that is not already in progress or completed						
Severe Storms	The City of Ferndale has no planned actions for this hazard that is not already in progress or completed						
	SW-a Ongoing -- Promote or require site	1	Ferndale	M	O	Local	Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Ferndale IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility for Carrying out Measure	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
Severe Wind	***and building design standards to minimize wind damage***		Community Development and Planning Department				
	SW-b Ongoing -- Increase severe wind risk awareness	2	City of Ferndale Communications Officer and WCDEM	M	O	Local	Staff
Tornadoes	The City of Ferndale has no planned actions for this hazard that is not already in progress or completed						
Wildfires	The City of Ferndale has no planned actions for this hazard that is not already in progress or completed						
Winter Storms/ Freezes (Severe Winter Weather)	***WW-a Ongoing -- Protect buildings and infrastructure***	1	Ferndale Public Works	M	O	Local	Staff
	WW-b Ongoing -- Reduce impacts to roadways	1	Ferndale Public Works	M	O	Local	Staff
	WW-c Ongoing -- Conduct winter weather risk awareness activities	1	City of Ferndale Communications Officer and	M	O	Local	Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Ferndale IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility for Carrying out Measure	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
			WCDEM				
Multiple Hazards	***MU-a Ongoing -- Assess community risk***	1	Ferndale Community Development and Planning Department	M	O	Local	Staff
	MU-b Ongoing -- Map community risk	1	Ferndale Community Development and Planning Department	M	O	Local	Staff
	MU-c Ongoing -- Prevent development in hazard areas	1	Ferndale Community Development and Planning Department	M	O	Local	Staff
	MU-d Ongoing -- Adopt development regulations in hazard areas	1	Ferndale Community Development and Planning Department	M	O	Local	Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Ferndale IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	MU-e Ongoing -- Integrate mitigation into local planning	1	Ferndale Community Development and Planning Department	M	O	Local	Staff
	MU-f Ongoing -- Protect structures	1	Ferndale Public Works	M	O	Local	Staff
	MU-g Ongoing -- Protect infrastructure and critical facilities	1	Ferndale Public Works	M	O	Local	Staff
	MU-h Ongoing -- Increase hazard education and risk awareness	1	City of Ferndale Communications Officer and WCDEM	M	O	Local	Staff
	MU-i Ongoing -- Improve household disaster preparedness	1	City of Ferndale Communications Officer and WCDEM	M	O	Local	Staff
Advanced Mitigation Projects	Natural Hazard Early Warning Systems	1,2,5	Whatcom County, Ferndale Police Department, What-Comm	M	S	Unknown	$500,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Ferndale IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility for Carrying out Measure	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
(Dream List)	Tone Radio Based Early Warning System Natural Hazard Early Warning Systems	1,2,5	Whatcom County, Ferndale Police Department, What-Comm	M	S	Unknown	$500,000
	Purchase Repetitive Loss Properties	1,3	City of Ferndale, Whatcom County River and Flood	L	L	FEMA, Local Match	$1 million
	Schell Marsh Flood Attenuation Project	1,3	City of Ferndale	H	M	State, Federal	$1 million

Ferndale Annual Review and Progress for Hazard-Specific Mitigation Actions 2021-2025

Progress monitoring means tracking the implementation of the hazard specific mitigation actions over time. Each jurisdiction must identify how, when, and by whom action items will be monitored. The responsible agency assigned to each mitigation action is responsible for tracking and reporting on each of their actions.

Annual review and progress reporting includes the following:

Step One: Identify mitigation actions that your planning team has identified for the annual review. The planning team has the option to address ALL action items, or only those that should be acted on during each review cycle.

Step Two: Use the table below to track annual progress. For each action item selected for annual review insert the appropriate letter that indicates the status of that action item.

Step Three: Complete a progress report form as illustrated in Appendix G for each mitigation action item selected for annual review

Step Four: Submit the completed form(s) to the Whatcom County DEM.

City of Ferndale Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
EDUCATION AND OUTREACH						
***EO-a*.** The City strives to continuously improve the safety of its citizens and level of protection for public infrastructure.	B					Ongoing/Forever Action
***EO-b*.** Continue to identify ways the city can improve the protection of public infrastructure.	B					Ongoing/Forever Action
***EO-c*.** Telephone based early warning system: A computerized early warning system that automatically dials each landline telephone number within a specified area, and plays a recorded message when the phone is answered is currently provided to the City by the Whatcom County Sheriff's Office, Division of Emergency Management. A larger capacity system that can also contact cell phones through the use of a federally licensed COG would help address a variety of natural and manmade problems.	D					
EO-d. Utility bill inserts.	B					Stormwater, Flood (anticipated for 2021)
EO-1. Hazard "Safety Fairs"		B				
EO-2. Hazard Awareness Weeks	B					City anticipates a hazard awareness week to coincide with the adoption of NHMP and CEMP
EO-3. Emergency preparedness education programs for schools.	B					
EO-4. Drills, exercises in homes, workplaces, classrooms, etc.	B					City anticipates 2021 evacuation/ emergency response drills in City facilities
Add New Action Items if Applicable						

City of Ferndale Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
DAM/LEVEE FAILURES						
Add New Action Items if Applicable						
DROUGHTS/HEAT WAVES						
D-a. Water Conservation Schedules	B					City annually distributes information concerning water conservation and steps to mitigate drought impacts
Add New Action Items if Applicable						
EARTHQUAKES						
EQ-a. Conduct inspections of building safety.	C					COVID-19 and higher-than-normal private development activity has reduced the City's ability to conduct safety inspections for existing buildings.
EQ-1. Construct a new city hall facility to meet requirements to survive a 6.0MW or greater earthquake event.	C					Design will not occur prior to 2022 at the earliest.
EQ-2. Earthquake Early Warning System	D					
Add New Action Items if Applicable						
VOLCANO						
VOL-a. Lahar warning through IPAWS alerting.						
Add New Action Items if Applicable						
FLOODING						
FL-a. Extension of Riverside Dike	B					Initial design and alternatives under

City of Ferndale Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Reinforcement: The City, working with Whatcom County River and Flood, anticipate that a project to modify the existing levee system north of the treatment plant may provide some flooding benefits. This project would not extend as far as what is described here, but would potentially be close.						review
FL-b. Preparedness handbooks, brochures. Distribution of severe weather guides, homeowner's retrofit guide, etc.	B					City maintains an inventory of FEMA flood information available to the public, Ferndale Public Library includes identical data available to the public for reference.
FL-c. Incorporate flood mitigation in local planning.	B					
FL-d. Form partnerships to support floodplain management.	B					
FL-e. Limit or restrict development in floodway areas.	B					
FL-f. Improve stormwater management planning.	B					The City has initiated an update to its Stormwater Comprehensive Plan, to be completed 4Q 2022.
FL-g. Adopt policies to reduce stormwater runoff.	B					The City has adopted such policies consistent with relevant stormwater manuals.
FL-h. Improve flood risk assessment.						
FL-i. Join or improve compliance with NFIP.	A					Ongoing/Forever Action
FL-j. Participate in the CRS, have been participating since 2016.	B					Ongoing/Forever Action
FL-k. Improve stormwater drainage system capacity.	B					Ongoing/Forever Action
FL-l. Conduct Regular Maintenance for	B					Ongoing/Forever Action

City of Ferndale Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Drainage Systems and Flood Control Structures.						
FL-m. Protect infrastructure.	B					Ongoing/Forever Action
FL-n. Protect critical facilities.	B					Ongoing/Forever Action
FL-o. Preserve pre-designated undeveloped flood plains as open space.	B					Ongoing/Forever Action
FL-p. Increase awareness of flood risk and safety.	B					Ongoing/Forever Action
FL-q. Educate property owners about flood mitigation techniques.	B					Ongoing/Forever Action
FL-1. Purchase Repetitive Loss Properties in the Floodplain	D					
Add New Action Items if Applicable						
LANDSLIDES/EROSION						
ER-a. Map and assess vulnerability to erosion.	A					
ER-b. Manage development in erosion hazard areas.	B					Ongoing/Forever Action
ER-c. Promote or require site and building design standards to minimize erosion risk.	B					Ongoing/Forever Action
ER-d. Increase awareness of erosion hazards.	B					Ongoing/Forever Action
LS-a. Map and assess vulnerability to landslides.	A					
LS-b. Manage development in landslide hazard areas.	B					Ongoing/Forever Action
LS-c. Prevent impacts to roadways.	B					Ongoing/Forever Action
LS-1. Survey for potential alluvial fan	D					

City of Ferndale Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
hazards						
Add New Action Items if Applicable						
LAND SUBSIDENCE						
SU-a. Educate residents about subsidence.	D					
Add New Action Items if Applicable						
TORNADOES						
Add New Action Items if Applicable						
TSUNAMI						
TSU-a. Map and assess vulnerability to tsunami.	A					
TSU-b. Manage development in tsunami hazard areas.	A					
TSU-c. Increase public awareness of tsunami hazard.	A					
Add New Action Items if Applicable						
WILDFIRES						
Add New Action Items if Applicable						
WINTER STORMS/FREEZES (SEVERE WINTER WEATHER)						
WW-a. Protect buildings and infrastructure.	B					Ongoing/Forever Action
WW-b. Reduce impacts to roadways.	B					Ongoing/Forever Action
WW-c. Conduct winter weather risk awareness activities.	B					Ongoing/Forever Action

City of Ferndale Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Add New Action Items if Applicable						
EXTREME TEMPERATURES						
Add New Action Items if Applicable						
LIGHTNING						
Add New Action Items if Applicable						
SEVERE WIND						
SW-a. Promote or require site and building design standards to minimize wind damage.	B					Ongoing/Forever Action
SW-b. Increase severe wind risk awareness.						
Add New Action Items if Applicable						
MULTIPLE HAZARDS						
MU-a. Assess community risk.	B					Ongoing/Forever Action
MU-b. Map community risk.	B					Ongoing/Forever Action
MU-c. Prevent development in hazard areas.	B					Ongoing/Forever Action
MU-d. Adopt development regulations in hazard areas.	A					
MU-e. Integrate mitigation into local planning.	A					
MU-f. Adopt and enforce building codes.	B					Ongoing/Forever Action
MU-g. Protect structures.	B					Ongoing/Forever Action
MU-h. Protect infrastructure and critical facilities.	B					Ongoing/Forever Action
MU-i. Increase hazard education and risk	B					Ongoing/Forever Action

City of Ferndale Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
awareness.						
MU-j. Improve household disaster preparedness.	D					
Add New Action Items if Applicable						

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WHATCOM COUNTY FLOOD CONTROL ZONE DISTRICT

Contact Information	**Paula Harris** River and Flood Manager Whatcom County Public Works 322 N Commercial Street, Suite 120 Bellingham, WA 98225 360-778-6230
Approving Authority	**County Executive Satpal Singh Sidhu and Whatcom County Council Members, acting as the Whatcom County Flood Control Zone** District Board of Supervisors 311 Grand Avenue, Suite 308 Bellingham, WA 98225 (360) 676-6717

Planning Process

The updating process started in early 2021. This process consisted of county wide meetings as well as more focused meetings with district staff and Western Washington University, with the goal of improving the Whatcom County Flood Control District section.

Key Contributor List

- Paula Harris, River and Flood Manager
- Kraig Olason, Stormwater Manager
- Andrew Wiser, Geohazard Specialist, Planner

The information contained in the Natural Hazards Mitigation Plan update regarding hazards, risks, vulnerability and potential mitigation is based on the best science and technology currently available. This information and related data on natural hazards potentially impacting the Flood Control Zone District will be used as a tool when the County updates other plans and programs, such as the following:

- Whatcom County Comprehensive Plan
- Whatcom County Comprehensive Emergency Management Plan
- Shoreline Management Program (part of comprehensive plan)
- Transportation Plan (part of comprehensive plan)

- Urban Growth Areas SubArea Plans
- Zoning Code
- Capital Improvement Program for Whatcom County Facilities

As additional information becomes available from other planning sources that can enhance this Plan, that information will be incorporated through the periodic update process.

Plan Maintenance for Whatcom Flood Control Zone District

The Whatcom County Flood Control Zone District (FCZD) has initiated the Floodplain Integrate Planning (FLIP) process to update and expand the Lower Nooksack River Comprehensive Flood Hazard Management Plan (CFHMP) to include the Upper Forks of the Nooksack River. The Whatcom County River and Flood Division of the Public Works Department is overseeing and coordinating the planning process. An extensive stakeholder group has been established that includes representatives from the resource agencies and special districts involved in river management to contribute to this planning process. Throughout the planning process, regular updates are provided to and feedback solicited from the FCZD Advisory Committee, a citizens committee that includes floodplain residents, mayors of two small cities and interested parties. These meetings are open to the public and are advertised through press releases, emailed agendas to those who request them, and postings on the Whatcom County website calendar. Additional opportunities for public input occur during regular updates to the Whatcom County FCZD Board of Supervisors, which occur during meetings of the Whatcom County Council. Once the CFHMP update is complete, the new risk and mitigation information will be incorporated into the next version of this Plan.

Public Outreach and Education

Program	Yes/No, Year Adopted	Description
Nonprofit organizations or local residents groups focused on hazard mitigation, emergency preparedness, vulnerable populations, etc.	No	
Ongoing public education or information programs	Yes	Provide information of flood hazards and mitigation measures to individuals and as projects develop
School-related programs for natural hazard safety	No	
Public education or information program	Yes	Community Rating System
StormReady certification	No	Whatcom County is a StormReady county.
Firewise Community certification	No	
Public-Private Partnership initiatives addressing disaster-related issues	No	
Other		

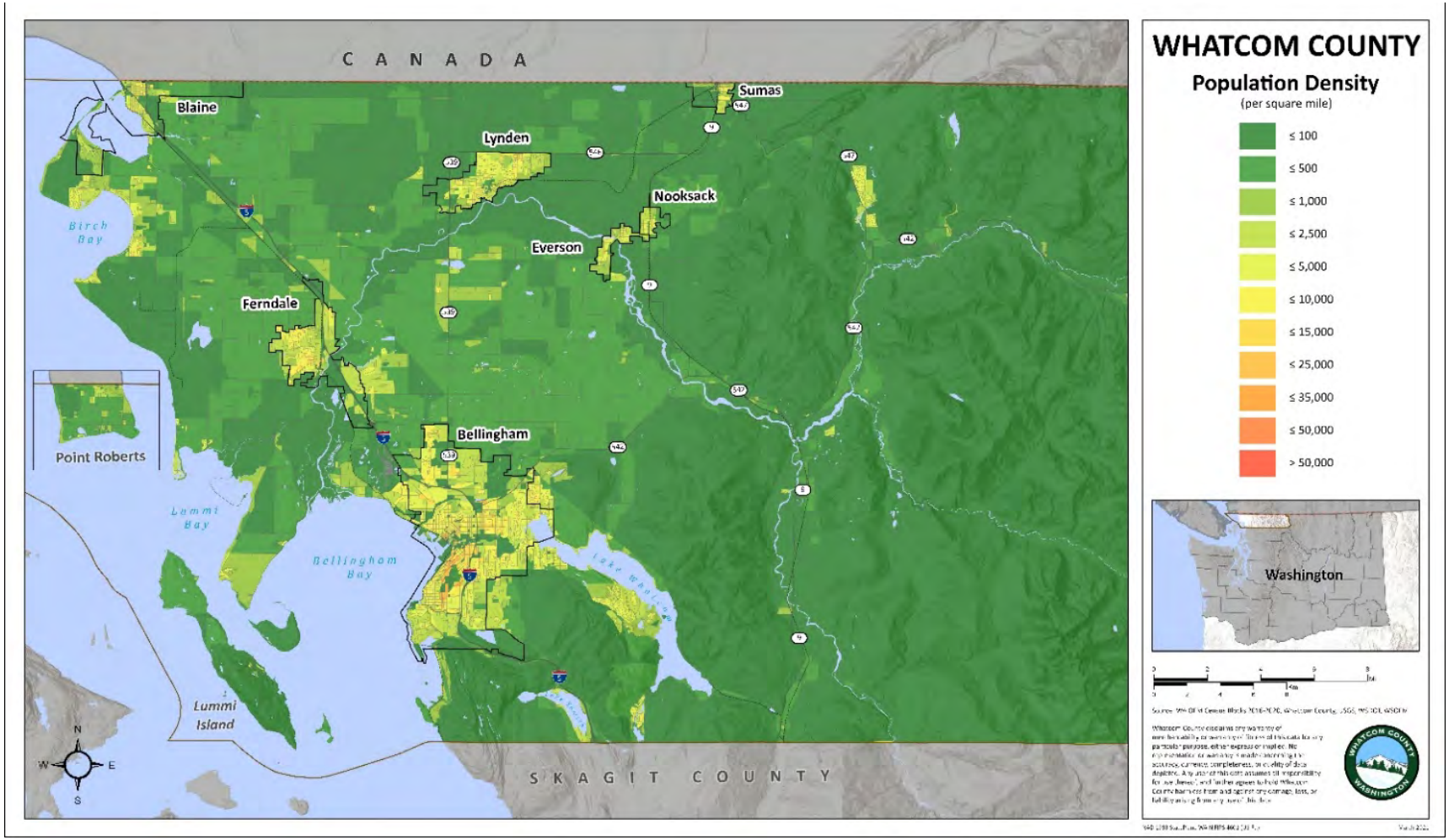
Overview of Whatcom Flood Control District, Hazards and Assets

Geography of The Whatcom Flood Control Zone District

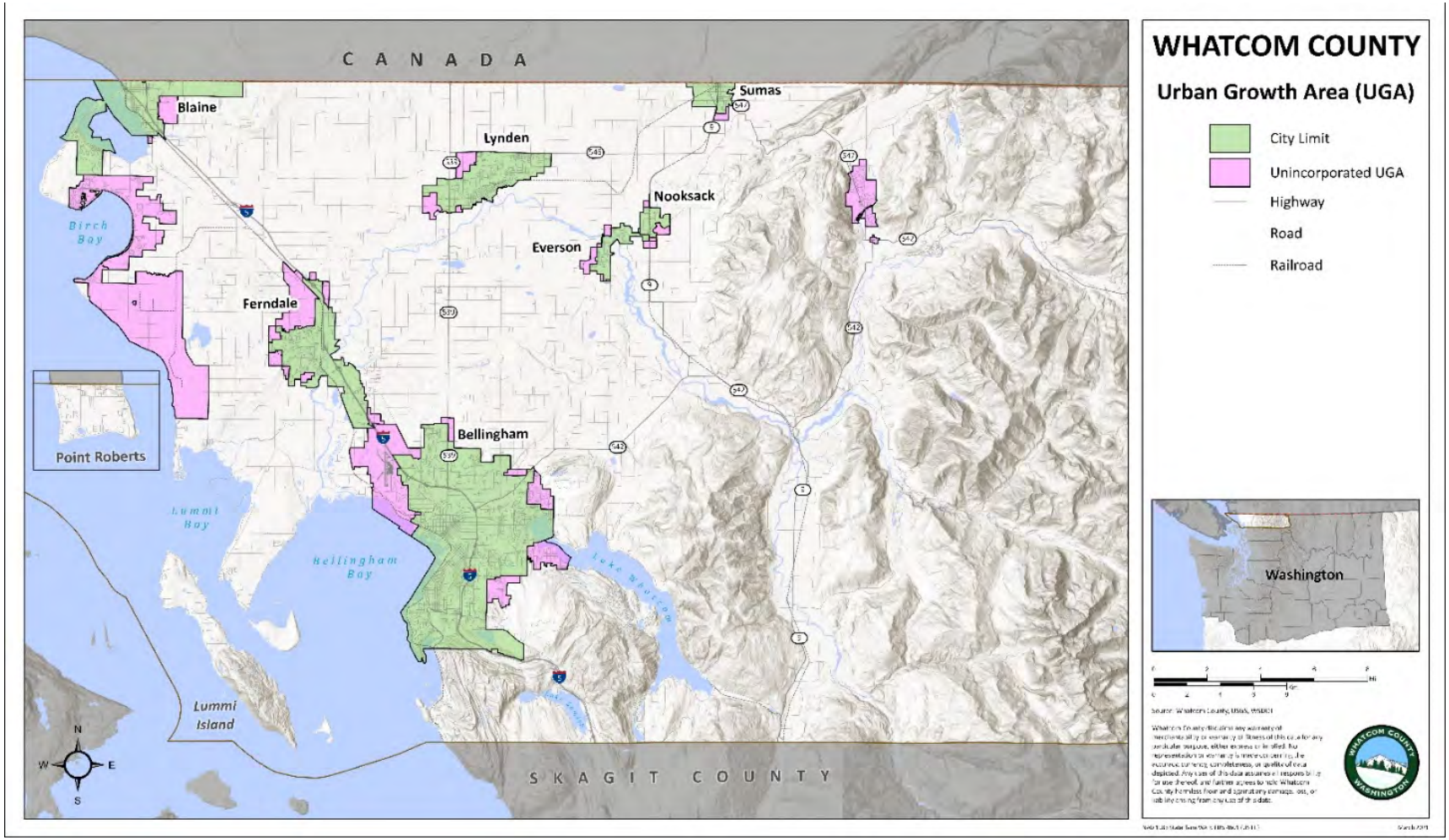
Flood Control Zone District Total Population	228,000 (2020 Census estimate)
Unincorporated Area Population	95,300 (2020 Census estimate)
Flood Control Zone District Total Area	2,120 mi
Flood Control Zone District Incorporated Area	95.4 mi
Flood Control Zone District Unincorporated Area	2,024.6 mi

Growth Trends

This maps below display the district boundaries, population, and the UGA for the Flood Control Zone District, as designated by the Whatcom County Comprehensive Plan.



Washington State Office of Financial Management (OFM) 2020 population and housing estimates for 2010-2020 census block data. This map uses the 2016-2020 average population to show population density per square mile.


C A N A D A
Blaine
Sumas
Lynden
Nooksack
Everson
Ferndale
Bellingham
Point Roberts
Birch Bay
Lummi Bay
Bellingham Bay
Lake Whatcom
Lummi Island
S K A G I T C O U N T Y
N
W
E
S
WHATCOM COUNTY
Urban Growth Area (UGA)
City Limit
Unincorporated UGA
Highway
Road
Railroad
Washington

Presence of Hazards and their Impacts in the Flood Control Zone District

The Flood Control Zone District encompasses the same area that Whatcom County does, and therefore has the same hazard exposure and impacts. The Flood Control Zone District is primarily concerned with the impacts of flooding and erosion. See the profiles of other jurisdictions or Whatcom County for details on more hazards.

Flooding on the Nooksack River in February of 2020 resulted in significant overflows at Everson that impacted the communities of Everson, Nooksack and Sumas as well as the unincorporated areas. In addition to structural damages to residences and businesses in the Everson-Sumas overflow corridor, the transportation infrastructure in the corridor was impacted for several days during and after the flood.

The Flood Control Zone District's growth is the same as Whatcom County's and the individual communities that make up the district. See their sections for more detail on growth, including exposure to hazards.

In the table below is a list of the major hazards that affect Whatcom County. The second column provides the percentage of the Flood Control Zone District's total area that is exposed to each hazard. The third column indicates the severity of anticipated impacts to community function, considering the credible worst-case hazard scenario. Severity of anticipated impacts considers effects on basic community function such as shelter, transportation, utilities, commerce, industry, agriculture, education, health, recreation, and cultural identity. Severity ranges from none to extreme, as shown in the key below the table. Finally, the last column of the table describes where the hazard impacts the community and which services the hazard would most significantly impact.

	Hazard	% area Exposed	Severity of Anticipated Impacts	Hazard Descriptions
Geological	**Earthquake**	86.4%	Moderate to High	The risk of earthquakes to the county is moderate to high. Lake shores are especially subject to damage, as well as characteristics of geologic materials in the County have caused major slides that impacted ground transportation.
	Liquefaction	25.5%	Moderate to High	The loss of intergranular strength in saturated, loosely packed sediment due to elevated pore pressures typically generated by seismic shaking during large magnitude earthquakes. Liquefaction can result in a loss of foundation bearing support and significant building damage, as well as lateral spreading, sand boils, and excessive ground settlement with associated disruption of utilities, roadway systems, and infrastructure.
	Landslide	5.8%	Moderate	Multiple areas around the county are at risk of landslides and debris flows due to unstable geologic conditions.
	Volcano	33.9%	High	Many of the populated areas are at risk in the event of a volcanic eruption from Mount Baker and associated lahars.
	Tsunami	1.2%	Low	Portions of the county exposed to the western straits are at risk of tsunami damage, specifically the area around Sandy Point, Lummi Peninsula, and the Nooksack and Lummi River deltas and floodplain upstream to Ferndale.
	Mine Hazards	0.1%	Low	Mine hazards are present throughout the county. Whatcom has a history of coal mining.
Hydrological	**Flooding**	4.8%	High	The Nooksack River, its upstream forks, alluvial fans on tributaries and coastal areas are subject to flooding. The main coastal communities impacted by coastal flooding are Sandy Point, Birch Bay, Point Roberts, and Lummi Peninsula.

				Damages can include structural damage to residences and seawalls as large debris is carried by waves hitting the shoreline, inundation damage to structures, and debris accumulation and flooding of roadways.
Meteorological	**Wildfire**	12.3%	Moderate	Certain Communities at Risk have been identified, as well as levels of fire risk.

Severity Scale: **None** = no impact to community function
Low = minor degradation of community functions, not widespread
Moderate = moderate degradation over multiple weeks or widespread
High =degradation or loss over many weeks, widespread

Natural Hazard Maps

Natural hazard maps for the Flood Control District can be found in Section 2, which provides hazard maps for the entire county.

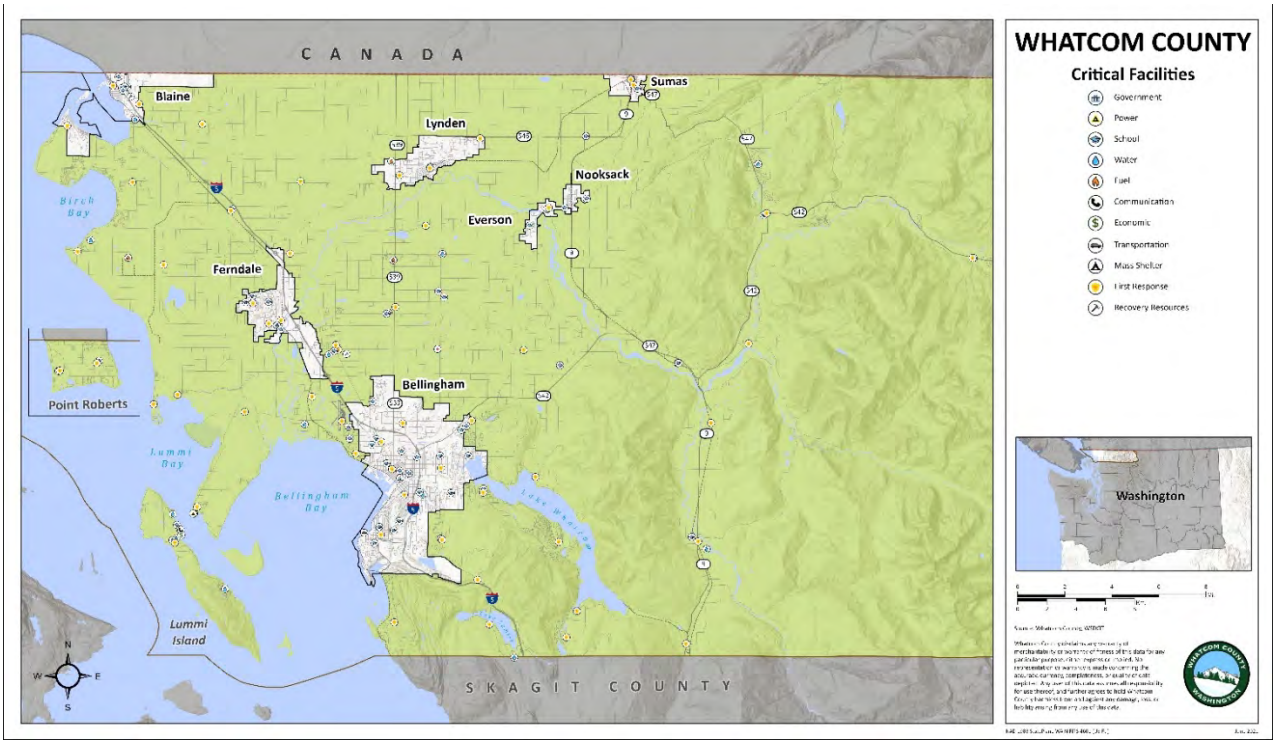
Whatcom Flood Control Zone District Critical Facility List

Facility Name	Facility Type	Signi-ficance	Location	Assessed Dollar Value	Notes
Columbia Valley Water District	LUS	3	6229 Azure Way, Maple Falls, WA 98266		Water District
Lummi Law & Order	EF	3	Lummi Reservation		Lummi Police
Nooksack Police Department	EF	3	111 W Main St., Everson, WA 98247		Nooksack Police
Northwest Water Works, Inc.	LUS	3	5207 Graveline Rd., Bellingham, WA 98226		Utility: Water
Pole Road Water Association	LUS	3	6912 Hannegan Rd. #105, Lynden, WA 98264		Utility: Water
Schools: Districts 501, 503, 505, 507	EF	1	10 Schools Total		School, possible shelter, distribution site or staging area.
Search & Rescue	LUS	3	1041 W Smith Rd, Bellingham, WA 98226		
Seattle City Light	LUS	3	Newhalem		Utility: Power
Fire Protection District – 38 Total	EF	3	Various		Critical Government Facility
Water District #2 – Bellingham	LUS	3	1615 Bayon Rd, Bellingham, WA 98225		Utility: Water
Water District #7 – Bellingham	LUS	3	1615 Bayon Rd, Bellingham, WA 98225		Utility: Water
Water District #4 – Point Roberts	LUS	3	1405 Gulf Rd, Point Roberts, WA 98281		Utility: Water

Water District #10 – Geneva/Sudden Valley	LUS	3	1220 Lakeway Dr, Bellingham, WA 98229		Utility: Water
Water District #12 – Lake Samish	LUS	3	2195 Nulle Road Bellingham, WA 98229		Utility: Water
Water District #13 – Maple Falls	LUS	3	6229 Azure Way, Maple Falls, WA 98266		Utility: Water
Water District #14 – Glacier	LUS	3	9973 Mt Baker Hwy, Deming, WA 98244		Utility: Water
Water District #18 – Acme	LUS	3	5456 Rothenbuhler Rd., Acme, WA 98220		Utility: Water
BP-Cherry Point Refinery	Fuel	2	4519 Grandview Road		
Birch Bay Water and Sewer (District 8)	LUS	3	7096 Pt. Whitehorn Road		Utility: Water
Birch Bay Water Connection	LUS	3	2701 Bell Road		Utility: Water
Whatcom Unified Emergency Coordination Center	EF	3	3888 Sound Way		Critical Government Facility

Facility Type: **EF** = Essential Facility; **HMF** = Hazardous Materials Facility; **HPL** = High Potential Loss; **LUS** = Lifeline Utility System

Significance to community function: **1**=Moderate; **2**= High; **3** =Very High



Map of critical facilities identified by the Whatcom County Flood Control Zone District. Across Whatcom County, critical facilities fell into 15 categories. Unique categories developed for this plan update include mass shelter, assisted living, and recovery resources. Mass shelter includes facilities such as fairgrounds and community centers. Recovery resources are facilities that are required post-hazard event, for example public works and private construction companies. Not all judications identified or included critical facilities in each category.

Critical Facility Rankings for the Flood Control Zone District

The table below indicates whether each critical facility falls within known hazard zones for earthquake, liquefaction, landslide, tsunami, volcano, riverine flooding, coastal flooding and wildfire zones. A rank assessment in the last column indicates how the relative risk of community impact. This ranking considers the significance of the facility to the community and the number of hazard zones the facility is within. The frequency of each hazard is also considered, such that being in a low frequency hazard zone would receive a lower ranking than that same facility being in a high frequency hazard zone. Ranking is on a scale of 1 to 10, with 1 being the facility with the highest-ranking score, and 10 being a facility with the lowest ranking score in the jurisdiction.

$$\text{Rank} = \text{Significance} * \left[\frac{EQ\_Zone}{EQ\_Freq} + \frac{LQ\_Zone}{LQ\_Freq} + \frac{LS\_Zone}{LS\_Freq} + \ldots + \frac{WF\_Zone}{WF\_Freq} \right]$$

Ranking value will be from 0.0 to 1.0, scaled to the highest ranking in jurisdiction.

Significance: 1=moderate; 2=high; 3=very high, as assessed in the critical facilities list in the previous section

Zone: 0=facility not in hazard zone; 1 = facility in the hazard zone

Frequency (e.g. EQ_Freq, LQ_Freq) is the most difficult variable to which to assign a value. Frequency varies based upon the magnitude of a hazard event and varies from one place to another. It was not possible within the time constraints to assess frequency of hazard at each critical facility location. Instead, a qualitative assessment of e hazard frequency across the entire county was made, as shown in the chart below.

Description	Freq Value used in formula	Hazards
Frequent, occurring on the order of decades	3	Riverine flooding (FL); Coastal flooding (COA)
Rare, occurring on the order of centuries	2	Earthquake (EQ); Liquefaction (LQ); Landslide (LS); Wildfire (WF)
Very rare, occurring on the order of millennia	1	Tsunami (TSU); Volcano (VOL)

Note: Severe storm, a very frequent hazard, was omitted because it is ubiquitous and because no hazard map of storm severity was available.

Critical Facilities Ranking Table

Facility Name	Facility Type	Signi-ficance	EQ	LQ	LS	TSU	VOL	FL	COA	WF	Rank Assessment
Columbia Valley Water District	LUS	3	1	1	0	0	0	0	0	1	0.45
Lummi Law & Order	EF	3	1	1	0	0	0	0	0	1	0.45
Nooksack Police Department	EF	3	1	1	0	0	0	0	0	0	0.30
Northwest Water Works, Inc.	LUS	3	1	1	0	0	0	0	0	0	0.30
Pole Road Water Association	LUS	3	1	1	0	0	0	0	0	0	0.30
Schools: Districts 501, 503, 505, 507	EF	1	See Whatcom Unincorporated in Section 3 for individual school listings.								0.05-0.33
Search & Rescue	LUS	3	1	1	0	0	0	0	0	0	0.30
Seattle City Light	LUS	3	1	0	0	0	0	1	0	0	0.25
Fire Protection District – 38 Total	EF	3	See Whatcom Unincorporated in Section 3 for individual school listings.								0.3-0.75
Water District #2 – Bellingham	LUS	3	1	1	0	0	0	0	0	1	0.45
Water District #7 – Bellingham	LUS	3	1	1	0	0	0	0	0	1	0.45
Water District #4 – Point Roberts	LUS	3	1	1	0	1	0	0	0	1	0.75
Water District #10 – Geneva/Sudden Valley	LUS	3	1	1	0	0	0	0	0	1	0.45
Water District #12 – Lake Samish	LUS	3	1	1	0	0	0	0	0	1	0.45
Water District #13 – Maple Falls	LUS	3	1	1	0	0	0	0	0	1	0.45
Water District #14 – Glacier	LUS	3	1	1	1	0	1	1	0	1	1

Water District #18 – Acme	LUS	3	1	1	0	0	1	1	0	1	0.85
BP-Cherry Point Refinery	Fuel	2	1	1	0	0	0	0	0	1	0.30
Birch Bay Water and Sewer (District 8)	LUS	3	1	1	0	1	0	0	0	1	0.75
Birch Bay Water Connection	LUS	3	1	1	0	1	0	0	0	1	0.75
Whatcom Unified Emergency Coordination Center	EF	3	1	1	0	0	0	0	0	0	0.30

Notes: **EQ** = Earthquake; **LQ** =Liquefaction; **LS** = Landslide; **TSUN** = Tsunami; **VOL** = Volcano; **FL** = Riverine Flooding; **COA** = Coastal Flooding; **WF** = Wildland Fire

Areas and Assets Exposed, Per Hazard

	Flood Control Zone District Exposure to Natural Hazards					
	Hazard Susceptibility	Asset County (% of Total)				Critical Facilities Appraised Value (Million)
		Area (sq.mi.)	Population	Parcels	Critical Facilities	
Geological Hazards	**Earthquake**, Shaking Intensity					
	MMI IV	7.7%	-	0.03%	-	-
	MMI V	31.7%	15.3%	15.7%	23.6%	$153
	MMI VI	29.6%	63.5%	66.8%	58.4%	$1181
	MMI VII	11.7%	13.8%	8.4%	7.9%	$14
	MMI VIII - IX	5.7%	7.3%	7.4%	10.1%	$40
	TOTAL	86.4%	99.9%	98.3%	100%	$1388
	Liquefaction					
	Very Low to Low	14.6%	45.4%	41.8%	51.7%	$215
	Low to Moderate	6.5%	24.4%	27.5%	24.7%	$1052
	Moderate	-	-	-	-	-
	Moderate to High	4.4%	7.5%	8.5%	7.9%	$34
	High	0.02%	-	0.04%	-	-
	TOTAL	25.5%	77.3%	77.84%	84.3%	$1301
	Landslide					
	Landslide Low	0.7%	0.2%	0.25	-	-
	Landslide Moderate	1%	0.2%	0.1%	-	-
	Landslide High	2.9%	1.2%	1.9%	1.1%	$0.1
	Fan Low	0.1%	0.1%	0.06%	-	-

	Fan Moderate	0.3%	0.2%	0.2%	-	-
	Fan High	0.8%	2.4%	1.9%	2.2%	$3
	Mine Hazard	0.1%	0.4%	2.1%	2.2%	$17
	TOTAL	5.9%	4.7%	6.51%	5.5%	$20.1
	Volcanic Eruption					
	Case 1 Debris Flows	1.6%	1.9%	2.1%	2.2%	$0.5
	Case 2 Debris Flows	0.9%	1.2%	-	-	-
	Case M Flows	2.9%	5.6%	6.3%	7.9%	$34
	Pyroclastic Flows, Lava Flows, and Ballistic Debris	5.8	0.2%	0.6%	1.1%	-
	Lateral Blast Hazard Zone	22.7%	3.8%	5.5%	6.7%	$11
	TOTAL	33.9%	12.7%	14.5%	17.9%	$45.5
	Tsunami, Inundation Zone					
	Low to Moderate Inundation Potential	0.3%	2.2%	0.6%	2.3%	$2
	Moderate to High Inundation Potential	0.3%	2.4%	0.5%	-	-
	High Inundation Potential	0.6%	0.7%	5.6%	2.3%	$0.4
	TOTAL	1.2%	5.3%	6.7%	4.6%	$2.4
Hydrological Hazards	**Flooding**					
	100-year Flood	3.5%	6.7%	8%	3.4%	$1
	500-year Flood	0.4%	1.9%	3.4%	4.5%	$4
	Floodway	0.9%	1.4%	-	-	-
	Undetermined (Zone D)	52.1%	0.1%	0.05%	1.1%	$9
	TOTAL	4.8%	10.1%	11.45%	9%	$14

Meteorological Hazards	**Wildfire Zones**					
	Interface Very Low-Low Structure Density	0.9%	1.9%	7.7%	1.1%	$0.4
	Interface Medium-High Structure Density	1.4%	23.2%	26.9%	41.6%	$1208
	Intermix Very Low-Low Structure Density	5.9%	17.2%	1.6%	30.3%	$112
	Intermix Medium-High Structure Density	4.1%	32.1%	30.4%	22.5%	$36
	TOTAL	12.3%	74.4%	66.6%	95.5%	$1356.4

Status of Whatcom County Flood Control Zone District's 2016-2020 and Ongoing Hazard Mitigation Actions

This section describes the status of mitigation actions that were proposed in the 2016 Mitigation Plan and are now 1) currently being implemented and are ongoing, 2) are now completed, or 3) are now discontinued because they are no longer needed. The actions are organized by hazard and indicate the lead agency, funding source, and status.

Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
Funding Source	Local; State; FEMA; Private; Other
Current Status	Action Discontinued / Action Completed / Action ongoing and expected completion date

Education and Outreach

EO-a. Ensure Welfare and Safety of Residents

For alluvial fans and landslides, additional measures recommended by studies are listed below. In general, the following steps should be implemented to reduce risk of the four geologic hazards – alluvial fans, coalmines, landslides, and seismic hazards – affecting Whatcom County:

- Train local Fire District volunteers on using the County's reverse 911 notification system to message community members in alluvial fan areas when danger is eminent.
- Limit, and if possible, eliminate new development in high-risk hazard areas.
- If new development is to be permitted, mitigate new construction to address the specific geological hazard.
- Educate existing property owners at risk to help minimize the risk of the local hazards.
- If cost effective, buyout high-risk properties.
- As a last-case resort, consider engineering solutions to manage the specific geologic hazard, if proven effective.

The Whatcom County FCZD has developed hazard mitigation recommendations strategies for several of the more developed alluvial fans, including Canyon Creek and Jones Creek. See the Geologic Hazard section of this Plan for further details.

Lead Agency	FCZD
Funding Source	Local, state and FEMA
Current Status	Ongoing

EO-b. Public service announcements: Broadcast early warning video on local TV

Lead Agency	FCZD and Public Works River and Flood.
Funding Source	Local
Current Status	Ongoing

EO-c. Newsletters: Flood preparedness newsletter and related flood materials, such as homeowner's retrofit guide, etc. Annual distribution of flood preparedness newsletter to floodplain residents.

Lead Agency	FCZD and Public Works River and Flood.
Funding Source	Local
Current Status	Ongoing

EO-d. Direct Mailings: Direct mailings to lenders/realtors/insurance agents and repetitive flood loss properties annually.

Lead Agency	FCZD and Public Works River and Flood.
Funding Source	Local
Current Status	Ongoing

Drought/heat wave

No actions ongoing, discontinued, or completed for this hazard.

Earthquake

EQ-a. Support County EQ recovery: The FCZD will support Whatcom County in responding to any flood-related impacts that could result from an earthquake.

Lead Agency	FCZD
Funding Source	Local, State and FEMA
Current Status	Ongoing

Extreme Temp

No actions ongoing, discontinued, or completed for this hazard.

Flooding

FL-a. Comprehensive Flood Hazard Management Plan: The mitigation strategies and recommendations for all five reaches of the Nooksack River and other areas prone to flooding are explored in the Flooding section of this Plan. The River and Flood Division, Whatcom County Public Works has published a Comprehensive Flood Hazard Management Plan (CFHMP) for the Lower Nooksack River which details the projects on the lower river downstream of Deming. This plan was prepared for the Whatcom County FCZD and was adopted by the District's Board of Supervisors. Since its adoption in 1999, the Whatcom County FCZD has been working to implement the plan. A multi-year collaborative process to update the plan and expand it to include the Upper Forks is currently underway.

Lead Agency	FCZD
Funding Source	Local, State, EPA, NOAA
Current Status	Ongoing

FL-b. Adopt and Enforce Building Codes and Development Standards. Whatcom County River and Flood continues to review all developments permits within the floodplain to ensure compliance with Whatcom County Title 17, Flood Damage Prevention and the National Flood Insurance Program.

Lead Agency	Whatcom County Public Works River and Flood and Whatcom County Planning
Funding Source	Local, State, FEMA
Current Status	Ongoing

FL-c. Improve Flood Risk Assessment. In January of 2019, FEMA adopted new floodplain maps for most of the flooding sources in Whatcom County except for the Lower Nooksack River. Work is ongoing to complete and adopt new mapping for the Lower Nooksack River.

Lead Agency	Whatcom County FCZD and Public Works River and Flood
Funding Source	Local, State, FEMA
Current Status	Ongoing

FL-d. Improve Compliance with NFIP. Whatcom County continues to educate the real estate and development community on flood hazards and the requirements for building within special flood hazard areas as part of the Community Rating System. An educational flyer is also being developed to help simplify the steps in permitting developments in the floodplain for property owners and their agents.

Lead Agency	Whatcom County Public Works River and Flood
Funding Source	Local, Private
Current Status	Ongoing

FL-e. Manage the Floodplain Beyond Minimum Requirements. Whatcom County's flood damage prevention ordinance requires new and substantially improved structures to be elevated one foot above the base flood elevation.

Lead Agency	Whatcom County Public Works River and Flood
Funding Source	Local
Current Status	Ongoing

FL-f. Participate in the CRS. Whatcom County River and Flood administers the CRS program in Whatcom County and continues to maintain a CRS rating of 6, resulting in a 20% discount on flood insurance premiums for unincorporated Whatcom County residents.

Lead Agency	Whatcom County Public Works River and Flood
Funding Source	Local, State, FEMA
Current Status	Ongoing

FL-g. Remove Existing Structures from Flood Hazard Areas. The FCZD acquired three additional residences in Marietta and removed the structures from the parcels. Additionally, the FCZD acquired a large agricultural parcel in the floodplain north of Ferndale for future wetland mitigation and the existing residence was removed.

Lead Agency	Whatcom County FCZD/Public Works River and Flood
Funding Source	Local, State, FEMA
Current Status	Ongoing

FL-h. Improve Stormwater Drainage System Capacity. Improved stormwater conveyance has been the focus of the BBWARM District (Birch Bay area of Whatcom County Stormwater Program) over the past decade. Projects from 2015 through 2020 include: Seaview Drive Drainage upgrade, replaced failing storm conveyance system, 2016 – Birch Point Drainage repair, replaced undersized marine outfall which resulted in regular flooding and landslides,

2017 – upgraded an inlet and increased headwall bank height to reduce regular flooding of a neighborhood, 2018 – regraded ditches and replaced driveway culverts to improve drainage system capacity, 2019 – major capacity upgrade consisting of 3,000 feet of pipe and new outfall.

Another focus area within Whatcom County for stormwater improvements is the Lake Whatcom watershed which provides the drinking water to over 100,000 people. Projects typically focus on conveyance and treatment improvements which seek to reduce phosphorus runoff into the lake. Projects in this area from 2015 – 2020 include: Academy Road Improvements, a water quality treatment facility utilizing "Filtera" media and sand polishing cells, 2016- Cedar Hills/Euclid, a variety of water quality treatment methods including swales, treatment cells and cartridge vaults, 2018 – Agate Bay Phase 1, installation of 3 cartridge filter vaults and conveyance upgrades, 2019 – Agate Bay Phase 2, installation of 3 cartridge filter vaults and conveyance upgrades, 2020 – North Shore/Edgewater cartridge treatment vault and conveyance upgrade.

Lead Agency	Whatcom County FCZD/Public Works Stormwater and Engineering
Funding Source	Local, State
Current Status	Ongoing

FL-i. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures. Whatcom County Maintenance & Operations continues to maintain the drainage system within the County's rights-of-way. Whatcom County River and Flood continues to with drainage and diking districts and Subzones to maintain the drainage systems and flood control structures within their districts.

Lead Agency	Whatcom County Public Works Maintenance and Operations
Funding Source	Local
Current Status	Ongoing

FL-j. Protect Infrastructure. The Deming Levee Improvement Project was constructed in 2017; a portion of the upstream end of the levee was set back from the river and raised to protect Nooksack tribal infrastructure, including their sewage treatment facilities for the former casino, as well as the town of Deming. Capital projects aimed at addressing deficiencies and/or repairing damages caused by floods. were conducted on the following levees during the 2016-2020 timeframe: Twin View Levee, Hannegan Levee, Red River Levee, Rayhorst Levee and Marine Drive Levee. Emergency projects were implemented at Rutsatz Road and Truck Road to

prevent erosion damage to the roadways. Sediment traps were constructed on High Creek to reduce flooding of the Mt Baker Highway. A project to reduce the threat of erosion of the Abbott Levee and Abbott Road is currently in final design and planned for construction in 2021.

Lead Agency	Whatcom County FCZD/Public Works River and Flood
Funding Source	Local, state, USACE, Private, Other
Current Status	Ongoing

FL-k. Protect Critical Facilities. Detailed design work is underway for two levee improvement projects to protect critical infrastructure in the Cities of Lynden and Ferndale. Improvements to the Lynden Levee adjacent to their sewage treatment plant are planned for construction in 2021 by the USACE; this work is being done in conjunction with a FCZD project to realign the creek that runs behind and under the levee. Detailed design for improvements to the Ferndale Levee is still in the early stages; this levee protects the City's water and wastewater treatment plants and the PUD's water treatment facility. Detailed design and land acquisition is also underway for the Jones Creek deflection berm that will mitigate debris flood hazards to the Acme Elementary School.

Lead Agency	Whatcom County FCZD/Public Works River and Flood
Funding Source	Local, state, FEMA, Private, Other
Current Status	Ongoing

FL-m. Protect and Restore Natural Flood Mitigation Features. Incorporating natural flood mitigation features into flood control structure design has become the new norm. The Deming Levee was set back connecting more floodplain area and a disconnected tributary was reconnected to the river. The Lynden Levee project includes realigning a small tributary behind the levee farther from the wastewater treatment plant facilities and improving habitat. The Abbott Levee project has been designed as habitat structures along the bank that will reduce the risk of the river eroding into the levee prism.

Lead Agency	Whatcom County FCZD/Public Works River and Flood
Funding Source	Local, state, FEMA, Private, Other
Current Status	Ongoing

Alluvial Fans

AF-a. Map and Assess Alluvial Fans Hazards. A detailed hazard assessment was performed for the Glacier-Gallup alluvial fans in the town of Glacier. This work will be used in developing a long-term solution to addressing the levee deficiency on the Glacier Levee and reducing risk to the town of Glacier.

Lead Agency	Whatcom County FCZD/Public Works River and Flood
Funding Source	Local
Current Status	Ongoing

AF-b. Manage Development in Alluvial Fan Hazard Areas. Whatcom County Planning and Development Services continues to review new development proposals in alluvial fans to ensure compliance with the Critical Areas Ordinance.

Lead Agency	Whatcom County Planning
Funding Source	Local, Private
Current Status	Ongoing

AF-c. Promote or Require Site and Building Design Standards to Minimize Risk on Alluvial Fans. Residential development that has occurred in regulated Alluvial Fan Hazard Areas has been subject to recommendations prepared by a qualified professional (Licensed Geologist) intended to mitigate hazards posed to the development and life-safety. Recommendations primarily consist of siting recommendations intended to achieve hazard avoidance to the maximum extent feasible as well as prevent the transfer of risk to adjacent or down-stream properties. In the event that avoidance cannot be accomplished due to site constraints, estimates of debris flow/flood conditions anticipated during a code-defined event (500-year recurrence debris flow) are provided by the qualified professional for incorporation in the foundation and building design by the project structural engineer. Structural measures employed vary based on proximity to the hazard source and the severity of estimated flow/flood conditions, but typically included elevating finish floor above estimated flow/flood depths, deepened foundation embedment with armoring to prevent scour, and increased foundation reinforcement to withstand flood and debris impacts or pier foundations to allow flow through of flood waters and debris.

Lead Agency	Whatcom County Planning
Funding Source	Local, Private
Current Status	Ongoing

AF-d. Remove Existing Buildings and Infrastructure from Erosion/Alluvial Fan Hazard Areas. One resident on the Jones Creek alluvial fan is being relocated to enable construction of the Jones Creek deflection berm. Once acquired all structures will be removed.

Lead Agency	Whatcom County FCZD/Public Works River and Flood
Funding Source	Local, State, FEMA
Current Status	Ongoing

AF-e. Develop Basin-Specific Plans for Alluvial Fan Hazard Areas. With the Glacier-Gallup hazard assessment now complete, work is underway to evaluate alternatives to address the deficiencies on the Glacier Levee and reduce the risk to the town of Glacier.

Lead Agency	Whatcom County FCZD/Public Works River and Flood
Funding Source	Local
Current Status	Ongoing

AF-f. Construct Mitigation Measures on Alluvial Fan Hazard Areas. Detailed design of the Jones Creek deflection berm is ongoing and will be completed once the final properties needed for construction of the deflection berm are acquired.

Lead Agency	Whatcom County FCZD/Public Works River and Flood
Funding Source	Local, State, FEMA, Private
Current Status	Ongoing

AF-g. Increase Awareness of Alluvial Fan Hazards. Whatcom County Public Works participates with the Acme Fire District during their annual outreach activities with the community of Acme; these have included public meetings, response and evacuation planning and reverse 911 call outs to the community. Community involvement is also an integral part of the Glacier-Gallup project; a community meeting was held at the start of the project in 2019 and more are planned as the project proceeds.

Lead Agency	Whatcom County FCZD/Public Works and Whatcom Unified Emergency Management.
Funding Source	Local
Current Status	Ongoing

Landslide/erosion

No actions ongoing, discontinued, or completed for this hazard.

Landslide Subsidence

No actions ongoing, discontinued, or completed for this hazard.

Lightning

No actions ongoing, discontinued, or completed for this hazard.

Severe Storm

No actions ongoing, discontinued, or completed for this hazard.

Severe Wind

No actions ongoing, discontinued, or completed for this hazard.

Tornadoes

No actions ongoing, discontinued, or completed for this hazard.

Tsunami

TSU-a. Ensure the Welfare and Safety of Residents. With new data available, tsunamis have been identified as a greater threat to Whatcom County and the jurisdictions within than previously thought. Education about tsunamis and acceptance of the threat must precede any plans. Both civic leaders and the public need to understand that there is a threat, and further, have a clear understanding of what the threat entails. Even with the current new data, there is not a clear understanding of the extent of a tsunami threat. More data needs to be obtained, specific to each community along the western border of Whatcom County. There is more tsunami mitigation plan information contained within the tsunami section of this Plan.

The following steps have been implemented to reduce tsunami risk:

- Finish all tsunami inundation mapping for the coast line of Whatcom County.
- Secure tsunami hazard signs from the State of Washington to post in the newly mapped inundation areas.
- Limit, and if possible, eliminate new development in high-risk hazard areas.
- If new development is to be permitted, mitigate new construction to address the specific tsunami hazard.

- As funding permits acquire more tsunami AHAB sirens for the remaining areas threatened by inundation.

The FCZD will support Whatcom County in responding to flooding associated with a tsunami.

Lead Agency	FCZD
Funding Source	Local, state and FEMA
Current Status	Ongoing

Volcanoes

VOL-a. Reduce Risk from Volcanic Activity. Raising awareness and educating both civic leaders and the public in the areas subject to volcano-related damage is very important. Recent statewide campaigns and the news-related stories of volcanoes in the state have sparked interest for those living in the shadow of Mount Baker, Whatcom County's volcano. More awareness and education needs to take place, especially with regards to warning signals of a volcanic eruption and the types of damage that can occur with an eruption with special attention to Lahars. There is more information about volcano-hazard mitigation planning under the Volcano section of this Plan.

The following steps have been implemented to reduce risk of volcanic activity:

- Finish the Mt. Baker / Glacier Peak Volcanic Eruption Plan, and complete a table top exercise based on it.
- Continue to message the citizens who reside in Glacier and Mt. Baker areas on the risks of living on a volcano.

The FCZD will support Whatcom County in responding to any flood-related impacts that could result from a volcano.

Lead Agency	FCZD
Funding Source	Local, state and FEMA
Current Status	Ongoing

Wildfire

WF-a. Create Mitigation Strategies in Cooperation with State and Federal Departments. In cooperation with fire managers from WDNR, NW Region, three mitigation strategies were developed to address Whatcom County's fire hazards:

- Inter-Agency Cooperation
- County-wide Wildland Fire Prevention
- Wildland/Urban Interface Communities at Risk

The FCZD will support Whatcom County in responding to any flood-related impacts that could result from any wildfires. More information and details can be found in the Wildland Fire section of this Plan.

Lead Agency	FCZD
Funding Source	Local, state and FEMA
Current Status	Completed

Winter storms/Freezes

No actions ongoing, discontinued, or completed for this hazard.

Multiple Hazards

No actions ongoing, discontinued, or completed for this hazard.

Flood Control Zone District 2021-2025 Hazard Mitigation Strategy

Whatcom County Hazard Mitigation Goals

Whatcom County has identified five overarching hazard mitigation goals, which represent what a community seeks to achieve through mitigation actions.

Goal 1. Protect Life, Property and Public Welfare

Goal 2. Increase Public Awareness

Goal 3. Preserve and Enhance Natural Systems

Goal 4. Encourage Partnership for Implementation

Goal 5. Ensure Continuity of Emergency Services

These countywide goals help guide any prioritization and implementation of mitigation actions, ensuring that the actions contribute to a community's vision for the future.

Flood Control Zone District-Specific Hazard Mitigation Goals

The 1999 Lower Nooksack River CFHMP included the following community-specific mitigation planning goals for the Flood Control Zone District:

FCZD Goal A: Protect lives

FCZD Goal B: Minimize damage to public and private property and to public resources

FCZD Goal C: Provide a comprehensive understanding of the river

FCZD Goal D: Propose projects with a positive environmental benefit

FCZD Goal E: Maintain ongoing jurisdictional involvement and cooperation

FCZD Goal F: Emphasize long-term solutions

FCZD Goal G: Minimize public expenditures related to flooding

Mitigation Action Options

Appendix E of the Whatcom County Natural Hazard Mitigation Plan provides a list of mitigation options. Flood Control Zone District considered mitigation options related to those that Whatcom County itself has considered, especially those related to flooding and alluvial fans, because these hazards have the potential to cause the greatest loss and damage. Not all mitigation options in Appendix E were relevant or a strong priority for the Flood Control Zone District. Some options have already been implemented or are ongoing in Flood Control Zone

District, as documented in the section above on the status of 2016-2020 and ongoing hazard mitigation actions.

Mitigation Action Prioritization

Whatcom County FCZD chose to prioritize its hazard mitigation strategies according to hazard, not by specific facilities. The FCZD is currently very involved with flood hazard mitigation and will continue with flooding as the primary mitigation project priority. Flood-related mitigation related to geological hazards is also a District priority.

The mitigation actions in this section are new actions that Flood Control Zone District has prioritized for the 2021-2025 planning period and beyond. Mitigation options were prioritized based upon review of the following two criteria: 1) The action's Overall Feasibility based on engineering, environmental, financial and political considerations, 2) The Criticality of the action, based upon a consideration of which actions had the greatest potential to protect life, property and public welfare. Flood Control Zone District is working in cooperation with the County and other participating communities and special districts to develop a systematic methodology that would use multiple evaluation criteria to determine mitigation action prioritization. This new methodology will be used in future updates of this Plan.

In the following Identified Mitigation Actions 2021-2025 table, each priority action is listed by hazard. Each action is followed by planning goals, lead agency, the priority evaluation, timeline, funding source and estimated cost, where such information is available. This information can be used by local decision makers in pursuing strategies for implementation.

Goals	Indicates the hazard mitigation planning goal or goals this action addresses; countywide and/or community-specific
Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
Priority:	H (High); M (Medium); L (Low)
Timeline:	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years)
Funding Source:	Local; State; FEMA; Private; Other
Estimated Cost:	Actual; Estimated

Flood Control District Identified Mitigation Actions 2021-2025

FLOOD CONTROL ZONE DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Education and Outreach Education and Awareness Actions	These are actions that inform and educate citizens, elected officials, and property owners about hazards and ways to mitigate them.						
	EO-a. Ensure Welfare and Safety of Residents	1	FCZD	M	O	Local, State, and FEMA	Staff
	EO-b. Public Service Announcements	1	FCZD and Public Works River and Flood	M	O	Local	
	EO-c. Newsletters	2	FCZD and Public Works River and Flood	M	O	Local	
	EO-d. Direct Mailings	2	FCZD and Public Works River and Flood	M	O	Local	
Hazard Specific (Reference: Whatcom County	Actions communities should consider to identify and evaluate a range of potential mitigation actions for reducing risk to natural hazards and disasters.						

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

FLOOD CONTROL ZONE DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Mitigation Ideas)							
Dam/Levee Failures (See: Flooding)	There are no new actions considered/all actions ongoing, discontinued, or completed						
Droughts/Heat Waves	There are no new actions considered/all actions ongoing, discontinued, or completed						
Earthquakes	***EQ-a. Support County EQ Recovery*** The FCZD will support Whatcom County in responding to any flood-related impacts that could result from an earthquake	1, 3, 5	FCZD	L	O	Local, State, and FEMA	Unknown
Extreme Temperatures	There are no new actions considered/all actions ongoing, discontinued, or completed						
Flooding	***FL-a Ongoing -- Comprehensive Flood Hazard Management Plan***	1, 5	FCZD	M	O	Local, State, NOAA, EPA	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

FLOOD CONTROL ZONE DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	FL-b Ongoing -- Adopt and Enforce Building Codes and Development Standards	1	Whatcom County Public Works River and Flood and Whatcom County Planning	M	O	Local State, FEMA	
	FL-c Ongoing -- Improve Flood Risk Assessment	1	Whatcom County FCZD and Public Works River and Flood	M	O	Local, State, FEMA	
	FL-d Ongoing -- Improve Compliance with NFIP	1	Whatcom County Public Works River and Flood	M	O	Local, Private	
	FL-e Ongoing -- Manage the Floodplain Beyond Minimum Requirements	1	Whatcom County Public Works River and Flood	M	O	Local	
	FL-f Ongoing -- Participate in the CRS	1	Whatcom County Public	M	O	Local, State, FEMA	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

FLOOD CONTROL ZONE DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
			Works River and Flood				
	FL-g Ongoing -- Remove Existing Structures from Flood Hazard Areas	1, 3	Whatcom County FCZD/Public Works River and Flood	M	O	Local, State, FEMA	
	FL-h Ongoing -- Improve Stormwater Drainage System Capacity	1	Whatcom County FCZD/Public Works Stormwater and Engineering	M	O	Local, State	
	FL-i Ongoing -- Conduct Regular Maintenance for Drainage Systems and Flood Control Structures	1	Whatcom County Public Works Maintenance and Operations	M	O	Local	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

FLOOD CONTROL ZONE DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	FL-j Ongoing -- Protect Infrastructure	1	Whatcom County FCZD/Public Works River and Flood	M	O	Local, state, USACE, Private, Other	
	FL-k Ongoing -- Protect Critical Facilities	1	Whatcom County FCZD/Public Works River and Flood	M	O	Local, state, FEMA, Private, Other	
	FL-m. Protect and Restore Natural Flood Mitigation Features	1, 3	Whatcom County FCZD/Public Works River and Flood	M	O	Local, state, FEMA, Private, Other	
	F-1 Incorporate Flood Mitigation in Local Planning	1,2	Whatcom County FCZD/Public Works River and	H	L	Local, state, FEMA	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

FLOOD CONTROL ZONE DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
			Flood and Whatcom County Planning				
	F-2 Form Partnerships to Support Floodplain Management	1,4	Whatcom County FCZD/Public Works River and Flood	H	L	Local, state, NOAA, Private	
	F-3 Limit or Restrict Development in Floodplain Areas	1,3	Whatcom County Public Works River and Flood and Whatcom County Planning	H	L	Local	
	FL-4 Improve Stormwater Management Planning	1,5	Whatcom County FCZD/Public Works Stormwater	M	L	Local, State	
	FL-5 Adopt Polices to Reduce Stormwater Runoff	3,5	Whatcom County Public Works	L	L	Local, State	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

FLOOD CONTROL ZONE DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
			Engineering Services				
	FL-6 Establish Local Funding Mechanisms for Flood Mitigation	1, 4	Whatcom County FCZD	L	L	Local	
	FL-7 Elevate or Retrofit Structures and Utilities	1, 4	Whatcom County Departments do not engage in this activity as public funds are not spent on private infrastructure. But these actions may be taken in the future.	L	L	Local, State, FEMA	
	FL-8 Flood proof Residential and Non-Residential Structures	1, 4	Whatcom County Departments do not engage in this activity as	L	L	Local, State, FEMA	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

FLOOD CONTROL ZONE DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
			public funds are not spent on private infrastructure. But these actions may be taken in the future.				
	FL-9 Preserve Floodplains as Open Space	1, 3	Whatcom County FCZD/Public Works River and Flood and Whatcom County Planning.	H	L	Local, State, FEMA, Private	
	FL-10 Increase Awareness of Flood Risk and Safety	2	Whatcom Unified Emergency Management	M	L	Local	
	FL-11 Educate Property Owners about Flood Mitigation Techniques	2	Whatcom County FCZD/Public	M	L	Local	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

FLOOD CONTROL ZONE DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
			Works River and Flood.				
Landslide/ Erosion	There are no new actions considered/all actions ongoing, discontinued, or completed						
Land Subsidence	There are no new actions considered/all actions ongoing, discontinued, or completed						
Lightning	There are no new actions considered/all actions ongoing, discontinued, or completed						
Severe Storms	There are no new actions considered/all actions ongoing, discontinued, or completed						
Severe Wind	There are no new actions considered/all actions ongoing, discontinued, or completed						
Volcanoes	***VOL-a. Reduce risk from volcanic activity***	1, 2, 5	FCZD	M	O	Local, State, and FEMA	Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

FLOOD CONTROL ZONE DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Tsunami	***TSU-a. Ensure the welfare and safety of residents.***	1	FCZD	L	O	Local, State, and FEMA	Staff
Wildfires	***WF-a. Create Mitigation Strategies in Cooperation with State and Federal Departments***	1, 5	FCZD	Complete	Complete	Local, State, FEMA	
Winter Storms/ Freezes (Severe Winter Weather)	There are no new actions considered/all actions ongoing, discontinued, or completed						
Multiple Hazards	There are no new actions considered/all actions ongoing, discontinued, or completed						
Advanced Mitigation Projects (Dream List)							

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

Flood Control District Annual Review and Progress for Hazard-Specific Mitigation Actions 2021-2025

Progress monitoring means tracking the implementation of the hazard specific mitigation actions over time. Each jurisdiction must identify how, when, and by whom action items will be monitored. The responsible agency assigned to each mitigation action is responsible for tracking and reporting on each of their actions.

Annual review and progress reporting includes the following:

Step One: Identify mitigation actions that your planning team has identified for the annual review. The planning team has the option to address ALL action items, or only those that should be acted on during each review cycle.

Step Two: Use the table below to track annual progress. For each action item selected for annual review insert the appropriate letter that indicates the status of that action item.

Step Three: Complete a progress report form as illustrated in Appendix G for each mitigation action item selected for annual review

Step Four: Submit the completed form(s) to the Whatcom County DEM.

Flood Zone Control District Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
EDUCATION AND OUTREACH						
EO-a. Ensure Welfare and Safety of Residents:						
EO-b. Public service announcements						
EO-c. Newsletters						
EO-d. Direct Mailings						
Add New Action Items if Applicable						
DAM/LEVEE FAILURES						
Add New Action Items if Applicable						
DROUGHTS/HEAT WAVES						
EARTHQUAKES						
EQ-a. Support County EQ recovery						
Add New Action Items if Applicable						
VOLCANOES						
VOL-a. Reduce Risk from Volcanic Activity						
Add New Action Items if Applicable						
FLOODING						
FL-a. Comprehensive Flood Hazard Management Plan						
FL-b. Adopt and Enforce Building Codes and Development Standards						

Flood Zone Control District Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & Enter Letter)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
FL-c. Improve Flood Risk Assessment						
FL-d. Join or Improve Compliance with NFIP						
FL-e. Manage the Floodplain Beyond Minimum Requirements						
FL-f. Participate in the CRS						
FL-g. Remove Existing Structures from Flood Hazard Areas						
FL-h. Improve Stormwater Drainage System Capacity						
FL-i. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures						
FL-j. Protect Infrastructure						
FL-k. Protect Critical Facilities						
FL-l. Construct Flood Control Measures						
FL-m. Protect and Restore Natural Flood Mitigation Features						
F-1 Incorporate Flood Mitigation in Local Planning						
F-2 Form Partnerships to Support Floodplain Management						
F-3 Limit or Restrict Development in Floodplain Areas						
FL-4 Improve Stormwater Management Planning						
FL-5 Adopt Polices to Reduce Stormwater Runoff						
FL-6 Establish Local Funding Mechanisms for Flood Mitigation						
FL-7 Elevate or Retrofit Structures and						

Flood Zone Control District Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Utilities						
FL-8 Flood proof Residential and Non-Residential Structures						
FL-9 Preserve Floodplains as Open Space						
FL-10 Increase Awareness of Flood Risk and Safety						
FL-11 Educate Property Owners about Flood Mitigation Techniques						
Add New Action Items if Applicable						
ALLUVIAL FANS						
AF-a. Map and Assess Alluvial Fans Hazards						
AF-b. Manage Development in Alluvial Fan Hazard Areas						
AF-c. Promote or Require Site and Building Design Standards to Minimize Risk on Alluvial Fans						
AF-d. Remove Existing Buildings and Infrastructure from Erosion/Alluvial Fan Hazard Areas						
AF-e. Develop Basin-Specific Plans for Alluvial Fan Hazard Areas						
AF-f. Construct Mitigation Measures on Alluvial Fan Hazard Areas						
AF-g. Increase Awareness of Alluvial Fan Hazards						
Add New Action Items if Applicable						
LANDSLIDES/EROSION						
Add New Action Items if Applicable						

Flood Zone Control District Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
LAND SUBSIDENCE						
Add New Action Items if Applicable						
TSUNAMI						
TSU-a. Ensure the Welfare and Safety of Residents						
Add New Action Items if Applicable						
WILDFIRES						
WF-a. Create Mitigation Strategies in Cooperation with State and Federal Departments						
Add New Action Items if Applicable						
WINTER STORMS/FREEZES (SEVERE WINTER WEATHER)						
Add New Action Items if Applicable						
EXTREME TEMPERATURES						
Add New Action Items if Applicable						
LANDSLIDE						
Add New Action Items if Applicable						
LIGHTNING						
Add New Action Items if Applicable						
SEVERE WIND						
Add New Action Items if Applicable						
MULTIPLE HAZARDS						

Flood Zone Control District Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Add New Action Items if Applicable						

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LAKE WHATCOM WATER AND SEWER DISTRICT

Contact Information	**Rich Munson** Safety Officer 1220 Lakeway Drive Bellingham, WA 98229 360.734.9224 / 360.296.4590
Approving Authority	**Board of Commissioners** Lake Whatcom Water and Sewer District 1220 Lakeway Drive Bellingham, WA 98229 360.734.9224

Planning Process

The Lake Whatcom Water and Sewer District completed an update to the District-specific content contained in the prior (2016) Plan through District department head review and formal adoption by the Board of Commissioners. In addition, District staff participated in all coordination meetings hosted by the Whatcom County Sheriff's Office Division of Emergency Management, updated the District's critical facility information based upon facilities constructed or improved since 2016, and incorporated a 2020 asset valuation conducted on all District-owned facilities. The District performed public outreach throughout the planning process through routine staff updates on the revision progress during regularly scheduled Board meetings, inviting public participation through the District's social media accounts, and ultimately through resolution adoption by the District Board during a regularly scheduled public meeting.

Key Contributor List

- Justin Clary, General Manager
- Bill Hunter, District Engineer/Assist. General Manager
- Rich Munson, Safety Officer

The information contained in the Natural Hazards Mitigation Plan update regarding hazards, risks, vulnerability, and potential mitigation is based on the best available science and technology currently available. This information and related data on natural hazards potentially impacting the Lake Whatcom Water and Sewer District will be used as a tool when the District

updates other plans and programs, such as the following:

- Emergency Response Plan
- Comprehensive Sewer Plan
- Water System Comprehensive Plan
- Water and Sewer Utility Capital Improvement Programs

As additional information becomes available from other planning sources that can enhance this Plan, that information will be incorporated through the periodic update process.

Plan Maintenance for Lake Whatcom Water & Sewer District

For each Whatcom County-led Plan revision, the District will review and revise District-specific content, perform public outreach via applicable avenues, and undergo formal Board of Commissioner adoption of the revised Plan during a regularly scheduled public meeting.

Public Outreach and Education

Program	Yes/No, Year Adopted	Description
Nonprofit organizations or local residents groups focused on hazard mitigation, emergency preparedness, vulnerable populations, etc.	No	not applicable
Ongoing public education or information programs	Yes	Periodic posts to District Facebook and web pages providing emergency preparedness information; periodic presentation to Sudden Valley Community Assoc. board regarding capital project and operational information
School-related programs for natural hazard safety	No	not applicable
Public education or information program	Yes	Water conservation education to limit system capacity impacts; semi-annual utility bill inserts on emergency and winter weather preparedness

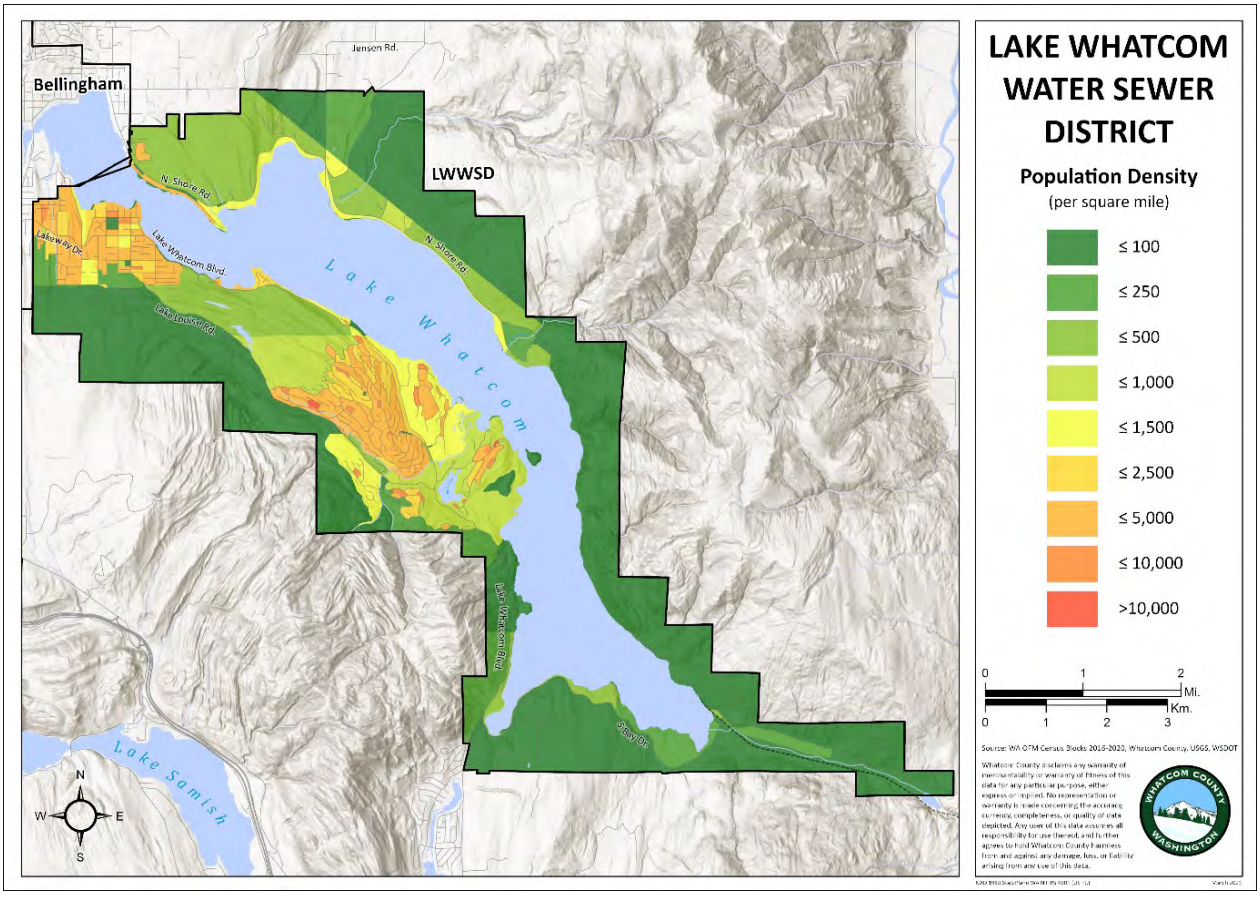
StormReady certification	No	not applicable
Firewise Community certification	No	not applicable
Public-Private Partnership initiatives addressing disaster-related issues	No	not applicable
Other	none	not applicable

Overview of Lake Whatcom Water & Sewer District, Hazards, and Assets

Geography of Lake Whatcom Water & Sewer District

District Population	12,000 (2020 estimate)
Total area	18 sq. mi.

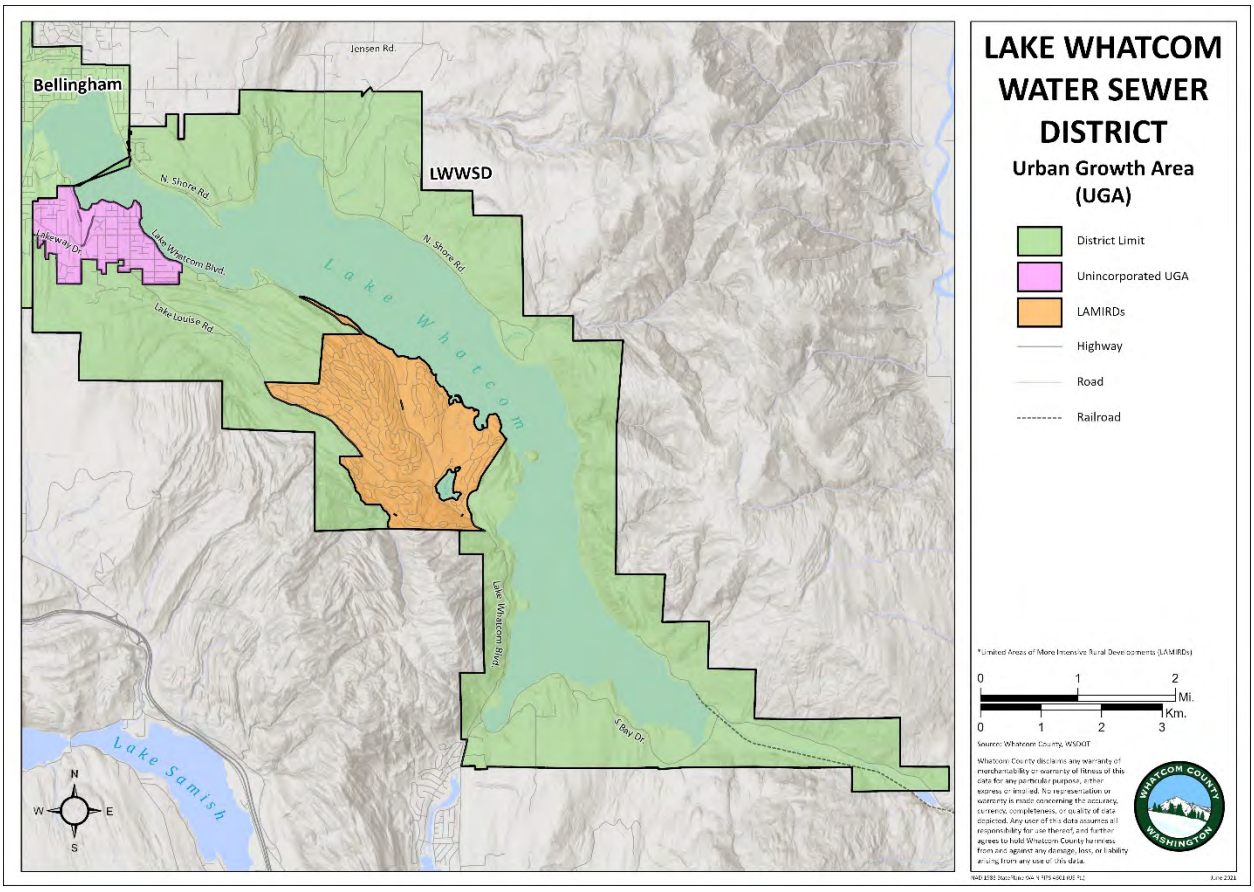
This map displays the service area for the Lake Whatcom Water and Sewer District, as defined in the resolution adopted by the Whatcom County Board of Commissioners on November 21, 1968, that created the District.



Washington State Office of Financial Management (OFM) 2020 population and housing estimates for 2010-2020 census block data. This map uses the 2016-2020 average population to show population density per square mile.

Growth Trends

The District's service area includes the City of Bellingham's Geneva Urban Growth Area, as well as the Sudden Valley LAMIRD (limited area of more intense rural development land use designation in Whatcom County Code). The majority of growth within the District since the last Plan update, as well as future growth projections, occurs in these two areas.



Presence of Hazards and their Impacts in the Lake Whatcom Water & Sewer District

Throughout its over 50-year existence, the District has had limited impact to its services and/or infrastructure caused by natural hazard-related events, with those that have occurred being landslide and riverine flooding caused by severe storm events. Of those events that have impacted District services, all have been ephemeral, lasting no more than a couple days, with most having services restored within 24 hours.

With the District wholly located within the environmentally sensitive Lake Whatcom Watershed, land use restrictions have been adopted within the Whatcom County Comprehensive Plan and Whatcom County Code to limit further development within the watershed. As a result, the District has witnessed relative low growth since issuance of the 2016 Plan, with much of the growth that has occurred being in the Sudden Valley LAMIRD (limited area of more intense rural development land use designation) and Geneva UGA. While the topography of Sudden Valley is largely comprised of lands classified as steep slopes (greater than 15%), all development has occurred on previously existing parcels served by existing District infrastructure. As a result, there has been limited need for infrastructure expansion projects that required incorporation of natural hazard-resilient measures.

In the table below is a list of the major hazards that affect Whatcom County. The second column provides the percentage of the Lake Whatcom Water and Sewer District's total area that is exposed to each hazard. The third column indicates the severity of anticipated impacts to community function, considering the credible worst-case hazard scenario. Severity of anticipated impacts considers effects on basic community function such as shelter, transportation, utilities, commerce, industry, agriculture, education, health, recreation, and cultural identity. Severity ranges from none to extreme, as shown in the key below the table. Finally, the last column of the table describes where the hazard impacts the community and which services the hazard would most significantly impact.

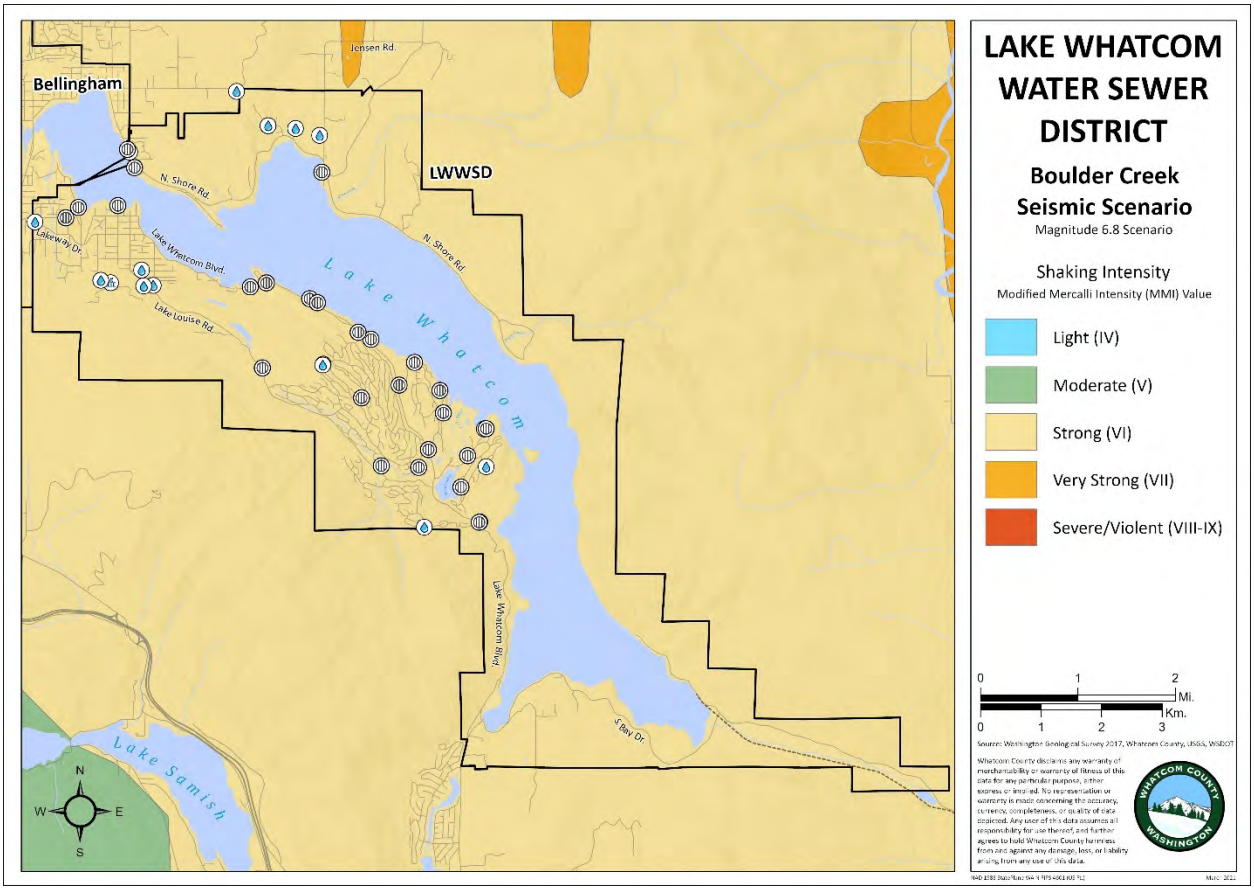
	Hazard	% area Exposed	Severity of Anticipated Impacts	Hazard Descriptions
Geological	**Earthquake**	100%	High	All land susceptible to seismic shaking. Anticipated loss of water/sewage systems for weeks to months, with potential for release of untreated sewage to Lake Whatcom.
	Liquefaction	13.5%	Mod	Areas susceptible to liquefaction are primarily limited to the areas immediately surrounding the mouths of Austin, Carpenter, Olson and Smith creeks (alluvial deposits). Infrastructure in these areas is relatively limited (water/sewer pipelines and 5 sewer lift stations), all of which could be damaged, resulting in a loss of service to some customers.
	Landslide	11.1%	Mod	Areas susceptible to landslide are primarily limited to the Sudden Valley area where slopes are predominately 15% or greater. Landslides could impact (or access to) critical infrastructure, including water/sewer pipelines, water pump stations and reservoirs, and sewer lift stations.
	Volcano	0%	Low	Unlikely that a lahar from a major eruption would enter service area; however, ash fallout could impact lake water quality (drinking water source).
	Tsunami	0%	None	Not within a tsunami inundation zone.
	Mine Hazards	0.8%	None	No known mines are located within the service area.
Hydro-logical	**Flooding**	34.1%	Mod	Prolonged periods of precipitation may create significant flows in Austin, Beaver, Carpenter, Olson and Smith creeks that could impact (or access to) infrastructure. An example includes the 1983 flood event

				that resulted in Austin Creek washing out bridges and a District water main.
Meteorological	**Wildfire**	44.3%	Mod	Much of service area is forested, including areas of development. As is indicated in the Wildland-Urban Interface map, much of the District's critical infrastructure could be impacted by wildfires.

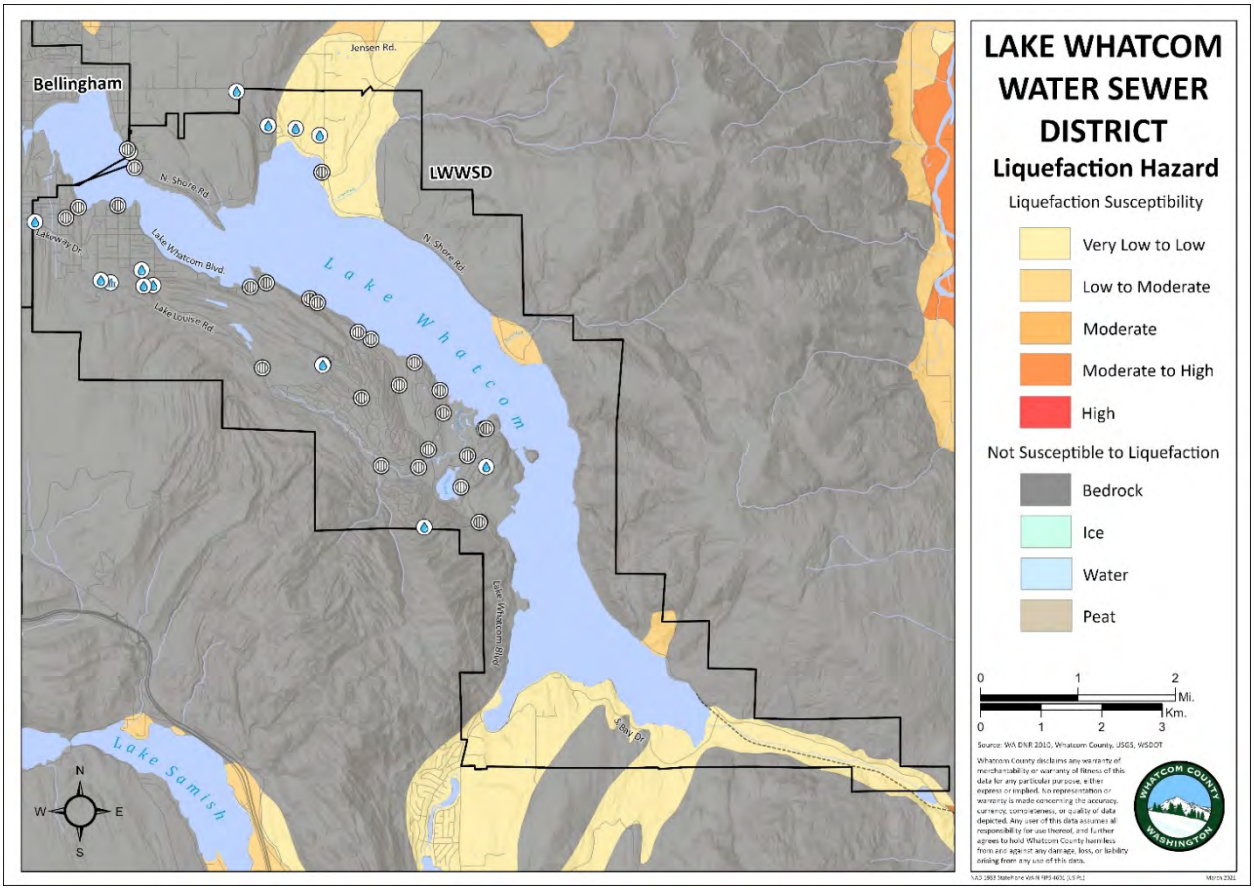
Severity Scale: **None** = no impact to community function
Low = minor degradation of community functions, not widespread
Moderate = moderate degradation over multiple weeks or widespread
High =degradation or loss over many weeks, widespread

Natural Hazard Maps

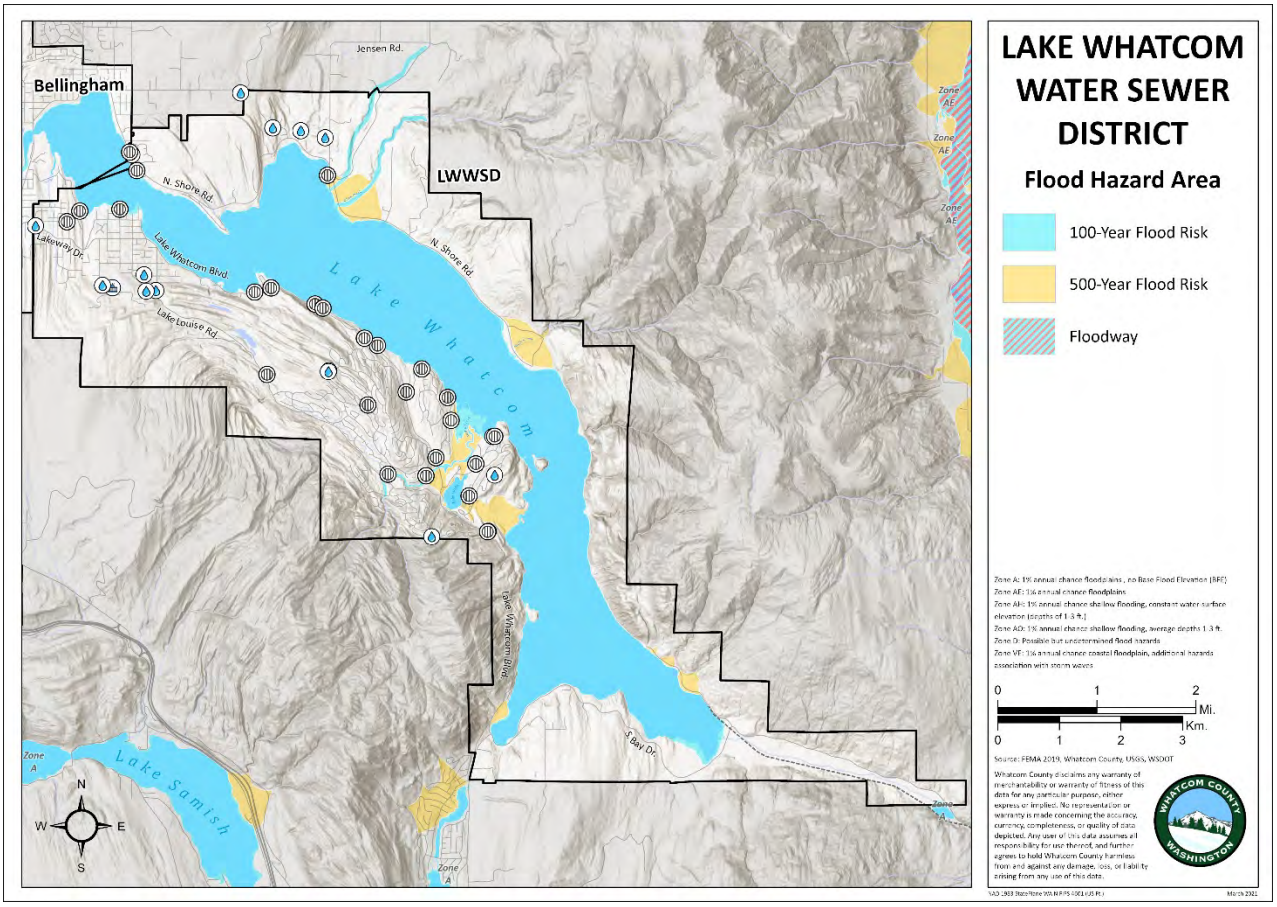
The following figures depict the natural hazards present within the jurisdiction.



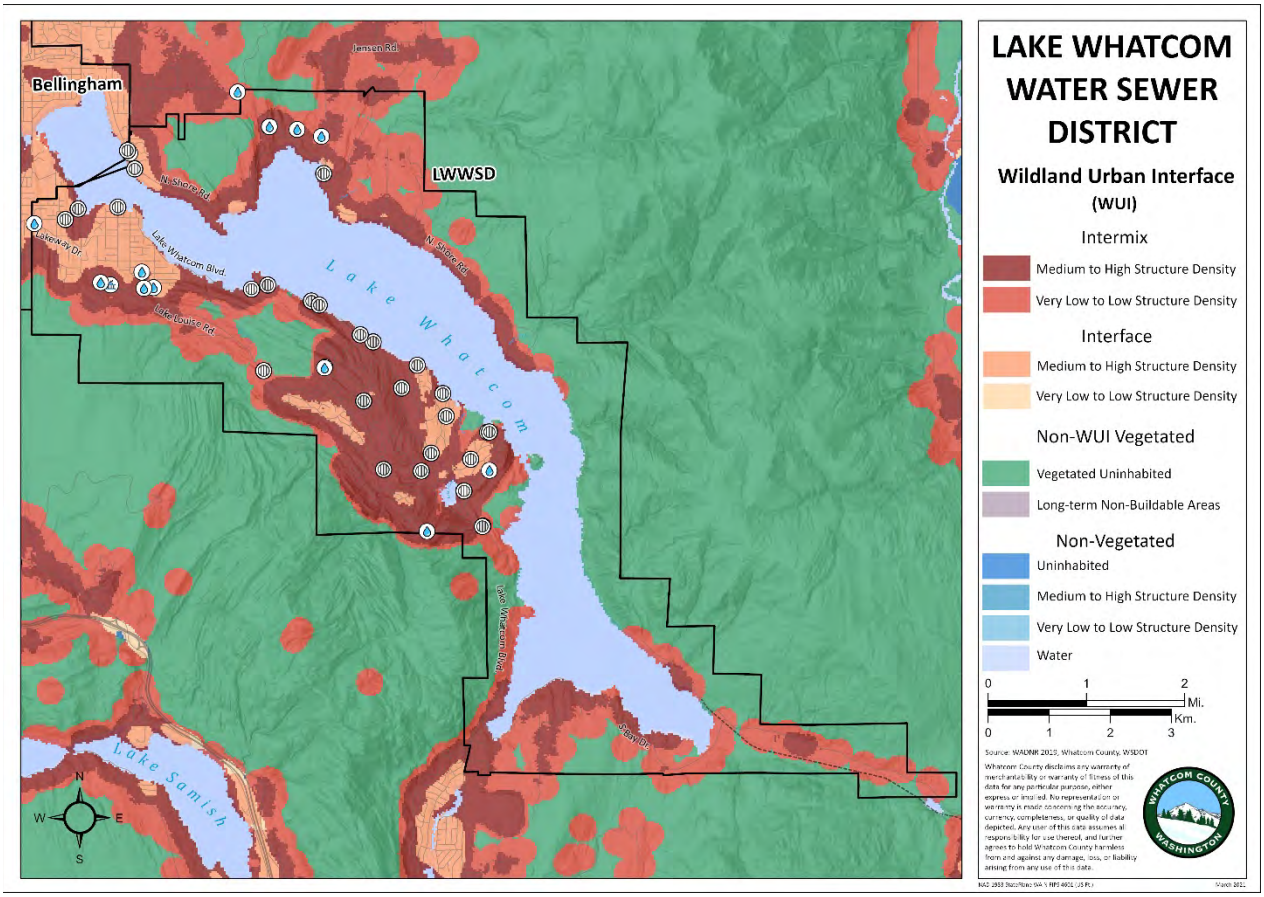
Washington Department of Natural Resources (WA DNR) 2017 Boulder Creek Fault Zone seismic scenario of magnitude 6.8 data. Displays extent and severity of the modeled earthquake in the Modified Mercalli Intensity (MMI) scale.



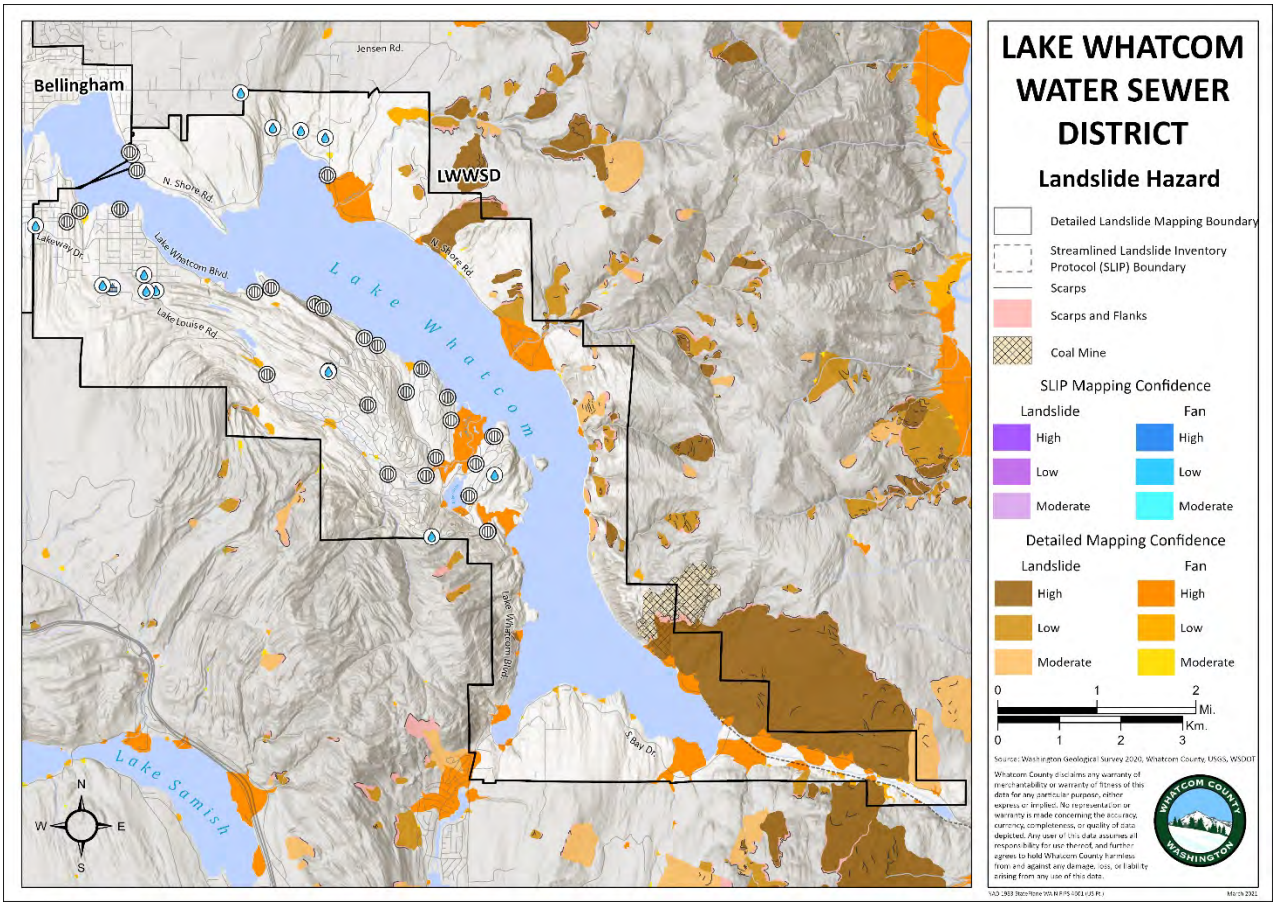
Washington Department of Natural Resources (WA DNR) 2010 liquefaction susceptibility data. This feature class is part of a geodatabase that contains statewide ground response data for Washington State.



FEMA 2019 flood hazard data showing 100-year flooding, 500-year flooding, floodways, and flood zones. FEMA flood data includes both riverine and coastal flooding.



Washington Department of Natural Resources (WA DNR) 2019 mapped data of Washington's Wildland Urban Interface (WUI). The WUI displays areas of WA where structures and wildland overlap with specific structure densities.



Washington Geological Survey (WGS) 2020 Washington landslide inventory data compiled following streamline landslide mapping protocol (SLIP). SLIP was developed by the WGS's Landslide Hazards Program to help geologists rapidly map landslide landforms from lidar. This data shows both detailed mapping and SLIP landslide data.

Lake Whatcom Water & Sewer District Critical Facility List

Facility Name	Facility Type	Signi-ficance	Location	Assessed Dollar Value (2020)	Notes
Administration Building	EF	1	1220 Lakeway Dr, Bellingham, WA	$964,000	Functions as District headquarters and EOC; located outside District
Post Point Wastewater Treatment Plant	EF	3	200 McKenzie Ave, Bellingham, WA	$6,254,284	City of Bellingham-owned facility that treats District-generated wastewater under an interlocal agreement
Maintenance Facility	EF	2	1010 Lakeview St, Bellingham, WA	$1,271,800	Stores all equipment, materials and spare parts, serves as backup EOC
Sudden Valley Water Treatment Plant/Chlorine Contact Reservoir	EF	3	26 Morning Beach Dr, Bellingham, WA	$3,194,700	Produces drinking water for South Shore System (3,880 connections)
Sudden Valley WTP Booster Station	EF	3	26 Morning Beach Dr, Bellingham, WA	$1,327,200	Pumps treated water from SVWTP to South Shore System
Agate Heights Water Treatment Plant/Well Site	EF	3	3320 Sunny Cove Ct, Bellingham, WA	$365,200	Produces drinking water for Agate Heights System (50 connections)
Johnson Well Site	EF	1	3471 Agate Bay Ln, Bellingham, WA	$139,200	Drinking water source for 2 connections
Eagleridge Booster Station	EF	1	1708 Northshore Rd, Bellingham, WA	$423,500	Intertie with City of Bellingham providing drinking water to Eagleridge System (70 connections)
Coronado Booster Station	EF	1	4826 Lookout St, Bellingham, WA	$58,300	Drinking water pump station

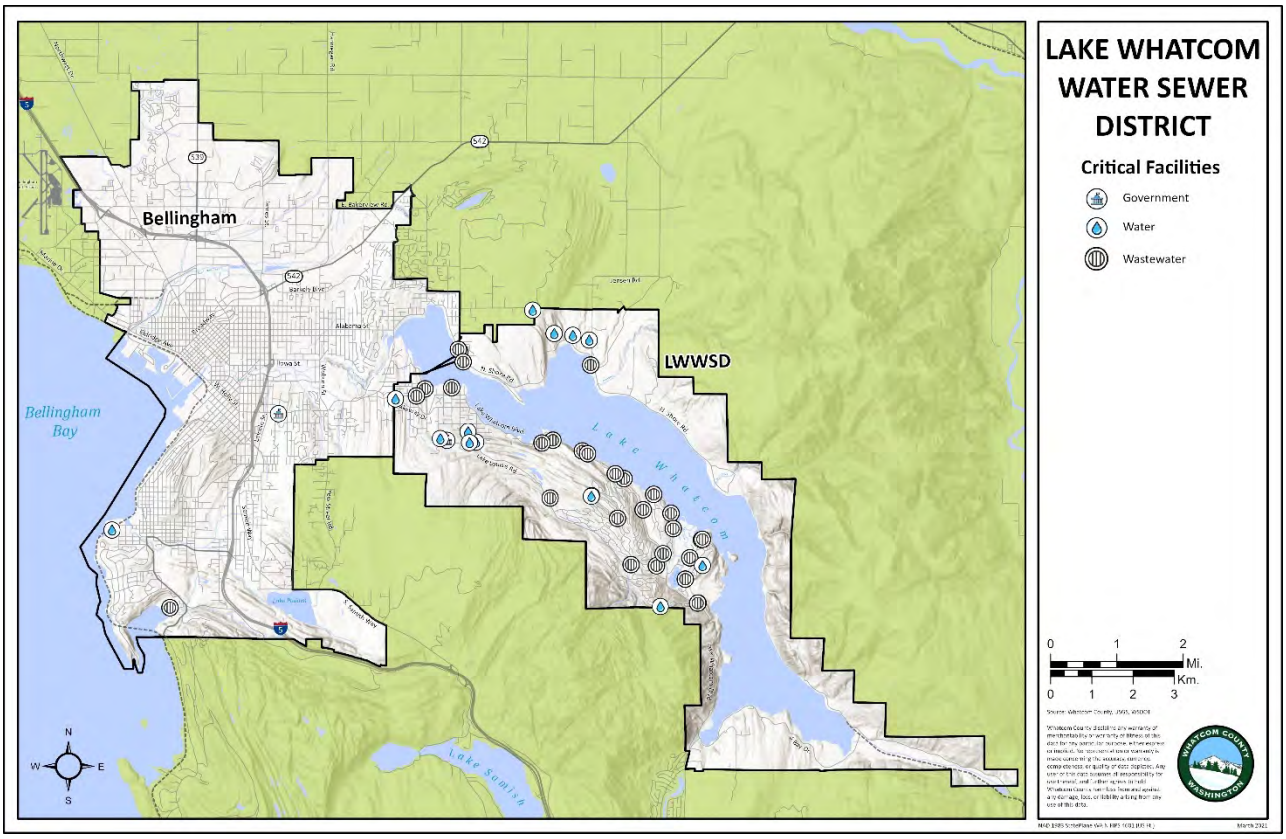
Geneva Intertie	EF	3	3914 Lakeway Dr, Bellingham, WA	$116,100	Intertie with City of Bellingham for emergency water supply
Agate Heights Booster Station	EF	2	3363 Opal Terrace, Bellingham, WA	$119,900	Drinking water pump station
Beecher Booster Station	EF	1	4748 Columbus Ave, Bellingham, WA	$69,300	Drinking water pump station
South Geneva Booster Station	EF	1	1765 Lake Louise Rd, Bellingham, WA	$109,100	Drinking water pump station
Division 30 Booster Station	EF	3	1744 Lake Whatcom Blvd, Bellingham, WA	$294,400	Drinking water pump station
Agate Heights Reservoir	EF	3	3363 Opal Terrace, Bellingham, WA	$383,200	0.08 MG water reservoir
LWRTC Reservoir	EF	3	2145 Academy Rd, Bellingham, WA	$544,800	0.1 MG water reservoir
Division 7 Reservoir	EF	3	3 Grand View Circle, Bellingham, WA	$1,448,300	1.0 MG water reservoir
Division 22 Reservoir No. 1	EF	3	10 Water Tower Ct, Bellingham, WA	$965,200	0.5 MG water reservoir
Division 22 Reservoir No. 2	EF	3	10 Water Tower Ct, Bellingham, WA	$1,074,500	0.6 MG water reservoir
Division 30 Reservoir	EF	3	30 Loganberry Ln, Bellingham, WA	$640,600	0.15 MG water reservoir
Geneva Reservoir	EF	3	1010 Lakeview St, Bellingham, WA	$937,100	0.5 MG water reservoir
Afternoon Beach Lift Station	EF	3	22 Morning Beach Dr, Bellingham, WA	$393,000	Sewer pump station with backup generator
Agate Bay Lift Station	EF	3	3187 Agate Bay Ln, Bellingham, WA	$240,200	Sewer pump station with backup generator

Airport Lift Station	EF	2	2316 Lake Whatcom Blvd, Bellingham, WA	$173,900	Sewer pump station with backup generator
Austin Lift Station	EF	1	8 Acorn Pl, Bellingham, WA	$125,200	Sewer pump station with backup generator
Beaver Lift Station	EF	3	2271 Lake Louise Rd, Bellingham, WA	$930,600	Sewer pump station with backup generator
Boulevard Lift Station	EF	1	2586 Lake Whatcom Blvd, Bellingham, WA	$172,600	Sewer pump station
Cable Street Lift Station	EF	3	2900 Lake Whatcom Blvd, Bellingham, WA	$818,700	Sewer pump station with backup generator
Camp Firwood Lift Station	EF	1	1744 Lake Whatcom Blvd, Bellingham, WA	$190,400	Sewer pump station
Dellesta Lift Station	EF	1	2127 Northshore Dr, Bellingham, WA	$94,300	Sewer pump station
Edgewater Lift Station	EF	1	1725 Edgewater Ln, Bellingham, WA	$85,200	Sewer pump station
Euclid Lift Station	EF	2	1602 Euclid Ave, Bellingham, WA	$207,200	Sewer pump station
Flat Car Lift Station	EF	3	2800 Lake Louise Rd, Bellingham, WA	$920,700	Sewer pump station with backup generator
Geneva Lift Station	EF	2	1545 Geneva St, Bellingham, WA	$476,100	Sewer pump station with backup generator
Lakewood Lift Station	EF	1	2462 Lake Whatcom Blvd, Bellingham, WA	$147,500	Sewer pump station
Lake Louise Lift Station	EF	2	7 Larkspur Park Dr, Bellingham, WA	$138,600	Sewer pump station with backup generator
Lowe Lift Station	EF	1	1525 Lowe Ave, Bellingham, WA	$98,700	Sewer pump station
Marina Lift Station	EF	2	2 Marina Circle, Bellingham, WA	$146,800	Sewer pump station with backup generator
North Point Lift Station	EF	3	10 Clear Lake Ct, Bellingham, WA	$531,000	Sewer pump station with backup generator

Par Lift Station	EF	1	18 Park Ln, Bellingham, WA	$229,100	Sewer pump station
Plum Lift Station	EF	2	15 Autumn Vista Pl, Bellingham, WA	$164,700	Sewer pump station
Ranch House Lift Station	EF	3	10 Marigold Dr, Bellingham, WA	$630,500	Sewer pump station with backup generator
Rocky Ridge Lift Station	EF	1	2566 Woodcliff Ln, Bellingham, WA	$108,300	Sewer pump station
Strawberry Canyon Lift Station	EF	2	12 Strawberry Canyon Ct, Bellingham, WA	$218,600	Sewer pump station with backup generator
Strawberry Point Lift Station	EF	1	2642 Lake Whatcom Blvd, Bellingham, WA	$208,000	Sewer pump station
Sudden Valley Lift Station	EF	3	2018 Lake Whatcom Blvd, Bellingham, WA	$2,651,700	Sewer pump station with backup generator and sewage detention basin
Tomb Lift Station	EF	1	16 Marina Ct, Bellingham, WA	$219,000	Sewer pump station with backup generator

Facility Type: **EF** = Essential Facility; **HMF** = Hazardous Materials Facility; **HPL** = High Potential Loss; **LUS** = Lifeline Utility System

Significance to community function: **1**=Moderate; **2**= High; **3** =Very High



Map of critical facilities identified by the Lake Whatcom Water & Sewer District. Across Whatcom County, critical facilities fell into 15 categories. Unique categories developed for this plan update include mass shelter, assisted living, and recovery resources. Mass shelter includes facilities such as fairgrounds and community centers. Recovery resources are facilities that are required post-hazard event, for example public works and private construction companies. Not all judications identified or included critical facilities in each category.

Critical Facility Rankings for the Lake Whatcom Water & Sewer District

The table below indicates whether each critical facility falls within known hazard zones for earthquake, liquefaction, landslide, tsunami, volcano, riverine flooding, coastal flooding and wildfire zones. A rank assessment in the last column indicates how the relative risk of community impact. This ranking considers the significance of the facility to the community and the number of hazard zones the facility is within. The frequency of each hazard is also considered, such that being in a low frequency hazard zone would receive a lower ranking than that same facility being in a high frequency hazard zone. Ranking is on a scale of 1 to 10, with 1 being the facility with the highest-ranking score, and 10 being a facility with the lowest ranking score in the jurisdiction.

$$\text{Rank} = \text{Significance} * \left[\frac{\text{EQ\_Zone}}{\text{EQ\_Freq}} + \frac{\text{LQ\_Zone}}{\text{LQ\_Freq}} + \frac{\text{LS\_Zone}}{\text{LS\_Freq}} + \ldots + \frac{\text{WF\_Zone}}{\text{WF\_Freq}} \right]$$

Significance: 1=moderate; 2=high; 3=very high, as assessed in the critical facilities list in the previous section

Zone: 0=facility not in hazard zone; 1 = facility in the hazard zone

Frequency (e.g. EQ_Freq, LQ_Freq) is the most difficult variable to which to assign a value. Frequency varies based upon the magnitude of a hazard event and varies from one place to another. It was not possible within the time constraints to assess frequency of hazard at each critical facility location. Instead, a qualitative assessment of the hazard frequency across the entire county was made, as shown in the chart below.

Description	Freq Value used in formula	Hazards
Frequent, occurring on the order of decades	3	Riverine flooding (FL); Coastal flooding (COA)
Rare, occurring on the order of centuries	2	Earthquake (EQ); Liquefaction (LQ); Landslide (LS); Wildfire (WF)
Very rare, occurring on the order of millennia	1	Tsunami (TSU); Volcano (VOL)

Note: Severe storm, a very frequent hazard, was omitted because it is ubiquitous and because no hazard map of storm severity was available.

Critical Facilities Ranking Table

Facility Name	Facility Type	Signi-ficance	EQ	LQ	LS	TSU	VOL	FL	COA	WF	Rank Assessment
Administration Building	EF	1	1	1	0	0	0	0	0	1	0.21
Post Point Wastewater Treatment Plant	EF	3	1	0	0	0	0	0	0	1	0.43
Maintenance Facility	EF	2	1	0	0	0	0	0	0	1	0.29
Sudden Valley Water Treatment Plant/Chlorine Contact Reservoir	EF	3	1	0	0	0	0	1	0	0	0.36
Sudden Valley WTP Booster Station	EF	3	1	0	0	0	0	1	0	0	0.36
Agate Heights Water Treatment Plant/Well Site	EF	3	1	1	0	0	0	0	0	1	0.64
Johnson Well Site	EF	1	1	1	0	0	0	0	0	1	0.21
Eagleridge Booster Station	EF	1	1	0	0	0	0	0	0	1	0.14
Coronado Booster Station	EF	1	1	0	0	0	0	0	0	1	0.14
Geneva Intertie	EF	3	1	0	0	0	0	0	0	1	0.43
Agate Heights Booster Station	EF	2	1	0	0	0	0	0	0	1	0.29
Beecher	EF	1	1	0	0	0	0	0	0	1	0.14

Booster Station											
South Geneva Booster Station	EF	1	1	0	0	0	0	0	0	1	0.14
Division 30 Booster Station	EF	3	1	0	0	0	0	0	0	1	0.43
Agate Heights Reservoir	EF	3	1	0	0	0	0	0	0	0	0.21
LWRTC Reservoir	EF	3	1	0	0	0	0	0	0	1	0.43
Division 7 Reservoir	EF	3	1	0	0	0	0	0	0	1	0.43
Division 22 Reservoir No. 1	EF	3	1	0	0	0	0	0	0	1	0.43
Division 22 Reservoir No. 2	EF	3	1	0	0	0	0	0	0	1	0.43
Division 30 Reservoir	EF	3	1	0	0	0	0	0	0	1	0.43
Geneva Reservoir	EF	3	1	0	0	0	0	0	0	1	0.43
Afternoon Beach Lift Station	EF	3	1	0	0	0	0	0	0	1	0.43
Agate Bay Lift Station	EF	3	1	1	1	0	0	1	0	1	1
Airport Lift Station	EF	2	1	0	0	0	0	0	0	1	0.29
Austin Lift Station	EF	1	1	0	0	0	0	0	0	1	0.14
Beaver Lift Station	EF	3	1	0	0	0	0	0	0	1	0.43
Boulevard Lift Station	EF	1	1	0	0	0	0	1	0	0	0.12
Cable Street Lift Station	EF	3	1	0	0	0	0	0	0	1	0.43
Camp Firwood Lift Station	EF	1	1	0	0	0	0	0	0	1	0.14

Dellesta Lift Station	EF	1	1	0	0	0	0	0	0	1	0.14
Edgewater Lift Station	EF	1	1	0	0	0	0	0	0	1	0.14
Euclid Lift Station	EF	2	1	0	0	0	0	0	0	1	0.29
Flat Car Lift Station	EF	3	1	0	0	0	0	0	0	1	0.43
Geneva Lift Station	EF	2	1	0	0	0	0	0	0	1	0.29
Lakewood Lift Station	EF	1	1	0	0	0	0	0	0	1	0.14
Lake Louise Lift Station	EF	2	1	0	0	0	0	0	0	1	0.29
Lowe Lift Station	EF	1	1	0	0	0	0	0	0	1	0.14
Marina Lift Station	EF	2	1	0	0	0	0	0	0	1	0.29
North Point Lift Station	EF	3	1	0	0	0	0	0	0	1	0.43
Par Lift Station	EF	1	1	1	0	0	0	0	0	1	0.21
Plum Lift Station	EF	2	1	0	0	0	0	0	0	1	0.29
Ranch House Lift Station	EF	3	1	0	0	0	0	0	0	1	0.43
Rocky Ridge Lift Station	EF	1	1	0	0	0	0	0	0	0	0.07
Strawberry Canyon Lift Station	EF	2	1	0	0	0	0	0	0	1	0.29
Strawberry Point Lift Station	EF	1	1	0	0	0	0	1	0	0	0.12
Sudden Valley Lift Station	EF	3	1	0	0	0	0	0	0	1	0.43
Tomb Lift Station	EF	1	1	0	0	0	0	0	0	1	0.14

Notes: **EQ** = Earthquake; **LQ** =Liquefaction; **LS** = Landslide; **TSUN** = Tsunami; **VOL** = Volcano; **FL** = Riverine Flooding; **COA** = Coastal Flooding; **WF** = Wildland Fire

Areas and Assets Exposed, Per Hazard

	Lake Whatcom Water & Sewer District Exposure to Natural Hazards					
	Hazard Susceptibility	**Asset County (% of Total)**				**Critical Facilities Appraised Value (Million)**
		Area (sq.mi.)	**Population**	**Parcels**	**Critical Facilities**	
Geological Hazards	**Earthquake**, Shaking Intensity					
	MMI V	-	-	-	2.1%	$0.2 [1]
	MMI VI	100%	99.9%	99.9%	97.9%	$31 [1]
	MMI VII	-	-	-	-	-
	MMI VIII - IX	-	-	-	-	-
	TOTAL	100%	99.9%	99.9%	100%	$31.2
	Liquefaction					
	Very Low to Low	12.4%	5.8%	8.9%	8.5%	$2 [1]
	Low to Moderate	1%	0.5%	1%	-	-
	Moderate	-	-	-	-	-
	Moderate to High	-	-	-	2.1%	$0.2 [1]
	High	-	-	-	-	-
	TOTAL	13.5%	6.3%	9.9%	10.6%	$2.2
	Landslide					
	Landslide Low	0.6%	0.1%	0.04%	-	-
	Landslide Moderate	0.6%	0.1%	0.1%	-	-
	Landslide High	4.9%	0.3%	0.7%	-	-
	Fan Low	0.1%	0.2%	0.2%	-	-
	Fan Moderate	0.5%	0.3%	0.3%	-	-

	Fan High	4.4%	4%	4.8%	2.1%	$0.2 [1]
	Mine Hazard	0.8%	0.02%	0.03%	-	-
	TOTAL	11.9%	5.02%	6.17%	2.1%	$0.2
	Volcanic Eruption					
	Case 1 Debris Flows	-	-	-	-	-
	Case 2 Debris Flows	-	-	-	-	-
	Case M Flows	-	-	-	-	-
	Pyroclastic Flows, Lava Flows, and Ballistic Debris	-	-	-	-	-
	Lateral Blast Hazard Zone	-	-	-	-	-
	TOTAL	-	-	-	-	-
	Tsunami, Inundation Zone					
	Low to Moderate Inundation Potential	-	-	-	2.1%	$0.2 [1]
	Moderate to High Inundation Potential	-	-	-	-	-
	High Inundation Potential	-	-	-	2.1%	$6 [1]
	TOTAL	-	-	-	4.2%	$6.2
Hydrological	**Flooding**					
	100-year Flood	31.4%	5.1%	6.4%	12.8%	$5 [1]
	500-year Flood	2.7%	3.2%	4.3%	4.3%	$0.4 [1]
	Floodway	-	-	-	-	-
	Undetermined (Zone D)	-	-	-	-	-
	TOTAL	34.1%	8.3%	10.7%	17.1%	$5.4
Mete	**Wildfire Zones**					
	Interface Very Low-Low Structure Density	-	-	0.2%	-	-

	Interface Medium-High Structure Density	5.5%	32.2%	25.1%	25.5%	$12 [1]
	Intermix Very Low-Low Structure Density	16.9%	5.8%	3.7%	8.5%	$2 [1]
	Intermix Medium-High Structure Density	21.9%	48.4%	65.5%	55.3%	$12 [1]
	TOTAL	44.3%	86.4%	94.5%	89.3%	$26

[1] Shows the assessed dollar value provided by the community in their critical facilities list. Does not include the appraised total value.

Status of Lake Whatcom Water & Sewer District's 2016-2020 and Ongoing Hazard Mitigation Actions

This section describes the status of mitigation actions that were proposed in the 2016 Mitigation Plan and are now 1) currently being implemented and are ongoing, 2) are now completed, or 3) are now discontinued because they are no longer needed. The actions are organized by hazard and indicate the lead agency, funding source, and status.

Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
Funding Source	Local; State; FEMA; Private; Other
Current Status	Action Discontinued / Action Completed / Action ongoing and expected completion date

General: All Hazards

G-a. Emergency Plan Updates – The Lake Whatcom Water and Sewer District updated a prior (2008) revision to its Emergency Management Plan in 2019. A subsequent revision that meets the requirements of the federal America's Water Infrastructure Act of 2018 (AWIA) is underway with anticipated adoption by the Board of Commissioners by the December 31, 2021 deadline.

Lead Agency	Lake Whatcom Water and Sewer District
Funding Source	Local
Current Status	Ongoing

G-b. Provide for an increased level of protection for public infrastructure – As owner/operator of water and sewer systems providing essential public services, the Lake Whatcom Water and Sewer District annually allocates funding toward system reinvestment projects that enhance system resiliency and/or redundancy in preparation for unforeseen events. Improvements completed since issuance of the 2016 Plan include: construction of new Division 22 reservoir meeting current seismic standards and outfitted with the ShakeAlert earthquake early detection system, installing an emergency water intertie with the City of Bellingham's system in Geneva, and installation of standby generators at three sewer lift stations.

Lead Agency	Lake Whatcom Water and Sewer District
Funding Source	Local sources, and state and federal grants
Current Status	Perpetual

Education and Outreach

EO-a. Utility bill inserts – On a semi-annual basis, the District includes educational materials related to emergency preparedness and winter-weather preparedness within bi-monthly utility bills.

Lead Agency	Lake Whatcom Water and Sewer District
Funding Source	Local
Current Status	Annual

Drought/heat wave

D-a. Monitor water supply – As required under its water system operating permits, the Lake Whatcom Water and Sewer District daily records volumes of water treated, distributed, consumed and lost within each of its three Group A water systems.

Lead Agency	Lake Whatcom Water and Sewer District
Funding Source	Local
Current Status	Perpetual

D-b. Educate residents on water saving techniques – The District maintains water conservation tips on its website, and regularly provides water conservation information via posts to its social media account, messages on the District office reader board, and via utility bill inserts. The District is an active member of the Whatcom Water Alliance, whose mission is to promote standardized water conservation messaging countywide.

Lead Agency	Lake Whatcom Water and Sewer District
Funding Source	Local
Current Status	Perpetual

Earthquake

EQ-a. Seismic retrofit of critical infrastructure – seismic retrofit of the District's Maintenance Office.

Lead Agency	Lake Whatcom Water and Sewer District
Funding Source	Local sources
Current Status	Complete

EQ-b. Protect critical facilities and infrastructure – complete minor improvements to various

facilities and infrastructure.

Lead Agency	Lake Whatcom Water and Sewer District
Funding Source	Local sources, other
Current Status	Complete

EQ-c. Seismic resistant water reservoirs – Constructed 0.6 MG water reservoir in 2018 (Div. 22 No. 2) and planning replacement of existing Division 7 water reservoir with two reservoirs that meet current seismic standards.

Lead Agency	Lake Whatcom Water and Sewer District
Funding Source	Local and Federal, including FEMA
Current Status	Ongoing

EQ-d. Seismic vulnerability assessment – In 2016, the District hired a consultant to assess the seismic vulnerability of all of its water reservoirs and develop a prioritization plan for retrofit/replacement.

Lead Agency	Lake Whatcom Water and Sewer District
Funding Source	Local
Current Status	Complete

EQ-e. Seismic resilient reservoir system – Constructed a second reservoir adjacent to original Division 22 water reservoir in 2018 (including ShakeAlert system), and plan to replace existing single Division 7 reservoir with two reservoirs that will have ShakeAlert-controlled valving to shut it off during high seismic shaking (to preserve water from loss due to anticipated main breaks).

Lead Agency	Lake Whatcom Water and Sewer District
Funding Source	Local and Federal, including FEMA
Current Status	Ongoing

Extreme Temp

No actions ongoing, discontinued, or completed for this hazard.

Flooding

No actions ongoing, discontinued, or completed for this hazard.

Landslide/erosion

ER-a. Vulnerability assessment – Mapped and assessed the vulnerability of system elements to landslide/erosion events.

Lead Agency	Lake Whatcom Water and Sewer District
Funding Source	Local sources
Current Status	Ongoing

Landslide Subsidence

No actions ongoing, discontinued, or completed for this hazard.

Lightening

No actions ongoing, discontinued, or completed for this hazard.

Severe Storm

No actions ongoing, discontinued, or completed for this hazard.

Severe Wind

No actions ongoing, discontinued, or completed for this hazard.

Tornadoes

No actions ongoing, discontinued, or completed for this hazard

Tsunami

No actions ongoing, discontinued, or completed for this hazard.

Wildfire

No actions ongoing, discontinued, or completed for this hazard.

Winter storms/Freezes

No actions ongoing, discontinued, or completed for this hazard.

Multiple Hazards

No actions ongoing, discontinued, or completed for this hazard.

Lake Whatcom Water & Sewer District 2021-2025 Hazard Mitigation Strategy

Whatcom County Hazard Mitigation Goals

Whatcom County has identified five overarching hazard mitigation goals, which represent what a community seeks to achieve through mitigation actions.

Goal 1. Protect Life, Property and Public Welfare

Goal 2. Increase Public Awareness

Goal 3. Preserve and Enhance Natural Systems

Goal 4. Encourage Partnership for Implementation

Goal 5. Ensure Continuity of Emergency Services

These countywide goals help guide any prioritization and implementation of mitigation actions, ensuring that the actions contribute to a community's vision for the future.

Lake Whatcom Water & Sewer District-Specific Hazard Mitigation Goals

Lake Whatcom Water and Sewer District adds to these county-wide goals, the following community-specific mitigation planning goals:

LWWSD Goal A: Ensure continuity of water and sewer services

LWWSD Goal B: Harden infrastructure to mitigate impact from seismic hazards

Mitigation Action Options

Appendix E of the Whatcom County Natural Hazard Mitigation Plan provides a list of mitigation options. Lake Whatcom Water and Sewer District considered mitigation options related to earthquake, liquefaction, landslide, volcanic, riverine flooding, and wildfire hazards, especially those related to earthquakes because this hazard has the potential to cause the greatest loss and damage. Not all mitigation options in Appendix E were relevant or a strong priority for the District. Some options have already been implemented or are ongoing in the District, as documented in the section above on the status of 2016-2020 and ongoing hazard mitigation actions.

Mitigation Action Prioritization

The mitigation actions in this section are new actions that the Lake Whatcom Water and Sewer District has prioritized for the 2021-2025 planning period and beyond. Mitigation options were prioritized based upon review of the following two criteria: 1) The action's Overall Feasibility based on engineering, environmental, financial and political considerations, 2) The Criticality of the action, based upon a consideration of which actions had the greatest potential to protect life, property and public welfare. The District is working in cooperation with the County and other participating communities and special districts to develop a systematic methodology that would use multiple evaluation criteria to determine mitigation action prioritization. This new methodology will be used in future updates of this Plan.

In the following Identified Mitigation Actions 2021-2025 table, each priority action is listed by hazard. Each action is followed by planning goals, lead agency, the priority evaluation, timeline, funding source and estimated cost, where such information is available. This information can be used by local decision makers in pursuing strategies for implementation.

Goals	Indicates the hazard mitigation planning goal or goals this action addresses; countywide and/or community-specific
Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
Priority:	H (High); M (Medium); L (Low)
Timeline:	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing
Funding Source:	Local; State; FEMA; Private; Other
Estimated Cost:	Actual; Estimated

Lake Whatcom Water & Sewer District Identified Mitigation Actions 2021-2025

Lake Whatcom Water & Sewer District IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
GENERAL: ALL HAZARDS Education and Awareness Actions	These are actions that inform and educate citizens, elected officials, and property owners about hazards and ways to mitigate them.						
	G-a. Emergency Plan Updates	1	Lake Whatcom Water and Sewer District	M	O	Local	
	G-b. Provide for an increased level of protection for public infrastructure	1	Lake Whatcom Water and Sewer District	M	O	Local, State, Federal	
Education and Outreach	***EO-a Ongoing -- Utility bill inserts***	1, 2	Lake Whatcom Water and Sewer District	M	O	Local	
Hazard Specific	Actions communities should consider to identify and evaluate a range of potential mitigation actions for reducing risk to natural hazards and disasters.						
Dam/Levee Failures (See: Flooding)	No applicable action items	-	-	-	-	-	-
Droughts/Heat	***D-a Ongoing -- Monitor water supply***	1	Lake Whatcom Water and Sewer	M	O	Local	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

Lake Whatcom Water & Sewer District IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Waves			District				
	D-b Ongoing -- Educate residents on water saving techniques	2	LWWSD	M	O	Local	
	D-1 Require water conservation during drought conditions	3, A	LWWSD	L	O	Local	$10,000
	D-2 Raw water bypass for low reservoir level	1, A	LWWSD	L	L	Local, State, FEMA, Other	$200,000
Earthquakes	***EQ-c Ongoing -- Seismic resistant water reservoirs***	1	LWWSD	L	O	Local, Federal, FEMA	
	EQ-e Ongoing -- Seismic resilient reservoir system	1	LWWSD	L	O	Local, Federal, FEMA	
	EQ-1 Seismic retrofit of existing water reservoirs	1, 5, A, B	LWWSD	H	O	Local, State, FEMA, Other	$8,000,000
	EQ-2 Replace water mains with seismically resistant piping	1, 5, A, B	LWWSD	L	L	Local, State, FEMA, Other	$50,000,000
	EQ-3 Seismic retrofit of existing pumping stations; install ShakeAlert system controls	1, 5, A, B	LWWSD	H	S	Local, State, FEMA, Other	$1,500,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

Lake Whatcom Water & Sewer District IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	EQ-4 Anchorage of critical facilities: pumps, electronics, communications	1, 5, A, B	LWWSD	H	M	Local, State, FEMA, Other	$3,000,000
Extreme Temperatures	No applicable action items	-	-	-	-	-	-
Flooding	**F-1 Protect Infrastructure** Harden infrastructure at bridge and dam crossings	1, 5, A	LWWSD	L	L	Local, State, FEMA, Other	$1,000,000
	F-2 Protect Critical Facilities Dry proof pumping stations	1, 5, A	LWWSD	L	L	State, FEMA	$150,000
Landslide/Erosion	***ER-a Ongoing -- Vulnerability assessment***	1	LWWSD	L	O	Local	
	ER-1 Protect Division 30 Reservoir	1, 5, A, B	LWWSD	L	L	Local, State, FEMA, Other	$1,000,000
Land Subsidence	**LS-1 Protect Critical Facilities**	1, 5, A	LWWSD	L	L	Local, State, FEMA, Other	$2,000,000
Lightning	No applicable action items	-	-	-	-	-	-
Severe Storms	**SS-1 Install backup generators at**	1, 5, A	LWWSD	H	O	Local, State,	$2,000,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

Lake Whatcom Water & Sewer District IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	facilities					FEMA, Other	
Severe Wind	No applicable action items	-	-	-	-	-	-
Tornadoes	No applicable action items	-	-	-	-	-	-
Tsunami	No applicable action items	-	-	-	-	-	-
Wildfires	**WF-1 Firewise critical facilities**	1, 5, A	LWWSD	M	M	Local, State, FEMA, Other	$1,000,000
Winter Storms/ Freezes (Severe Winter Weather)	**WS-1 Install backup generators at facilities**	1, 5, A	LWWSD	H	O	Local, State, FEMA, Other	$2,000,000
Multiple Hazards	No applicable action items	-	-	-	-	-	-
Advanced Mitigation Projects (Dream List)	No applicable action items	-	-	-	-	-	-

Lake Whatcom Water & Sewer District Annual Review and Progress for Hazard-Specific Mitigation Actions 2021-2025

Progress monitoring means tracking the implementation of the hazard specific mitigation actions over time. Each jurisdiction must identify how, when, and by whom action items will be monitored. The responsible agency assigned to each mitigation action is responsible for tracking and reporting on each of their actions.

Annual review and progress reporting includes the following:

Step One: Identify mitigation actions that your planning team has identified for the annual review. The planning team has the option to address ALL action items, or only those that should be acted on during each review cycle.

Step Two: Use the table below to track annual progress. For each action item selected for annual review insert the appropriate letter that indicates the status of that action item.

Step Three: Complete a progress report form as illustrated in Appendix G for each mitigation action item selected for annual review

Step Four: Submit the completed form(s) to the Whatcom County DEM.

Lake Whatcom Water and Sewer District Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
GENERAL: ALL HAZARDS						
G-a. Update District-specific emergency response plan	B					Plan updated in 2019 and is on track for update in compliance with AWIA-requirements in 2021.
G-b. Provide for an increased level of protection for public infrastructure	B					Six-year water/sewer capital improvement plans includes projects each year assoc. with this task.
Add Additional Actions as Needed						
EDUCATION AND OUTREACH						
EO-a. Utility bill inserts	B					Completed annually.
Add Additional Actions as Needed						
DAM/LEVEE FAILURES						
none	-	-	-	-	-	
DROUGHTS/HEAT WAVES						
D-a. Monitor water supply	B					Conduct daily.
D-b. Educate residents on water saving techniques	B					Conduct via utility bill fact sheets, social media posts, and Lakeway Drive reader board messages.
D-1 Require water conservation during drought conditions	B					To be implemented, if necessary.
D-2 Install raw water bypass for low lake level conditions	D					Improvement planned beyond current planning horizon.
Add Additional Actions as Needed						
EARTHQUAKES						
EQ-c. Seismic resistant water reservoirs	B					Replacement of existing Div. 7 reservoir planned for 2023.
EQ-e. Seismic resilient reservoir system	B					Installation of ShakeAlert controls on water system components planned for

Lake Whatcom Water and Sewer District Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
						2023.
EQ-1 Seismic retrofit of existing water reservoirs	D					Improvements dependent upon external funding.
EQ-2 Replace water mains with seismically resistant piping	D					Improvements dependent upon external funding.
EQ-3 Seismic retrofit of existing pumping stations; install ShakeAlert system controls	D					Improvements dependent upon external funding.
EQ-4 Anchorage of critical facilities: pumps, electronics, communications	D					Improvements dependent upon external funding.
Add Additional Actions as Needed						
FLOODING						
F-1 Protect infrastructure (harden infrastructure at bridge and dam crossings)	D					Improvements dependent upon external funding.
F-2 Protect critical facilities (dry proof pumping stations)	D					Improvements dependent upon external funding.
Add Additional Actions as Needed						
LANDSLIDES/EROSION						
ER-1 Protect Division 30 reservoir	D					Improvements dependent upon external funding.
Add Additional Actions as Needed						
LAND SUBSIDENCE						
LS-1 Protect Critical Facilities	D	-	-	-	-	Improvements dependent upon external funding.
Add Additional Actions as Needed						

Lake Whatcom Water and Sewer District Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
TORNADOES						
none	-	-	-	-	-	
TSUNAMI						
none	-	-	-	-	-	
WILDFIRES						
WF-1 Firewise critical facilities	D					Improvements dependent upon external funding.
Add Additional Actions as Needed						
WINTER STORMS/FREEZES (SEVERE WINTER WEATHER)						
WS-1 Power generation at critical facilities	B					Completed per current capital improvement plan.
Add Additional Actions as Needed						
EXTREME TEMPERATURES						
none	-	-	-	-	-	
LIGHTNING						
none	-	-	-	-	-	
SEVERE WIND						
none	-	-	-	-	-	
MULTIPLE HAZARDS						
none	-	-	-	-	-	

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CITY OF LYNDEN

Contact Information	**Mark Billmire** Fire Chief 215 4th Street, Lynden, WA 98264 (360) 255-7913
Approving Authority	**Mayor Scott Korthuis & City Council Members** 300 Fourth Street Lynden, WA 98264 (360) 354-5026

Planning Process

The City of Lynden process for reviewing, updating, and adopting the 2021 Whatcom County Natural Hazard Mitigation Plan (NHMP) included a review by multiple city departments and formal adoption by the City Council. The staff attended regular, bi-weekly Whatcom County plan update meetings through February through May of 2021. Staff met with Dr. Rebekah Paci-Green in March to review the 2016 plan and understand new elements of 2021 community profile template. In February through June 2021, the Fire Chief attended coordination meetings hosted by the Whatcom County Sheriff's Office Division of Emergency Management (DEM) and received initial guidance from DEM. The City of Lynden Fire Chief and City Administrator reviewed the previous plan, confirmed the critical facilities list and that the existing mitigation strategies were appropriate, and then met with the Mayor, Public Works Director, Chief of Police, and other city departments to solicit input for additional revisions. They worked with Western Washington University to further revise the plan, based upon new elements of the 2021 plan.

The final draft revisions to the NHMP addressing the City of Lynden were submitted to DEM in May of 2021 to be incorporated into the county-wide plan. The Lynden City Council, in partnership with the county, held two duly advertised, virtual public meetings about the planning process on March 23, 2021 and April 13, 2021 and one public hearing on May 5, 2021 to review the draft NHMP dated June 1, 2021 and expects to formally adopted the Plan in the summer of 2021.

Key Contributor List

- Mike Martin, Lynden City Administrator
- Sarah Silvas, Lynden Fire Department

The information contained in the Natural Hazards Mitigation Plan update regarding hazards, risks, vulnerability and potential mitigation is based on the best available science and technology currently available. All City departments will utilize this information. This information and related data on natural hazards potentially impacting Lynden will be used as a tool when the City updates other plans and programs, such as the following:

Comprehensive Plan required by the Growth Management Act (GMA);

- Critical Areas Ordinance;
- Capital facilities planning;
- Water Resource Inventory Area planning
- Historic Preservation Ordinance No 1492
- Shoreline Management Plan (updated 2019)
- Pepin Creek Sub-Area Master Plan

As additional information becomes available from other planning sources that can enhance this Plan, that information will be incorporated through the periodic update process.

Plan Maintenance for Lynden

This plan will be updated periodically with public information and education programs deployed by the Fire, Police and Public Works departments, along with special, one-time events such as booths at public events.

Public Outreach and Education

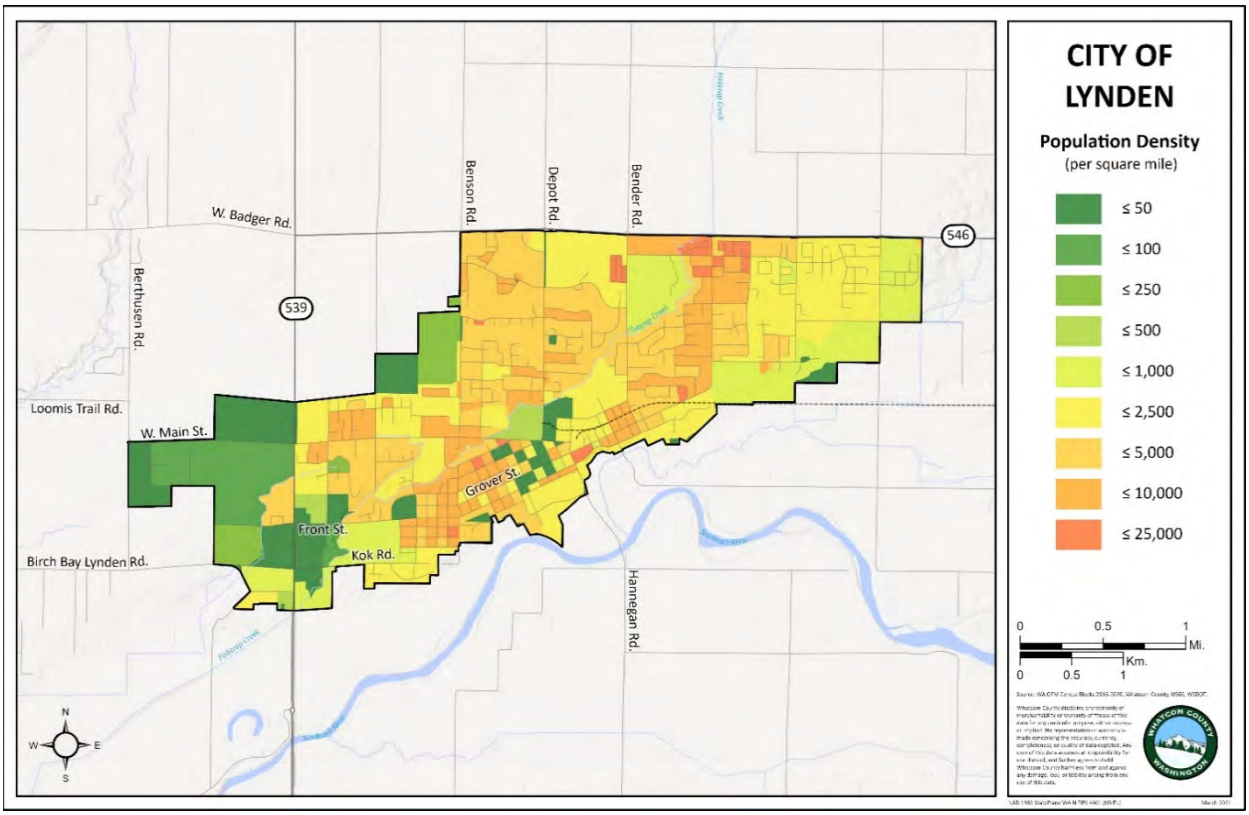
Program	Yes/No, Year Adopted	Description
Nonprofit organizations or local residents groups focused on hazard mitigation, emergency preparedness, vulnerable populations, etc.	Yes, ongoing	The Mt. Baker Chapter of the Red Cross is active in promoting emergency preparedness. Through the WCDEM, Lynden residents participate in CERT training.
Ongoing public education or information programs	Yes, ongoing	Police and Fire departments routinely conduct public education for students in all age levels.
School-related programs for natural hazard safety	Yes	The Lynden School Board policy 3432 mandates fire, earthquake, lockdown, evacuation, and shelter-in-place drills. Ongoing programs with Police and Fire Departments.
StormReady certification	Yes, 2003	Whatcom County is one of 14 counties in Washington State to be certified StormReady. StormReady uses a grassroots approach to help communities develop plans to handle all types of extreme weather.
Firewise Community certification	No	

Public-Private Partnership initiatives addressing disaster-related issues	Yes, ongoing	City partners with the Lynden Chamber of Commerce to use its website for emergency notifications. Also, radio station KGMI 790 is a designated emergency communications asset that we use for the same purpose.
Other	No	

Overview of Lynden, Hazards, and Assets

Geography of Lynden

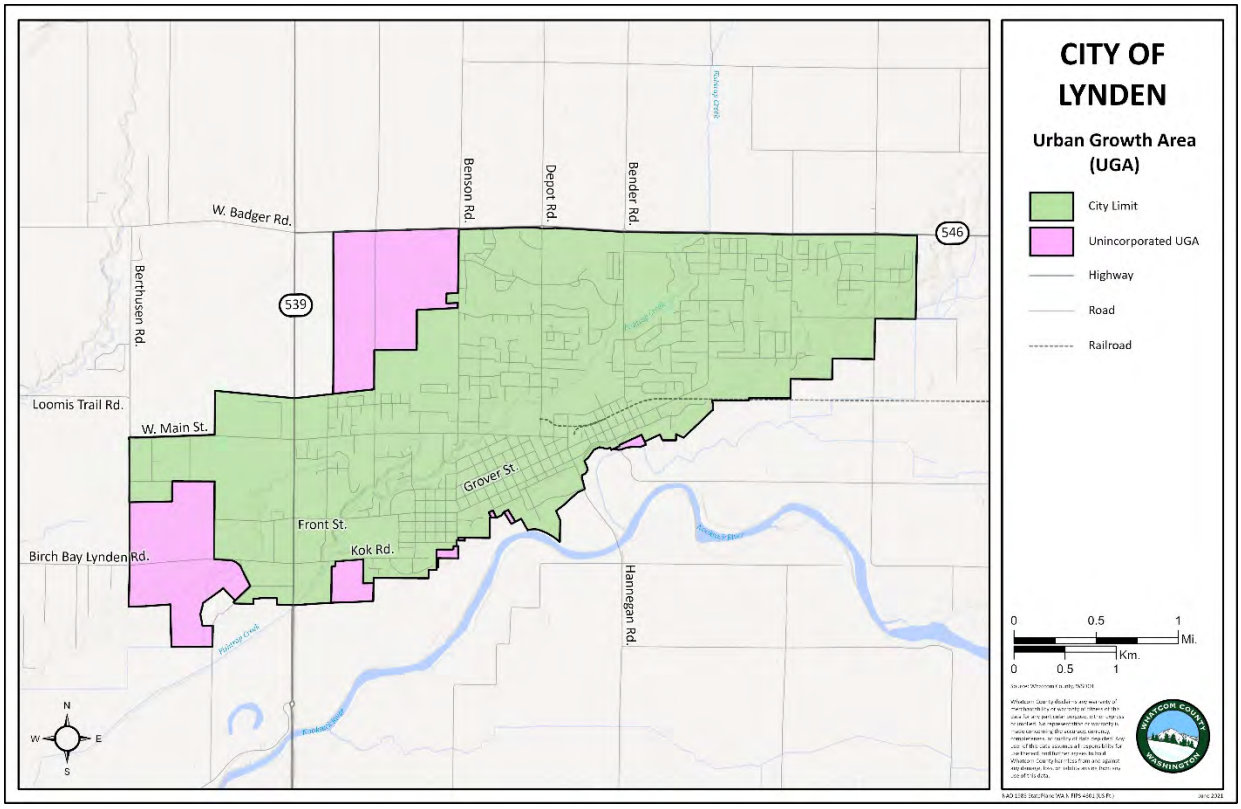
Lynden Population	14,800 (Apr 1, 2021 estimate)
Total area	6.5 mi (within city limits)



Washington State Office of Financial Management (OFM) 2020 population and housing estimates for 2010-2020 census block data. This map uses the 2016-2020 average population to show population density per square mile.

Growth Trends

This map displays the UGA for Lynden, as designated by the Whatcom County Comprehensive Plan.



Presence of Hazards and their Impacts in Lynden

Flooding, freezing and occasional high-wind events are the most consistent natural hazards affecting Lynden. Flooding occurs in several specific places. Winter flood waters in mainstem of the Nooksack River routinely breach dikes and levees, posing a particular threat to north-south roads, including State Highway 539 and the Hanigan Road – both critical travel assets to the City of Lynden. Flooding also occurs in the Pepin Creek sub-area. This is part of a drainage basin located mainly in Canada that empties into Lynden. Finally, severe, high winds from the Frazier River Valley sweep into North Whatcom County, including Lynden each winter, downing trees, transmission wires and causing other damage.

Since the adoption of the 2016 NHMP Lynden has grown by roughly 2000 people. There has been no change in hazardous areas. Steps are being taken to ensure less structures are at risk of flooding.

The City works closely with the Whatcom County Flood Control districts and other agencies to ensure structures intended to keep the Nooksack River in its channel are adequately maintained and repaired. Regarding the Pepin Creek drainage basin; the City is currently buying property, and designing infrastructure that will greatly reduce flooding in areas that are most at risk from this hazard. It has also rezoned property in this area to mitigate the effects of flooding on private property. Finally, the City consistently updates and improves its response to high wind, freezing and snow events. The manpower, equipment and resources needed to address these hazards is a priority reflected in the City's annual budget.

In the table below is a list of the major hazards that effect Whatcom County. The second column provides the percentage of Lynden's total area that is exposed to each hazard. The third column indicates the severity of anticipated impacts to community function, considering the credible worst-case hazard scenario. Severity of anticipated impacts considers effects on basic community function such as shelter, transportation, utilities, commerce, industry, agriculture, education, health, recreation, and cultural identity. Severity ranges from none to extreme, as shown in the key below the table. Finally, the last column of the table describes where the hazard impacts the community and which services the hazard would most significantly impact.

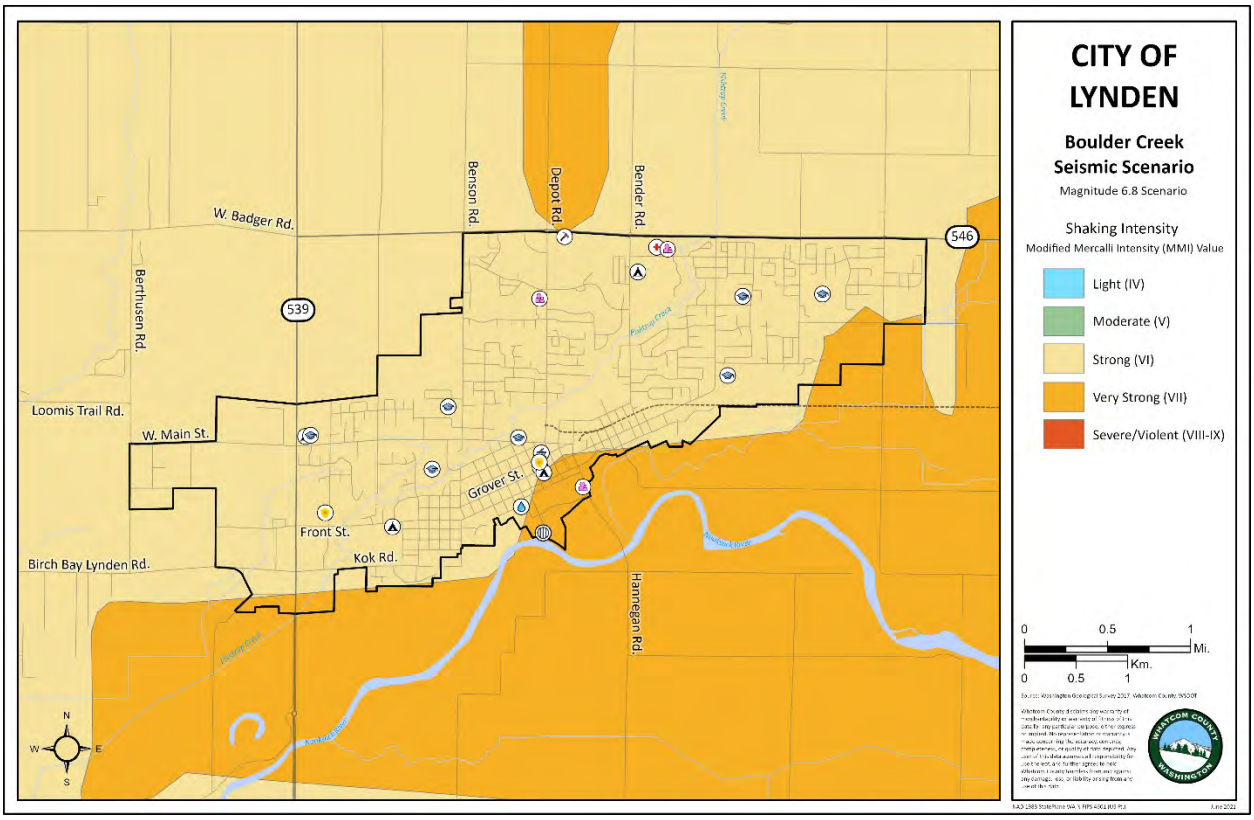
	Hazard	% area Exposed	Severity of Anticipated Impacts	Hazard Descriptions
Geological	**Earthquake**	100%	High	Strong shaking (MMI value 6) expected in Lynden during a Boulder Creek earthquake or Cascadia event. Such shaking is expected to cause low to moderate damage to infrastructure. Wastewater Treatment Plant, which is expected to experience very strong shaking (MMI value 7), may experience moderate damage. High impact to the North and South means that extensive and prolonged disruption of transportation and goods may occur.
	Liquefaction	98.9%	Mod	Seismically-sensitive soils present near the Nooksack River, a small portion of the downtown area, and the waste water treatment plant. Could also affect transportation route (Guide Meridian, Hampton Rd, Hannegan Rd) into and out of the community.
	Landslide	0.2%	None	NA
	Volcano	2.4%	Low	The southern portion of the city is at risk of a Mount Baker lahar. This would impact the Wastewater Treatment Plant.
	Tsunami	0%	Low	Portions of the City are exposed to the Nooksack River. During the raining season this stretch of the river could be prone to tsunami inundation, specifically the area around the Wastewater Treatment Plant.
	Mine Hazards	0%	None	NA
Hydro-logical	**Flooding**	4.3%	Low	Lynden is located above the floodplain. New construction has currently encroached on the floodplain. Fishtrap Creek, which bisects

				the City, is subject to seasonal flooding, which could impact sanitary services at the Wastewater Treatment Plant, as well as transportation at crossing.
Meteorological	**Wildfire**	20.9%	Low	The Eastern portion of Lynden, called the Northwood area, is designated a Wildland Urban Interface area with moderate wildfire potential. However, the area has rapidly urbanized with new developments and is surrounded by open farmland. Forest cover is now minimal. It is unlikely to experience wildfire that could severely threaten these neighborhoods.

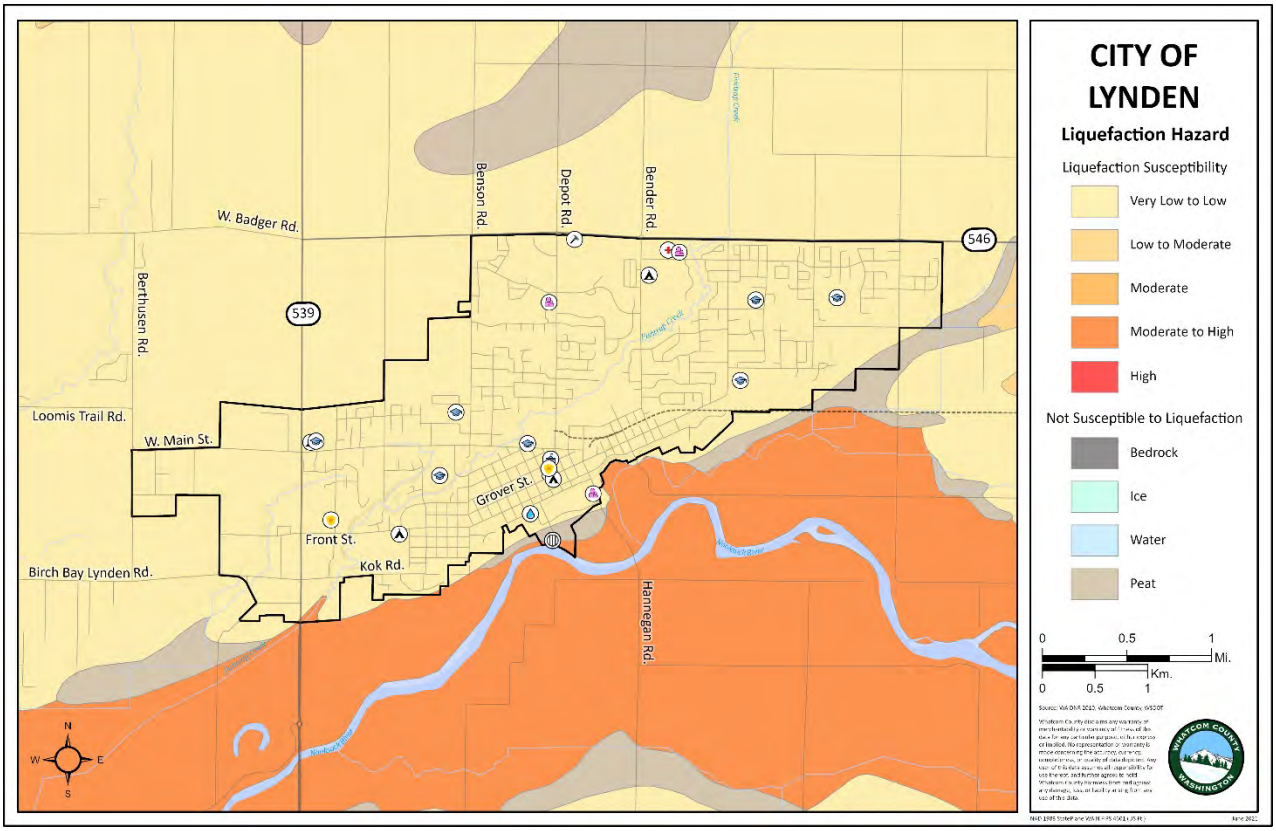
Severity Scale: **None** = no impact to community function
Low = minor degradation of community functions, not widespread
Moderate = moderate degradation over multiple weeks or widespread
High =degradation or loss over many weeks, widespread

Natural Hazard Maps

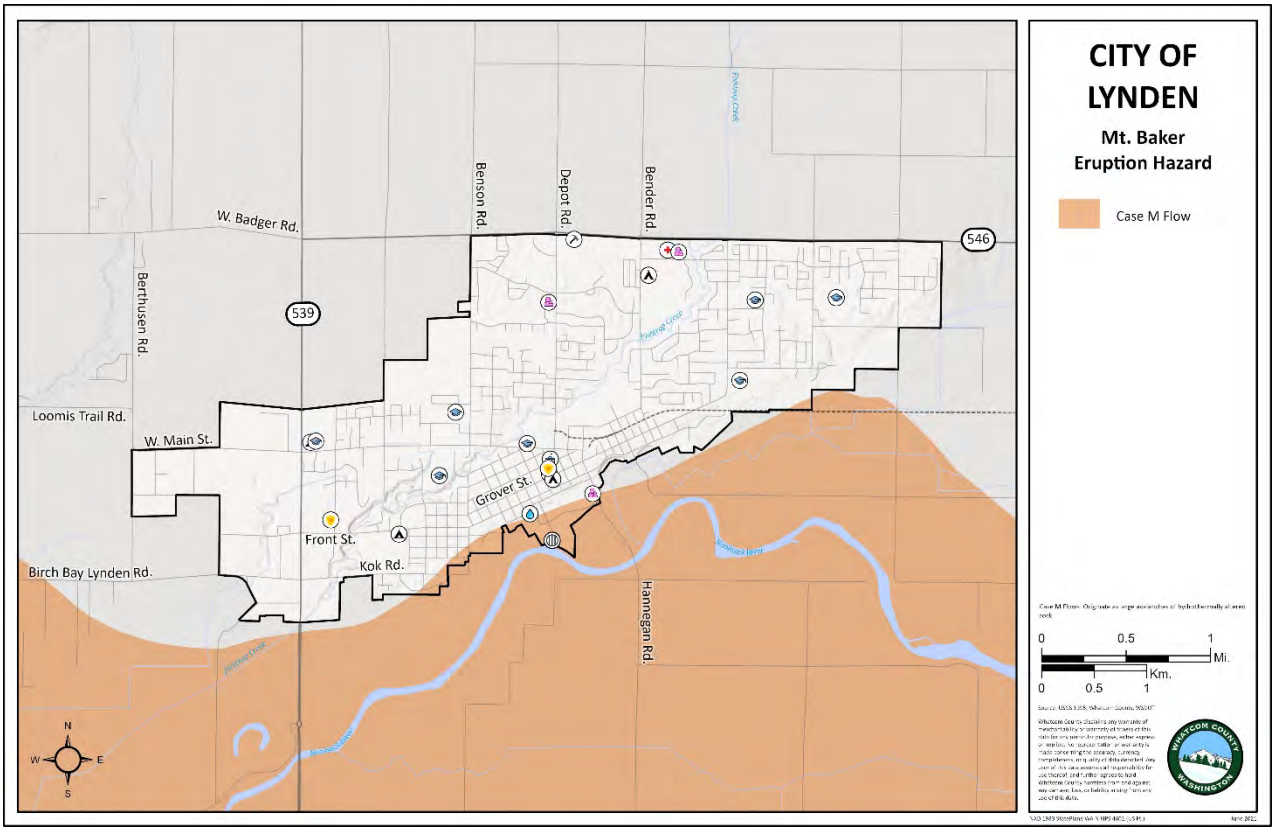
The following figures depict the natural hazards present within the jurisdiction.



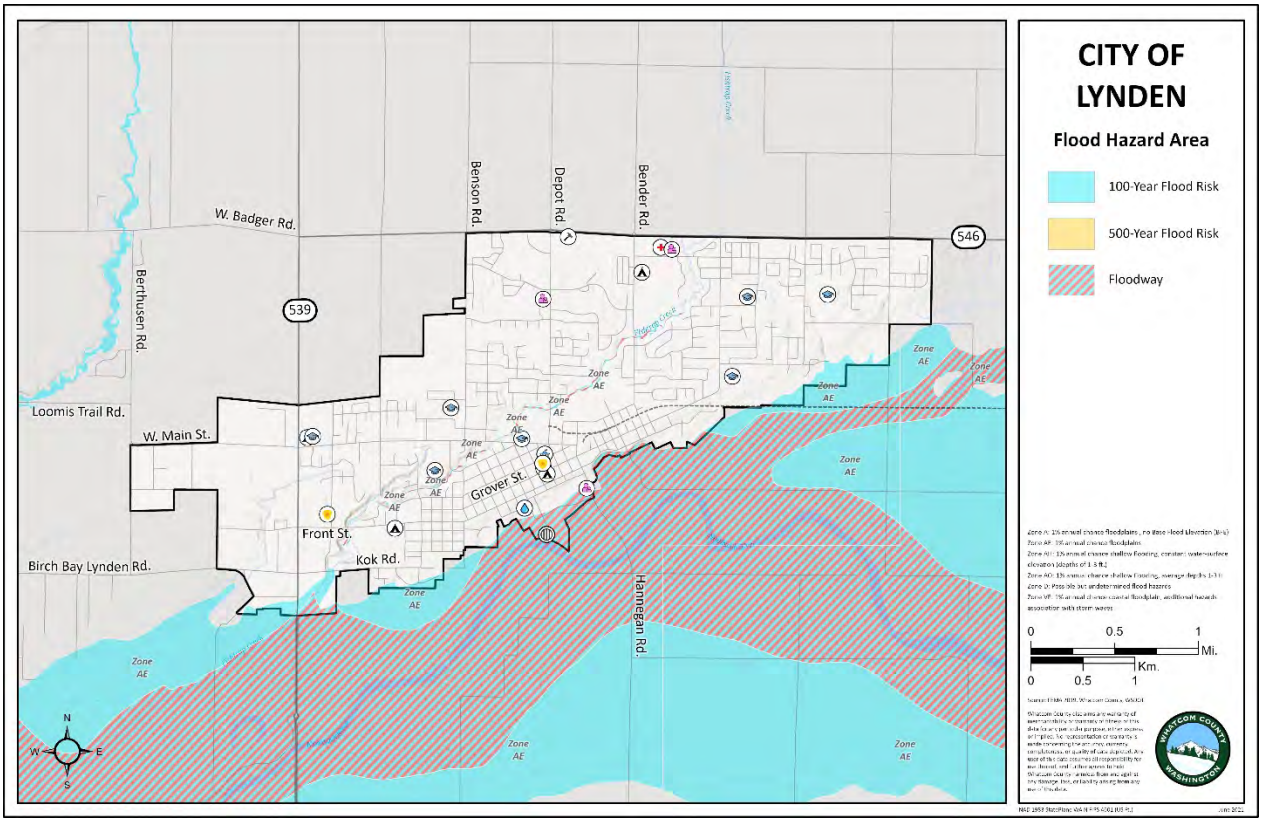
Washington Department of Natural Resources (WA DNR) 2017 Boulder Creek Fault Zone seismic scenario of magnitude 6.8 data. Displays extent and severity of the modeled earthquake in the Modified Mercalli Intensity (MMI) scale.



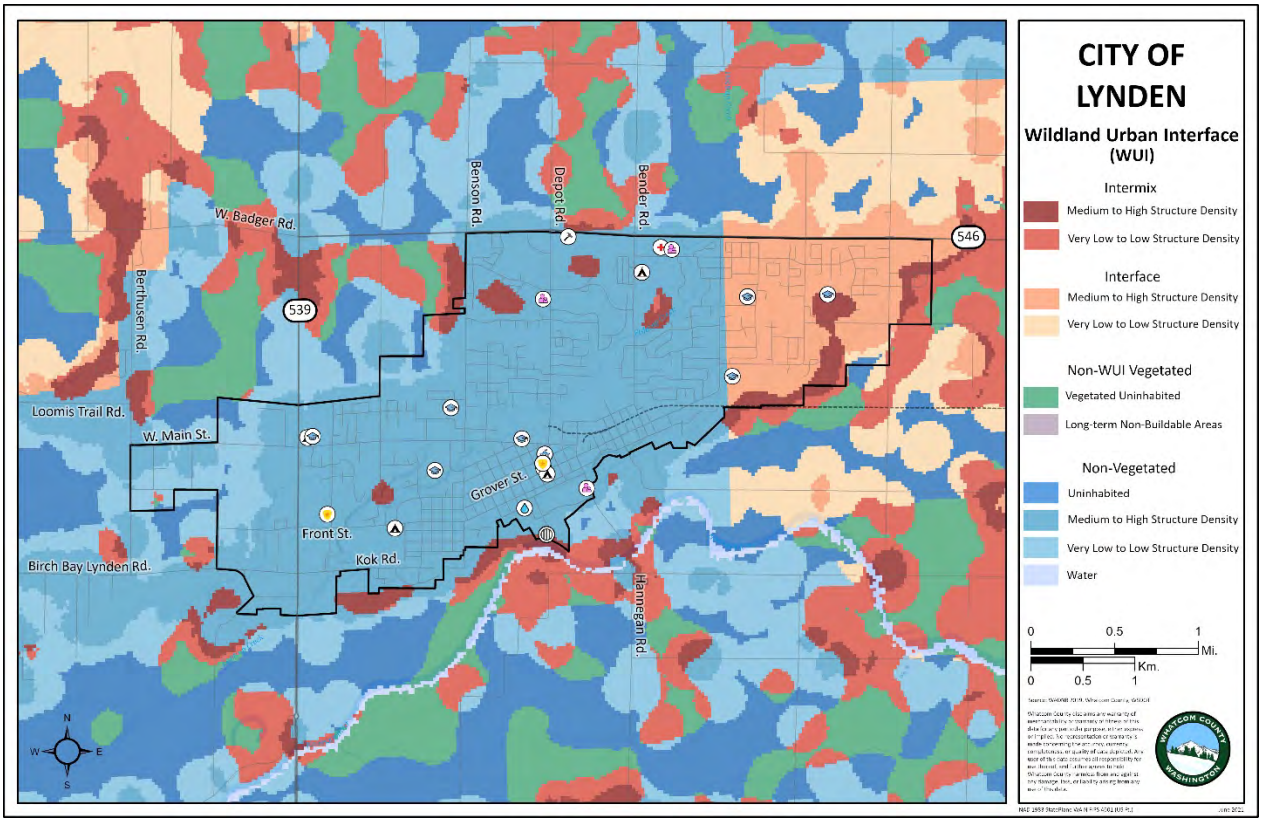
Washington Department of Natural Resources (WA DNR) 2010 liquefaction susceptibility data. This feature class is part of a geodatabase that contains statewide ground response data for Washington State.



USGS Hazards from Future Activity of Mount Baker, WA (1995) data shows different volcanic flows. Case M flows originate as large avalanches of hydrothermally altered rock. Case 1 debris flows are non-cohesive flows related to melting of snow and ice, with a recurrence of 500 years. Case 2 debris flows are cohesive flows from small debris avalanches, with a recurrence of 100 years.



FEMA 2019 flood hazard data showing 100-year flooding, 500-year flooding, floodways, and flood zones. FEMA flood data includes both riverine and coastal flooding.



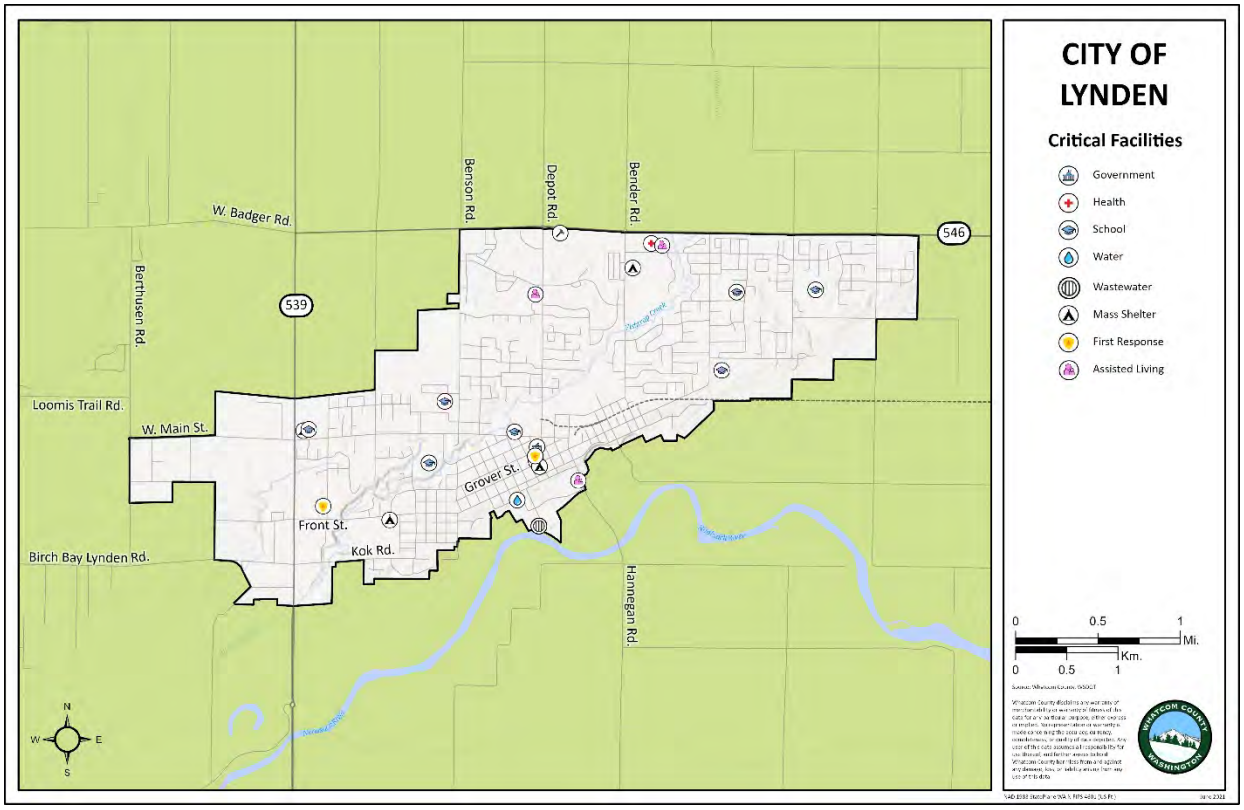
Washington Department of Natural Resources (WA DNR) 2019 mapped data of Washington's Wildland Urban Interface (WUI). The WUI displays areas of WA where structures and wildland overlap with specific structure densities.

Lynden Critical Facility List

Facility Name	Facility Type	Signi-ficance	Location	Assessed Dollar Value	Notes
Christian Health Care Center	EF: Assisted Living	2	855 Aaron Drive, Lynden WA 98264	$17 million	24/7 care for elderly, fragile population who are physically or mentally compromised. Large Elder Care, including skilled nursing.
Lynden City Hall	EF: Government	2	300 Fourth Street, Lynden WA 98264	$12 million	Center for most City functions, including Public Works. EOC located here. City “headquarters.”
Lynden City Hall Annex	EF: Government	1	205 Fourth Street, Lynden WA 98264	$3.5 million	Usually empty. Not a high risk.City Council and Municipal Court Chambers.
Lynden Community Center	EF: Assisted Living	1	401 Grover Street, Lynden WA 98264	$4 million	Seniors use this for social gatherings, meals, and other services. Has kitchen. Senior Gathering place.
Lynden Fire Department	EF: Fire Station	2	215 Fourth Street, Lynden WA 98264	$9 million	Includes all personnel and equipment for fire response. City’s only Fire Station.
Lynden Manor	EF: Assisted Living	2	905 Aaron Drive, Lynden WA 98264	$20 million	24/7 care for elderly, fragile population who are physically or mentally compromised. Elder Care, including skilled nursing.
Lynden Police Department	EF: Law Enforcement	2	203 – 19th Street, Lynden WA 98264	$8.5 million	Includes all personal and equipment for police response. City’s only Police Station.
Meadow Greens	EF: Assisted Living	2	301 W. Homestead Blvd. , Lynden WA 98264	$20 million	24/7 care for elderly, fragile population who are physically or mentally compromised. Elder Care, including skilled nursing

Riverhouse Retirement	EF: Assisted Living	1	100 Riverview Rd. , Lynden WA 98264	$12 million	Aging population but robust enough to live alone. Retirement Community.
Northwest Washington Fair	EF: Emergency Services	1	1775 Front Street, Lynden WA 98264	$25 million	Large facility with capacity for staging and sheltering. Fairgrounds.
Schools – District 504	EF: Evacuation Center	3	7 Schools Total, Lynden WA 98264	$200 million	2,000 children attend. Facilities have capacity for sheltering. Grades K through 12.
Sonlight Church	EF: Evacuation Center	1	8800 Bender Road, Lynden WA 98264	$6 million	Large congregation. Used as latchkey facility for school kids. Large Church.
Waste Water Treatment Plant	LUS: Sewer	3	800 S. 6th Street, Lynden WA 98264	$22 million	All City sewage treated here. Has outfall to Nooksack River. Tertiary sewage treatment.
Water Treatment Plant	LUS: Water	3	525 Judson Street, Lynden WA 98264	$32 million	Water source for entire City and its residents. Produces City water.
City Bible Church	EF: Evacuation Center	1	1986 Main Street, Lynden WA 98264	$11 million	Large congregation, transitioning to sports facility. Also “socializing” facility for homeschoolers. Large Church and Gym.
Public Works Street Shop	EF: Snow/Ice removal, various	2	745 Badger Road, Lynden, WA	$3 million	This facility houses the City’s men and equipment that respond to all natural disasters (flood, snow, ice road washouts etc.). Shop and storage on 5 acres.

Facility Type: **EF** = Essential Facility; **HMF** = Hazardous Materials Facility; **HPL** = High Potential Loss; **LUS** = Lifeline Utility System
Significance to community function: **1**=Moderate; **2**= High; **3** =Very High



Map of critical facilities identified by the City of Lynden. Across Whatcom County, critical facilities fell into 15 categories. Unique categories developed for this plan update include mass shelter, assisted living, and recovery resources. Mass shelter includes facilities such as fairgrounds and community centers. Recovery resources are facilities that are required post-hazard event, for example public works and private construction companies. Not all judications identified or included critical facilities in each category.

Critical Facility Rankings for the Lynden

The table below indicates whether each critical facility falls within known hazard zones for earthquake, liquefaction, landslide, tsunami, volcano, riverine flooding, coastal flooding and wildfire zones. A rank assessment in the last column indicates how the relative risk of community impact. This ranking considers the significance of the facility to the community and the number of hazard zones the facility is within. The frequency of each hazard is also considered, such that being in a low frequency hazard zone would receive a lower ranking than that same facility being in a high frequency hazard zone. Ranking is on a scale of 1 to 10, with 1 being the facility with the highest-ranking score, and 10 being a facility with the lowest ranking score in the jurisdiction.

$$\text{Rank} = \text{Significance} * \left[\frac{\text{EQ\_Zone}}{\text{EQ\_Freq}} + \frac{\text{LQ\_Zone}}{\text{LQ\_Freq}} + \frac{\text{LS\_Zone}}{\text{LS\_Freq}} + \ldots \frac{\text{WF\_Zone}}{\text{WF\_Freq}} \right]$$

Ranking value will be from 0.0 to 1.0, scaled to the highest ranking in the jurisdiction.

Significance: 1=moderate; 2=high; 3=very high, as assessed in the critical facilities list in the previous section

Zone: 0=facility not in hazard zone; 1 = facility in the hazard zone

Frequency (e.g. EQ_Freq, LQ_Freq) is the most difficult variable to which to assign a value. Frequency varies based upon the magnitude of a hazard event and varies from one place to another. It was not possible within the time constraints to assess frequency of hazard at each critical facility location. Instead, a qualitative assessment of the hazard frequency across the entire county was made, as shown in the chart below.

Description	Freq Value used in formula	Hazards
Frequent, occurring on the order of decades	3	Riverine flooding (FL); Coastal flooding (COA)
Rare, occurring on the order of centuries	2	Earthquake (EQ); Liquefaction (LQ); Landslide (LS); Wildfire (WF)
Very rare, occurring on the order of millennia	1	Tsunami (TSU); Volcano (VOL)

Note: Severe storm, a very frequent hazard, was omitted because it is ubiquitous and because no hazard map of storm severity was available.

Critical Facilities Ranking Table

Facility Name	Facility Type	Signi-ficance	EQ	LQ	LS	TSU	VOL	FL	COA	WF	Rank Assessment
Christian Health Care Center	Assisted Living	2	1	1	0	0	0	0	0	0	0.26
Lynden City Hall	Government	2	1	1	0	0	0	0	0	0	0.26
Lynden City Hall Annex	Government	1	1	1	0	0	0	0	0	0	0.14
Lynden Community Center	Assisted Living	1	1	1	0	0	0	0	0	0	0.14
Lynden Fire Department	Fire Station	2	1	1	0	0	0	0	0	0	0.29
Lynden Manor	Assisted Living	2	1	1	0	0	0	0	0	0	0.29
Lynden Police Department	Law Enforcement	2	1	1	0	0	0	0	0	0	0.29
Meadow Greens	Assisted Living	2	1	1	0	0	0	0	0	0	0.29
Riverhouse Retirement	Assisted Living	1	1	1	0	0	0	1	0	0	0.19
Northwest Washington Fair	Emergency Services	1	1	1	0	0	0	0	0	0	0.14
Schools – District 504	Evacuation Center	3	1	1	0	0	0	0	0	1	0.64
Sonlight Church	Evacuation Center	1	1	1	0	0	0	0	0	0	0.14
Waste Water Treatment Plant	Utility: Sewer	3	1	0	0	0	1	1	0	1	1

Water Treatment Plant	Utility: Water	3	1	1	0	0	0	0	0	0	0.42
City Bible Church	Evacuation Center	1	1	1	0	0	0	0	0	0	0.14
Public Works Street Shop	EF: Snow/Ice removal, various	2	1	1	0	0	0	0	0	0	0.28

Notes: **EQ** = Earthquake; **LQ** =Liquefaction; **LS** = Lan1dslide; **TSUN** = Tsunami; **VOL** = Volcano; **FL** = Riverine Flooding; **COA** = Coastal Flooding; **WF** = Wildland Fire

Areas and Assets Exposed, Per Hazard

City of Lynden Exposure to Natural Hazards						
	Hazard Susceptibility	**Asset County (% of Total)**				**Critical Facilities Appraised Value (Million)**
		Area (sq.mi.)	**Population**	**Parcels**	**Critical Facilities**	
Geological Hazards	**Earthquake**, Shaking Intensity					
	MMI V	-	-	-	-	-
	MMI VI	93.9%	95.8%	96.5%	86.4%	$145 [2]
	MMI VII	6.1%	4.2%	3.5%	13.6%	$38 [2]
	MMI VIII - IX	-	-	-	-	-
	TOTAL	100%	100%	100%	100%	$183
	Liquefaction					
	Very Low to Low	98.5%	99.1%	99.8%	95.5%	$197 [1]
	Low to Moderate	-	-	-	-	-
	Moderate	-	0.2%	-	-	-
	Moderate to High	0.4%	-	0.1%	-	-
	High	-	-	-	-	-
	TOTAL	98.9%	99.3%	99.9%	95.5%	$197
	Landslide					
	Landslide Low	-	-	-	-	-
	Landslide Moderate	-	-	-	-	-
	Landslide High	-	-	-	-	-
	Fan Low	0.2%	0.02%	0.1%	-	-
	Fan Moderate	-	-	-	-	-
	Fan High	-	-	-	-	-

	Mine Hazard	-	-	-	-	-
	TOTAL	0.2%	0.02%	0.1%	-	-
	Volcanic Eruption					
	Case 1 Debris Flows	-	-	-	-	-
	Case 2 Debris Flows	-	-	-	-	-
	Case M Flows	2.4%	2.4%	1.9%	4.5%	$22 [2]
	Pyroclastic Flows, Lava Flows, and Ballistic Debris	-	-	-	-	-
	Lateral Blast Hazard Zone	-	-	-	-	-
	TOTAL	2.4%	2.4%	1.9%	4.5%	$22
	Tsunami, Inundation Zone					
	Low to Moderate Inundation Potential	-	-	-	-	-
	Moderate to High Inundation Potential	-	-	-	-	-
	High Inundation Potential	-	-	-	-	-
	TOTAL	-	-	-	-	-
Hydrological	**Flooding**					
	100-year Flood	1.9%	0.7%	0.5%	-	-
	500-year Flood	0.1%	0.1%	-	-	-
	Floodway	2.3%	2.1%	0.5%	9.1%	$34 [2]
	Undetermined (Zone D)	-	-	-	-	-
	TOTAL	4.3%	3%	1%	9.1%	$34
Meteor	**Wildfire Zones**					
	Interface Very Low-Low Structure Density	0.3%	0.1%	0.02%	-	-

	Interface Medium-High Structure Density	14.8%	15.1%	17.8%	9.1%	$19
	Intermix Very Low-Low Structure Density	0.9%	0.2%	0.5%	-	-
	Intermix Medium-High Structure Density	4.9%	2.8%	2.3%	9.1%	$26 [1]
	TOTAL	20.9%	18.2%	20.62	18.2%	$45

[1]This value shows the total of 2020 Whatcom County parcel data appraised total value and community's critical facility assessed dollar value (found in the community's critical facilities list). The critical facility's assessed dollar value was used instead of the appraised total value when available.

[2]Shows the assessed dollar value provided by the community in their critical facilities list. Does not include the appraised total value.

Status of Lynden's 2016-2020 and Ongoing Hazard Mitigation Actions

This section describes the status of mitigation actions that were proposed in the 2016 Mitigation Plan and are now 1) currently being implemented and are ongoing, 2) are now completed, or 3) are now discontinued because they are no longer needed. The actions are organized by hazard and indicate the lead agency, funding source, and status.

Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
Funding Source	Local; State; FEMA; Private; Other
Current Status	Action Discontinued / Action Completed / Action ongoing and expected completion date, if applicable

General: All Hazards

G-a. Provide for an increased level of safety to the citizens of Lynden. The City regularly undertakes public works projects to prevent or mitigate the effects of natural hazards, particularly flooding, freezing and high-wind events. Particular attention paid to "sheet flooding" which can occur when flat fields freeze solid, followed by heavy rain.

Responsible Entity:	Lynden City Council
Funding Source:	Local sources, and state and federal grants
Timeline:	Current and ongoing
2016-2020 Status	On-Going

G-b. Provide for an increased level of protection for public infrastructure. The City since 2015 has spent an estimated $600,000 developing the Pepin Creek project which will include $103,000,000 in infrastructure projects to alleviate flooding in the north-central part of the City. This project is currently underway, with the installation of a boxed-bridge culvert under West Main Street. The project is expected to take 12-15 years, and will be funded mainly through development fees.

Responsible Entity:	Lynden City Council
Funding Source:	Local sources, and state and federal grants
Timeline:	Current and ongoing
2016-2020 Status	On-Going

G-c. Work with neighboring jurisdictions to add additional flow capacity to the Nooksack River in order to minimize catastrophic flooding losses. The City works closely with the Whatcom County flood district to anticipate and mitigate flooding from the Nooksack. The City is also working with the State Department of Ecology to monitor flows on the north, south and mainstem of the Nooksack River.

Responsible Entity:	Lynden City Council

Funding Source:	Local sources, and state and federal grants
Timeline:	Current and ongoing
2016-2020 Status	On-Going

Education and Outreach

EO-a. Ongoing Community-wide Education and Awareness Activities. Lynden, through the fire department and emergency management, continues to engage in a range of public awareness activities at public events, in the schools and through media channels.

Action Item	Lead Responsibility	Funding	Estimated Cost
Emergency preparedness education programs for schools.	Lynden Fire Department (LFD)	Local	10,000
Drills, exercises in homes, workplaces, classrooms, etc.	LFD	Local	5,000
Public service announcements.	LFD	Local	500
Hazard "safety fairs."	DEM / LFD	Local	1,000
Hazard conferences, seminars.	DEM / LFD	Local	1,000
Hazard awareness weeks.	DEM / LFD	Local	500
Preparedness handbooks, brochures. Distribution of severe weather guides, homeowner's retrofit guide, etc.	DEM / LFD	Local	2,000
Regular newspaper articles.	LFD	Local	200
Annual correspondence with residents reminding them of the need to be hazard prepared.	LFD	Local	200

Drought/heat wave

D-a. Monitor Water Supply. The City has increased its recognized annual water right from 1,792 acre-feet in 2015 to more than 2,000 acre-feet currently. It will increase by another 300-400 acre-feet when the Industrial Condensate Project is complete at the end of 2021. The City is also working on a Managed Aquifer Recharge (MAR) Project that has the potential of providing a surfeit of water to the City's water right. Lynden recently received a $4.7 million grant to develop the project.

Responsible Entity:	Public Works
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

D-b. Require Water Conservation During Drought Conditions. The City informally discourages unnecessary summertime water use, such as pressure washing sidewalks etc. It also schedules "watering days" for all residences that have an alternating schedule.

Responsible Entity:	Public Works
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

Earthquake

EQ-a Conduct Inspections of Building Safety. The Fire Department does annual Life-Safety inspections of all business.

Responsible Entity:	Lynden Fire Department
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

EQ-b Protect Critical Facilities and Infrastructure. This is an ongoing activity that is part of the City's regular facility maintenance cycle.

Responsible Entity:	Public Works and Lynden Fire Department
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

EQ-c Conduct Outreach to Builders, Architects, Engineers, and Inspectors. The City has a close working relationship with the Building Development Community. This relationship was strengthened during the recent COVID crisis due to the precautions that needed to be taken and monitored to build safely.

Responsible Entity:	Planning
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

Extreme Temp

ET-a Assist Vulnerable Populations. Lynden has a number of assisted living care facilities. They are all equipped with generators that are tested regularly. There is a strong community-based network in all neighborhoods that check on vulnerable individuals who many need care. Likewise, there are many faith-based assets that reach out to vulnerable individuals to ensure their safety, especially in times of natural hazard events.

Responsible Entity:	Care facilities
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

Flooding

F-a. Incorporate Flood Mitigation in Local Planning. Lynden, like most jurisdictions, has strict requirements intended to anticipate and mitigate local flooding events.

Responsible Entity:	Public Works/Panning
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

F-b. Limit or Restrict Development in Floodplain Areas. Lynden does not allow development in floodplains except in very rare cases. In those cases, significant mitigation is required.

Responsible Entity:	Planning
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

F-c. Improve Stormwater Management Planning. The City is continually improving its stormwater system and collects impact fees to support that activity. The City recently began physically removing snow that collects in north-south drainage ditches, improving their effectiveness.

Responsible Entity:	Public Works
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

F-d. Improve Stormwater Drainage System Capacity. See F-c above.

Responsible Entity:	Public Works
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

F-e. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures. Lynden regularly maintains and repairs its entire stormwater drainage system, including the use of vacators to extract debris washed into the system.

Responsible Entity:	Public Works
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

F-f. Protect Infrastructure

Responsible Entity:	Public Works
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

F-g. Preserve Floodplains as Open Space. This is generally required by law, and Lynden complies.

Responsible Entity:	Public Works
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

Landslide/erosion

No actions ongoing, discontinued, or completed for this hazard

Landslide Subsidence

No actions ongoing, discontinued, or completed for this hazard

Lightening

No actions ongoing, discontinued, or completed for this hazard

Severe Storm

No actions ongoing, discontinued, or completed for this hazard

Severe Wind

No actions ongoing, discontinued, or completed for this hazard

Tornadoes

No actions ongoing, discontinued, or completed for this hazard

Tsunami

Not Applicable

Wildfire

No actions ongoing, discontinued, or completed for this hazard

Winter storms/Freezes

WW-a Protect Power Lines. This is generally not a City function. Puget Sound Energy regularly prunes trees and vegetation to reduce the possibility of damage to power lines.

Responsible Entity:	Power Company and Public Works

Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

Multi-Hazard

MU-a. Prevent Development in Hazard Areas. Like all Cities, Lynden is subject to state and local laws that prohibit development in hazard areas where flooding or other events that might endanger residents might occur.

Responsible Entity:	Planning
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

MU-b. Adopt and Enforce Building Codes. Lynden adopted the International Building Code, the International Residential Code and the International Fire Code in 2004, and the International Existing Building Code in 2009, among other building codes. It further adopts any future amendments to these codes, effective upon their adoption by the State Building Code Council. The Planning department and fire department support enforcement.

Responsible Entity:	Public Works and Lynden Fire Department
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

MU-c. Monitor Mitigation Plan Implementation. Lynden does regular annual monitoring of the Mitigation Plan as required by law.

Responsible Entity:	Planning
Funding Source:	Local
Timeline:	Current and ongoing
2016-2020 Status	On-Going

Lynden 2021-2025 Hazard Mitigation Strategy

Whatcom County Hazard Mitigation Goals

Whatcom County has identified five overarching hazard mitigation goals, which represent what a community seeks to achieve through mitigation actions.

Goal 1. Protect Life, Property and Public Welfare

Goal 2. Increase Public Awareness

Goal 3. Preserve and Enhance Natural Systems

Goal 4. Encourage Partnership for Implementation

Goal 5. Ensure Continuity of Emergency Services

These countywide goals help guide any prioritization and implementation of mitigation actions, ensuring that the actions contribute to a community's vision for the future.

Lynden-Specific Hazard Mitigation Goals

Lynden supports the county-wide planning goals. No additional community-specific mitigation planning goals have been identified at this time.

Mitigation Action Options

Appendix E of the Whatcom County Natural Hazard Mitigation Plan provides a list of mitigation options. Lynden considered mitigation options related to drought, earthquake, extreme temperature, flooding, landslides, subsidence, lightening, severe storms, severe wind, wildfires, winter storms, and actions that addressed multiple hazards or all hazards. Lynden especially considered actions related to flooding, earthquakes, severe winter storms, and drought because of the jurisdiction's high exposure to these hazards and/or their potential to cause the greatest loss and damage. Not all mitigation options in Appendix E were relevant or a strong priority for Lynden. Some options have already been implemented or are ongoing in Lynden, as documented in the section above on the status of 2016-2020 and ongoing hazard mitigation actions.

Mitigation Action Prioritization

The mitigation actions in this section are new actions that Lynden has prioritized for the 2021-2025 planning period and beyond. Mitigation options were prioritized based upon review of the following two criteria: 1) The action's Overall Feasibility based on engineering, environmental, financial and political considerations, 2) The Criticality of the action, based upon a consideration

of which actions had the greatest potential to protect life, property and public welfare. Lynden is working in cooperation with the County and other participating communities and special districts to develop a systematic methodology that would use multiple evaluation criteria to determine mitigation action prioritization. This new methodology will be used in future updates of this Plan.

In the following Identified Mitigation Actions 2021-2025 table, each priority action is listed by hazard. Each action is followed by planning goals, lead agency, the priority evaluation, timeline, funding source and estimated cost, where such information is available. This information can be used by local decision makers in pursuing strategies for implementation.

1	Goals	Indicates the hazard mitigation planning goal or goals this action addresses; countywide and/or community-specific
2	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
3	Priority	H (High); M (Medium); L (Low)
4	Timeline	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years)
5	Funding Source	Local; State; FEMA; Private; Other
6	Estimated Cost	Actual; Estimated

Lynden Identified Mitigation Actions 2021-2025

IDENTIFIED MITIGATION ACTIONS 2021-2025, LYNDEN							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
GENERAL: ALL HAZARDS Education and Awareness Actions	These are actions that inform and educate citizens, elected officials, and property owners about hazards and ways to mitigate them.						
	G-a. Ongoing: Provide for an increased level of safety to the citizens of Lynden.	1, 5	Lynden City Council	H	O	Local sources, and state and federal grants	
	G-b. Ongoing: Provide for an increased level of protection for public infrastructure.	1, 5	Lynden City Council	M	O	Local sources, and state and federal grants	
	G-c. Ongoing: Work with neighboring jurisdictions to add additional flow capacity to the Nooksack River in order to minimize catastrophic flooding losses.	1, 3	Lynden City Council	M	O	Local sources, and state and federal grants	
Education and Outreach	***EO-a. Ongoing: Ongoing Community-wide Education and Awareness Activities.***	1, 2	Lynden Fire Department and Department of Emergency Management	L	O	Local	
Hazard Specific (Reference:	Actions communities is considering to reducing risk to natural hazards and disasters.						

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

IDENTIFIED MITIGATION ACTIONS 2021-2025, LYNDEN							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
Whatcom County Mitigation Ideas)							
Dam/Levee Failures (See: Flooding)							
Droughts/Heat Waves	***D-a Ongoing: Monitor Water Supply***	1,3	PW	H	O	Local	2,000
	D-b Ongoing: Require Water Conservation During Drought Conditions	1,3	PW	H	O	Local	1,000
Earthquakes	***EQ-a Ongoing: Conduct Inspections of Building Safety***	1	LFD	M	O	Local	10,000
	EQ-b Ongoing: Protect Critical Facilities and Infrastructure	1,5	PW / LFD	M	O	Local	2,000
	EQ-c Ongoing: Conduct Outreach to Builders, Architects, Engineers, and Inspectors	2	PW	M	O	Local	1,000
Extreme Temperatures	***ET-a Ongoing: Assist Vulnerable Populations***	1	LFD	H	O	Local	1,000
	F-a Ongoing: Incorporate Flood	1	PW	M	O	Local	2,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

IDENTIFIED MITIGATION ACTIONS 2021-2025, LYNDEN							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
Flooding	***Mitigation in Local Planning***						
	F-b Ongoing: Limit or Restrict Development in Floodplain Areas	1,3	PLANNING	M	O	Local	1,000
	F-c Ongoing: Improve Stormwater Management Planning	1,5	PW	M	O	Local	1,000
	F-d Ongoing: Improve Stormwater Drainage System Capacity	1,5	PW	M	O	Local	1,000
	F-e Ongoing: Conduct Regular Maintenance for Drainage Systems and Flood Control Structures	1.5	PW	M	O	Local	2,000
	F-f Ongoing: Protect Infrastructure	1	PW	M	O	Local	1,000
	F-g Ongoing: Preserve Floodplains as Open Space	3	PW	M	O	Local	500
	F-h Ongoing: Increase Awareness of Flood Risk and Safety	2	PW / LFD	M	O	Local	1,000
	F-1 Elevate or Retrofit Structures and Utilities Sewer outfall on Nooksack River in need	5	PW	H	S	Local	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

IDENTIFIED MITIGATION ACTIONS 2021-2025, LYNDEN							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	of retrofit.						
	F-2 Protect Wastewater Treatment Plant Construct a ring dike, flood wall, or otherwise mitigate the wastewater treatment plant against a 75-year flood event or volcanic lahars.	5	PW	L	S	Local, State, and Federal	
	F-3 Relocate Wastewater Shops and Offices The Wastewater Treatment shops and offices are located in the floodplain. These should be mitigated in place or moved out of the floodplain.	1,5	PW	L	L	Local, State, and Federal	
	F-4 Fishtrap Creek Flood Storage and Fish Enhancement Fishtrap Creek has had a significant amount of its floodwater storage capacity eliminated due to development. With very little storage capacity left, any discharges into the stream system immediately surge downstream. Increasing this storage	3	PW	M	S	Local, State, and Federal	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

IDENTIFIED MITIGATION ACTIONS 2021-2025, LYNDEN							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	capacity would mitigate to attenuate stream discharges.						
Landslide/ Erosion	No actions currently ongoing or planned						
Land Subsidence	No actions currently ongoing or planned						
Lightning	No actions currently ongoing or planned						
Severe Storms	No actions currently ongoing or planned						
Severe Wind	No actions currently ongoing or planned						
Tornadoes	No actions currently ongoing or planned						
Wildfires	No actions currently ongoing or planned						
Winter Storms/ Freezes (Severe Winter Weather)	***WW-a. Ongoing: Protect Power Lines***	5	POWER COMPANY / PW	H	O	Local	10,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

IDENTIFIED MITIGATION ACTIONS 2021-2025, LYNDEN							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
Multi-Hazard	***MU-a. Ongoing: Prevent Development in Hazard Areas***	1	PLANNING	M	O	Local	500
	MU-b. Ongoing: Adopt and Enforce Building Codes	1	PW / LFD	M	O	Local	4,000
	MU-c. Ongoing: Monitor Mitigation Plan Implementation	1	PLANNING	M	O	Local	500
Advanced Mitigation Projects (Dream List)	**Lahar Early Warning System** – The US Geological Survey has designed a number of systems that automatically detect lahars as they descend neighboring valleys. These systems automatically trigger various types of early warning systems, such as sirens or telephone-based warning systems, such as the reserve 911 telephone-based warning system the city secured.	1,2	WCDEM/LFD	L	L	Local sources, and state and federal grants	
	Community Early Warning System - A community-wide warning system could be	1,2	WCDEM/LFD	L	L	Local sources, and state and federal grants	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

IDENTIFIED MITIGATION ACTIONS 2021-2025, LYNDEN							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	built to help provide broad community notice for evacuation in the event of flooding, lahars, dam failures, etc. Such an early warning system would typically be a series of sirens that could be triggered in the event the City needed to be evacuated.						
	Cell Phone-Based Early Warning System. A computerized early warning system that automatically dials each landline telephone number within a specified area, and play a recorded message when the phone is answered is currently provided to the City by the Whatcom County Sheriff's Office Division of Emergency Management. A larger capacity system that can also contact cell phones through the use of a federally licensed COG would help to address a variety of natural and manmade problems.	1,2	WCDEM/LFD	L	L	Local sources, and state and federal grants	

IDENTIFIED MITIGATION ACTIONS 2021-2025, LYNDEN							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	Tone Radio Based Early Warning System - Tone Radios turn on when triggered by a central transmitter, and then information or instructions are announced over the radio. Such a system is currently used for various types of weather radios, for tornados and severe storms hazard areas. A similar system could be put into place for warnings of flooding, lahars, and other related natural hazards.	1,2	WCDEM/LFD	L	O	Local sources, and state and federal grants	
	Earthquake Early Warning System -Such a system could warn residence of an impending earthquake. Technology doesn't currently exist for such a system, but will likely be possible in the future.	1,2	WCDEM/LFD	L	O	Local sources, and state and federal grants	

Lynden Annual Review and Progress for Hazard-Specific Mitigation Actions 2021-2025

Progress monitoring means tracking the implementation of the hazard specific mitigation actions over time. Each jurisdiction must identify how, when, and by whom action items will be monitored. The responsible agency assigned to each mitigation action is responsible for tracking and reporting on each of their actions.

Annual review and progress reporting includes the following:

Step One: Identify mitigation actions that your planning team has identified for the annual review. The planning team has the option to address ALL action items, or only those that should be acted on during each review cycle.

Step Two: Use the table below to track annual progress. For each action item selected for annual review insert the appropriate letter that indicates the status of that action item.

Step Three: Complete a progress report form as illustrated in Appendix G for each mitigation action item selected for annual review

Step Four: Submit the completed form(s) to the Whatcom County DEM.

City of Lynden Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
GENERAL: ALL HAZARDS						
G-a. Ongoing: Provide for an increased level of safety to the citizens of Lynden.	B					This is baked into our annual budget process.
G-b. Ongoing: Provide for an increased level of protection for public infrastructure.	B					As above.
G-c. Ongoing: Work with neighboring jurisdictions to add additional flow capacity to the Nooksack River in order to minimize catastrophic flooding losses.	B					Consistent work with Whatcom County on strategies to maintain and improve levies and diking systems.
Add New Action Items if Applicable						
EDUCATION AND OUTREACH						
EO-a. Ongoing: Ongoing Community-wide Education and Awareness Activities.	B					Launched "Lynden Watch" website to keep public apprised of Awareness Activities.
Add New Action Items if Applicable						
DROUGHTS/HEAT WAVES						
D-a Ongoing: Monitor Water Supply	B					Completing Industrial Condensate Project Q3 2021.
D-b Ongoing: Require Water Conservation During Drought Conditions	B					Built into City Code
Add New Action Items if Applicable						
EARTHQUAKES						
EQ-a Ongoing: Conduct Inspections of Building Safety	B					FD performs annual inspections of all commercial structures.
EQ-b Ongoing: Protect Critical Facilities and	B					

City of Lynden Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Infrastructure						
EQ-c Ongoing: Conduct Outreach to Builders, Architects, Engineers, and Inspectors	B					Regular and close contact with building community, particularly during COVID emergency.
Add New Action Items if Applicable						
FLOODING						
F-a Ongoing: Incorporate Flood Mitigation in Local Planning	B					Required by code.
F-b Ongoing: Limit or Restrict Development in Floodplain Areas	B					This is required by state and local law.
F-c Ongoing: Improve Stormwater Management Planning	B					Undertaking major project to control stormwater runoff in north-central part of City (Pepin Creek).
F-d Ongoing: Improve Stormwater Drainage System Capacity	B					Improving drainage on Pepin Creek.
F-e Ongoing: Conduct Regular Maintenance for Drainage Systems and Flood Control Structures	B					This is part of normal City activity.
F-f Ongoing: Protect Infrastructure	B					This is part of normal City activity.
F-g Ongoing: Preserve Floodplains as Open Space	B					
F-h Ongoing: Increase Awareness of Flood Risk and Safety	B					
F-1 Elevate or Retrofit Structures and Utilities	B					Retrofitted sewar outfall into Nooksack River, completed Q1 2021.
F-2 Wastewater Treatment Plant	D					Low priority
F-3 Relocate Wastewater Shops and Offices	D					Low priority
F-4 Fishtrap Creek Flood Storage and Fish	B					Always ongoing

City of Lynden Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Enhancement						
Add New Action Items if Applicable						
LANDSLIDES/EROSION						
Add New Action Items if Applicable	E					
LAND SUBSIDENCE						
Add New Action Items if Applicable	E					
TORNADOES						
Add New Action Items if Applicable	E					
TSUNAMI						
Add New Action Items if Applicable	E					
WILDFIRES						
Add New Action Items if Applicable						
	E					
WINTER STORMS/FREEZES (SEVERE WINTER WEATHER)						
WW-a. Ongoing: Protect Power Lines	B					
Add New Action Items if Applicable						
EXTREME TEMPERATURES						
ET-a Ongoing: Assist Vulnerable Populations	B					Will remain a high priority for this City.
ET-b Ongoing: Educate Property Owners About Freezing Pipes	B					Community is largely self-sufficient but City engages on this when appropriate.
Add New Action Items if Applicable						

City of Lynden Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
LANDSLIDE						
Add New Action Items if Applicable	E					
LIGHTNING						
Add New Action Items if Applicable	E					
SEVERE WIND						
Add New Action Items if Applicable						
MULTIPLE HAZARDS						
MU-a. Ongoing. Prevent Development in Hazard Areas						
MU-b. Ongoing: Adopt and Enforce Building Codes						
MU-c. Ongoing: Monitor Mitigation Plan Implementation						
Add New Action Items if Applicable						

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MERIDIAN SCHOOL DISTRICT

Contact Information	**Kurt Harvill** Assistant Superintendent 214 W Laurel Road Bellingham, WA 98226 360-318-2153
Approving Authority	**James Everett, Ed.D** Superintendent 214 W Laurel Road Bellingham, WA 98226 360-398-7111

Planning Process

School District will make use of its capabilities, infrastructure, and dedicated population. The School District will implement its mitigation strategy over the next five years primarily through its annual budget process and varying grant application processes.

The Meridian School District reviewed the previous plan to identify new hazards and recent events to inform new measures. We will work in conjunction with those organizations identified under each mitigation measure to initiate the overall mitigation strategy. Each department or office responsible for carrying out the measures will play a role in self-monitoring and evaluating achievement of measures and objectives. Because the School District has no land use or regulatory authority, it must rely heavily on collaboration with neighboring jurisdictions. For example, for density-related issues the School District will work with partners Whatcom County, and the Hazard Mitigation Forum to implement recommendations into the existing Whatcom County Comprehensive Plan. Other measures will be implemented through collaboration with the identified jurisdictions/departments listed under each measure's evaluation.

These efforts fall under a broader implementation strategy that represents a county-wide effort. This strategy must be adaptable to change while being consistent in its delivery.

Key Contributor List

- Kurt Harvill, Assistant Superintendent
- James Everett, Ed.D, Superintendent
- Joe O'Brien – District Technology Director
- Jay Yeager – District Maintenance and Facilities Director

The information contained in the Natural Hazards Mitigation Plan update regarding hazards, risks, vulnerability, and potential mitigation is based on the best available science and technology currently available. This information and related data on natural hazards potentially impacting Meridian School District will be used as a tool when the School District updates other plans and programs, such as the following:

- Strategic and Emergency Response Plan
- Damage Assessment Plan

As additional information becomes available from other planning sources that can enhance this Plan, that information will be incorporated through the periodic update process.

Plan Maintenance for the Meridian School District

The mitigation implementation strategy is a three-tiered method that emphasizes localized needs and vulnerabilities while addressing School District and multi-jurisdictional policies and programs. The first tier is implementation through individual citizen level—existing public education programs in the School District. For example, programs at the individual level through safety presentations and evacuation drills. The second is a School District-wide mechanism for implementation comprised of School District employees implementing strategies from the Emergency Programs Office, Construction Management Office, Facilities Management Office, and Computing & Telecommunications through an ambitious building construction and remodel plan. This perhaps offers the greatest opportunity to implement mitigation opportunities. The third tier is a more external and multi-jurisdictional mechanism, the Hazard Mitigation Forum (HMF).

This method ensures that implementation speaks to unique vulnerabilities at the most local level, allows for coordination among and between levels, and promotes collaboration and innovation. Further, it provides a structured system of monitoring implementation. Finally, it is a method that can adapt to the changing vulnerabilities of the School District, the region, and the times.

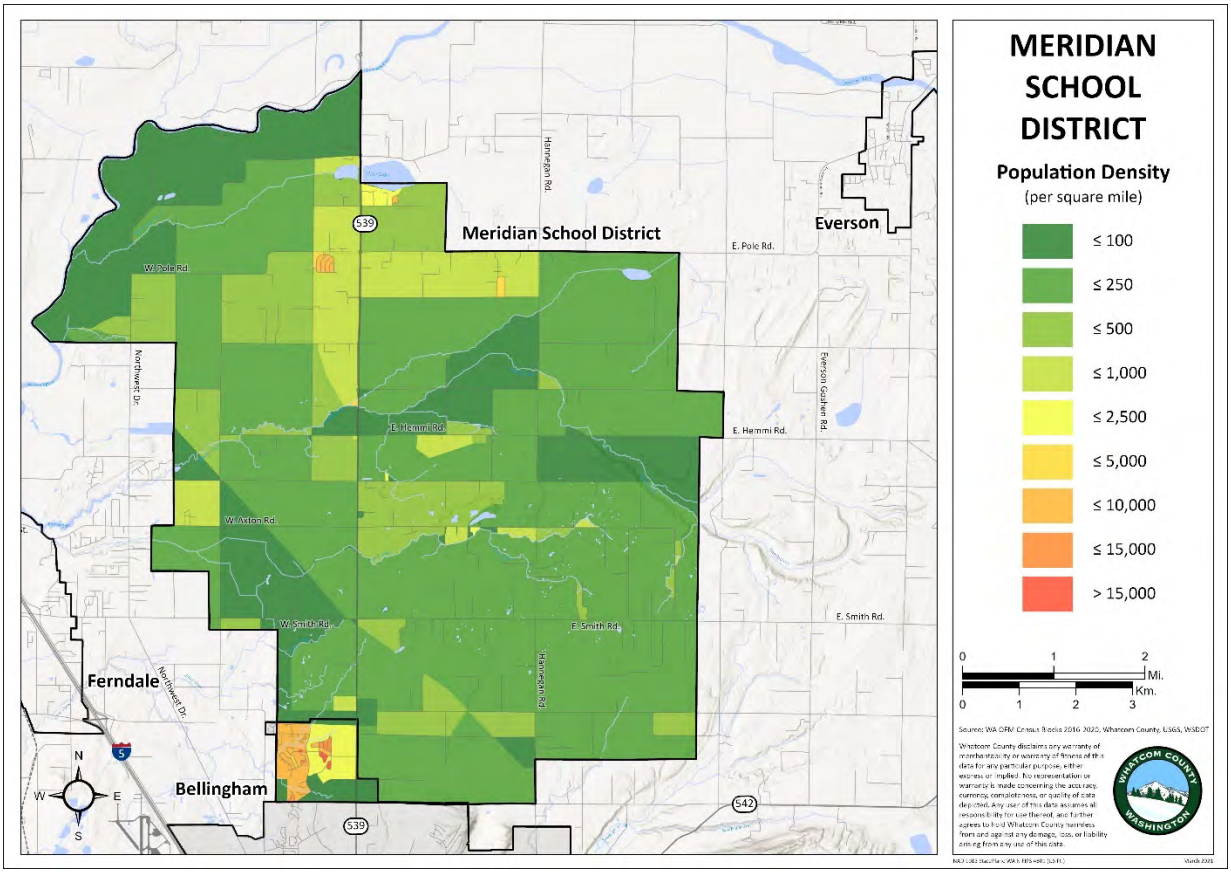
Public Outreach and Education

Program	Yes/No, Year Adopted	Description
Nonprofit organizations or local residents groups focused on hazard mitigation, emergency preparedness, vulnerable populations, etc.	Yes	We teach a fire-science course and have had guests come in to share with classes in the past. We have hosted the WSP drunk driving simulation each 4-6 years.
Ongoing public education or information programs	No Policy; District safety procedures.	We communicate with families and district community members when we are closed or are addressing some need with posting content to our website, Flash Alert system, Student Information System alerts, and robo-calling.
School-related programs for natural hazard safety	Policy 3432, Adopted 2013, Updated 2021	Monthly emergency drills include earthquake, various evacuations, shelter-in-place, and lockdown.
StormReady certification	No	Whatcom is a StormReady County
Firewise Community certification	No	N/A
Public-Private Partnership initiatives addressing disaster-related issues	No	N/A

Overview of Meridian School District, Hazards, and Assets

Geography of the Meridian School District

Meridian School District Students	1800 (2021 estimate)
Meridian School District Staff	250 staff
Total area	38 sq. mi. (within school district)



Washington State Office of Financial Management (OFM) 2020 population and housing estimates for 2010-2020 census block data. This map uses the 2016-2020 average population to show population density per square mile.

Presence of Hazards and their Impacts in the Meridian School District

The main hazards of concern are severe storms and earthquakes. As recently as November 2013, the Meridian School District High School sustained severe cold and wind, resulting in a burst sprinkler head and resulting flood. The damage has been repaired. Another burst pipe, power loss, barn door was blown off and replaced, roofing blown off by wind to the Performing Arts building during winter of 2020. The damage inflicted is a reminder of why proactive steps should be taken to mitigate future natural hazard events.

While enrollment has increased slightly in the past five years, we have not seen an impact to the context of natural hazards in the district. We are currently bringing in eight (8) portables to three sites in the district (three at Meridian Middle School, four at Irene Reither Elementary School, and one to the MP3 campus). There have been no changes other than an increase enrollment and the installation of additional portables (as noted above) during the summer of 2021.

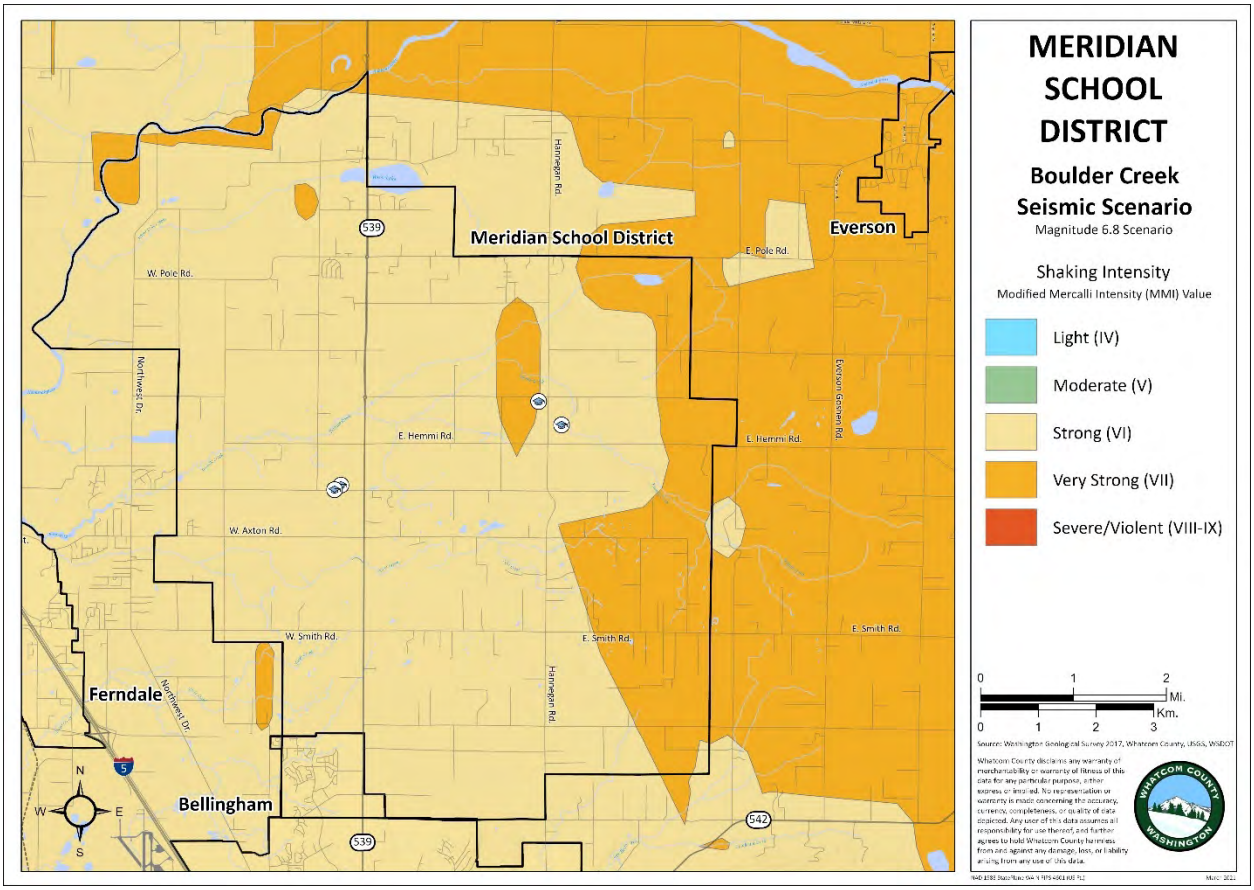
In the table below is a list of the major hazards that effect Whatcom County. The second column provides the percentage of Meridian School Districts' total area that is exposed to each hazard. The third column indicates the severity of anticipated impacts to community function, considering the credible worst-case hazard scenario. Severity of anticipated impacts considers effects on basic community function such as shelter, transportation, utilities, commerce, industry, agriculture, education, health, recreation, and cultural identity. Severity ranges from none to extreme, as shown in the key below the table. Finally, the last column of the table describes where the hazard impacts the community and which services the hazard would most significantly impact.

	Hazard	% area Exposed	Severity of Anticipated Impacts	Hazard Descriptions
Geological	**Earthquake**	97.4%	High	The Meridian School District is prone to earthquake impacts. In particular, according to the Boulder Creek Seismic Scenario, the Meridian School District could receive strong (VI) intensity in the south by the high school and very strong (VII) intensity more north by the middle school.
	Liquefaction	92.81%	High	There are seismically unstable soils throughout the school district.
	Landslide	0.04%	N/A	N/A
	Volcano	7.6%	N/A	N/A
	Tsunami	0%	N/A	N/A
	Mine Hazards	0%	N/A	There are Mine Hazards in north Bellingham, but none are directly below the Meridian schools.
HydrLogical	**Flooding**	6%	Moderate	The Meridian High School, Meridian Parent Partnership Program building, and the Irene Reither Primary School all sit within or near a 100-year floodplain.
Meteorological	**Wildfire**	64.7%	Moderate	There is a risk of fires spreading to the Meridian schools.
	Severe Storms	100%	Moderate	The Meridian School District is subject to severe storms year-round.

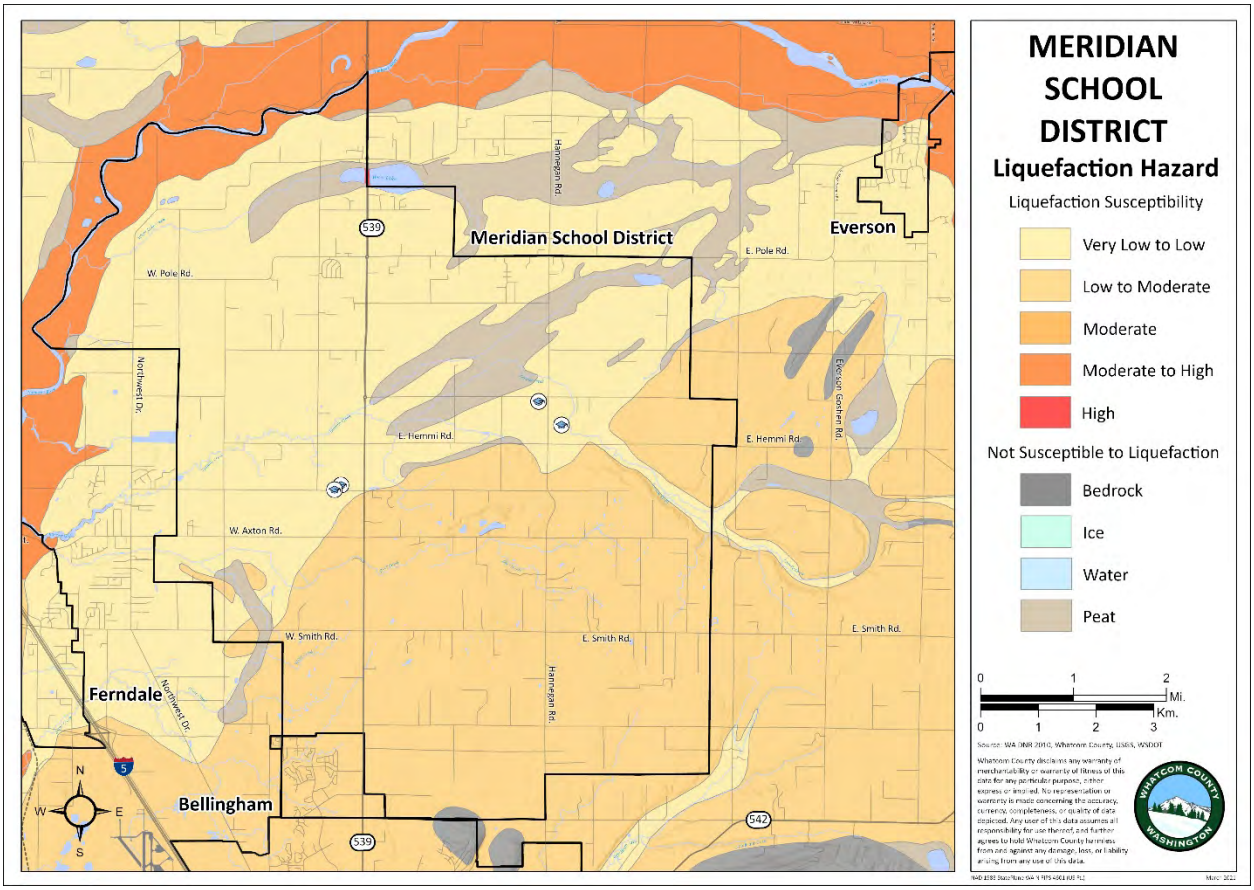
Severity Scale: **None** = no impact to community function
Low = minor degradation of community functions, not widespread
Moderate = moderate degradation over multiple weeks or widespread
High =degradation or loss over many weeks, widespread

Natural Hazard Maps

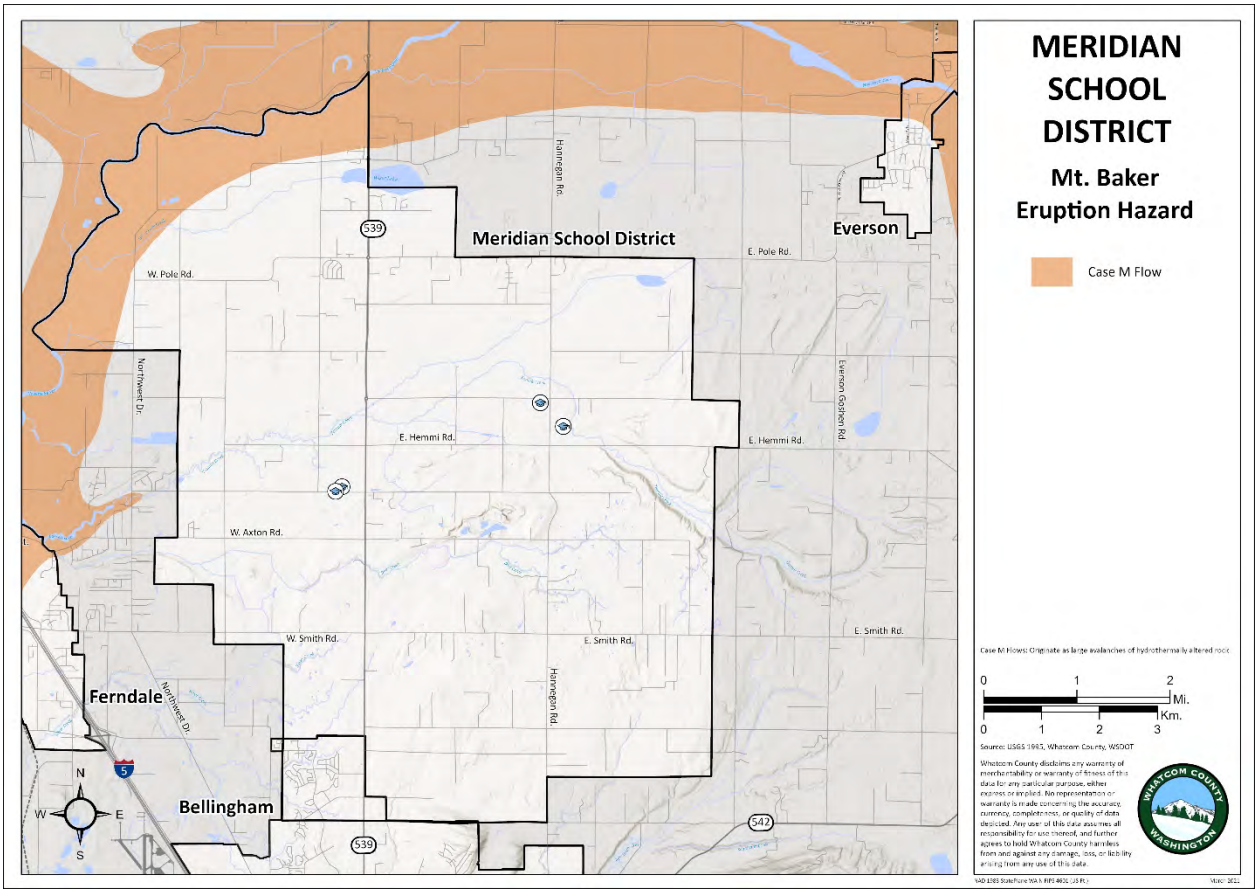
The following figures depict the natural hazards present within the jurisdiction.



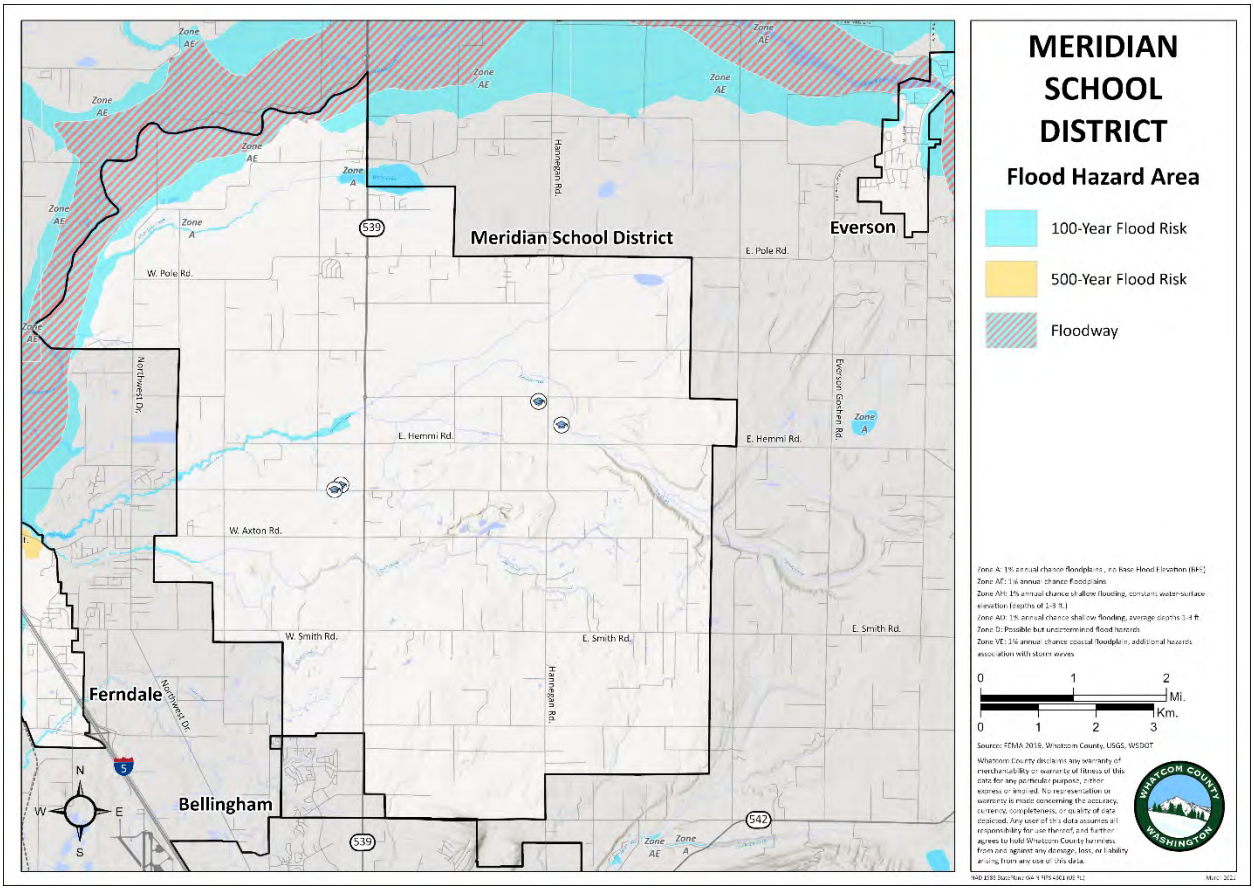
Washington Department of Natural Resources (WA DNR) 2017 Boulder Creek Fault Zone seismic scenario of magnitude 6.8 data. Displays extent and severity of the modeled earthquake in the Modified Mercalli Intensity (MMI) scale.



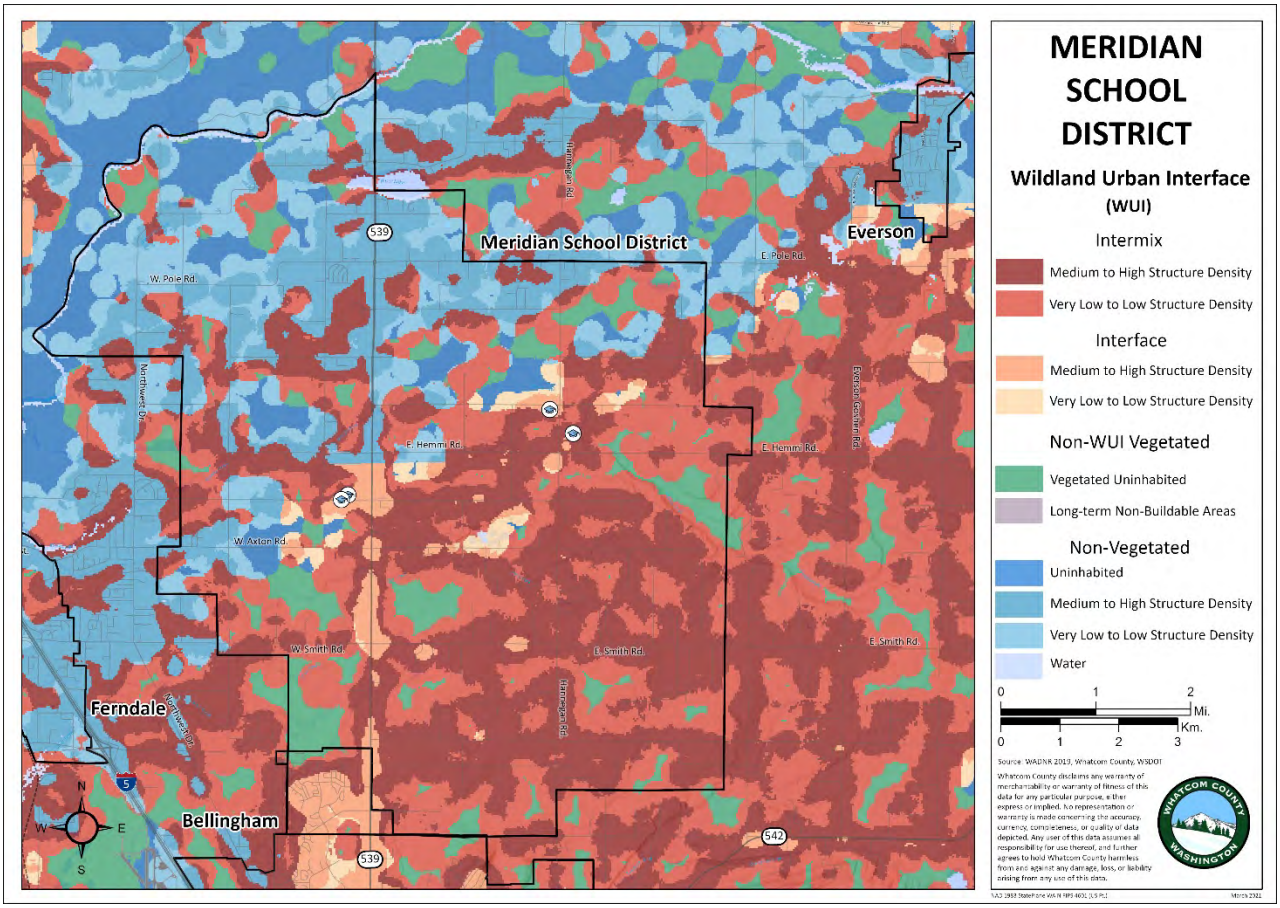
Washington Department of Natural Resources (WA DNR) 2010 liquefaction susceptibility data. This feature class is part of a geodatabase that contains statewide ground response data for Washington State.



USGS Hazards from Future Activity of Mount Baker, WA (1995) data shows different volcanic flows. Case M flows originate as large avalanches of hydrothermally altered rock. Case 1 debris flows are non-cohesive flows related to melting of snow and ice, with a recurrence of 500 years. Case 2 debris flows are cohesive flows from small debris avalanches, with a recurrence of 100 years.



FEMA 2019 flood hazard data showing 100-year flooding, 500-year flooding, floodways, and flood zones. FEMA flood data includes both riverine and coastal flooding.



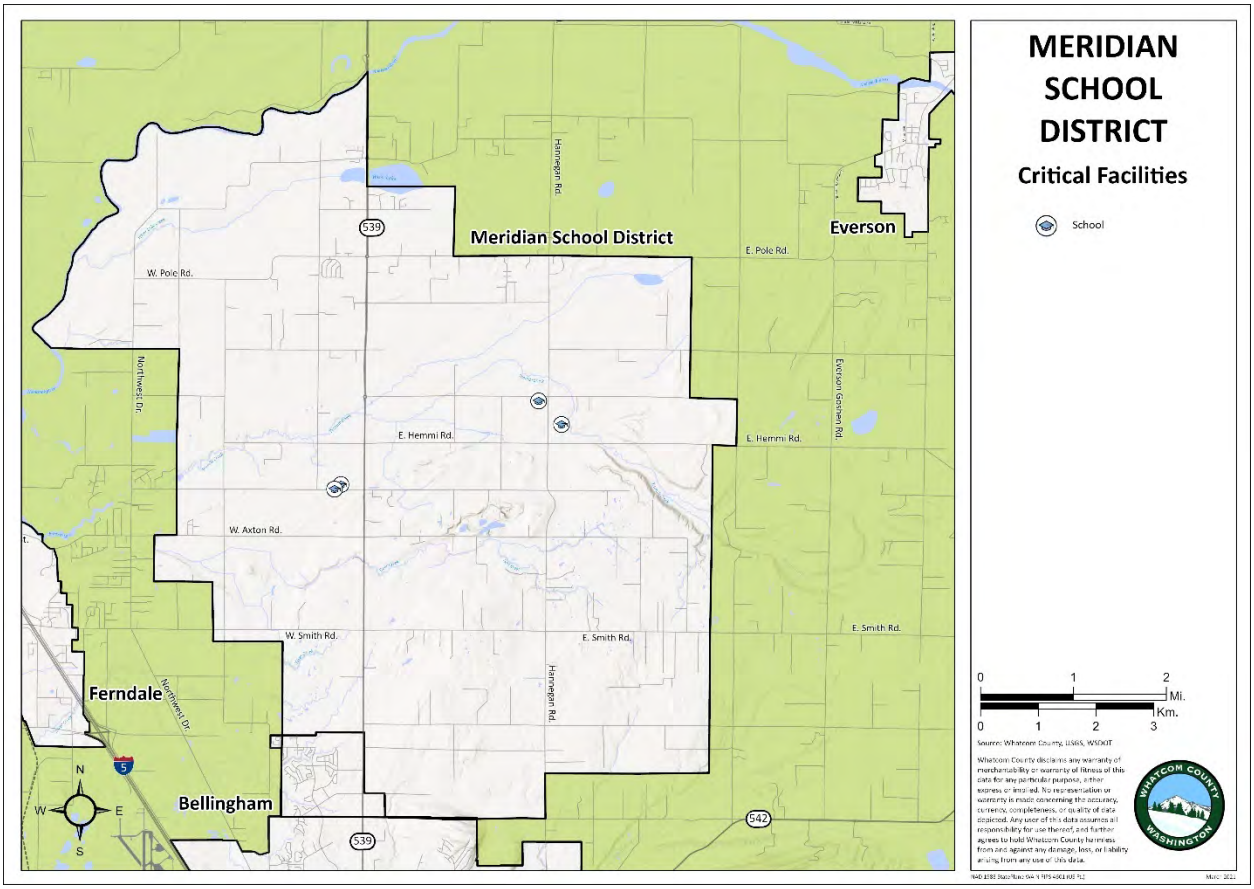
Washington Department of Natural Resources (WA DNR) 2019 mapped data of Washington's Wildland Urban Interface (WUI). The WUI displays areas of WA where structures and wildland overlap with specific structure densities.

Meridian School District Critical Facility List

Facility Name	Facility Type	Signi-ficance	Location	Assessed Dollar Value	Notes
Middle School Gym	EF	3	861 Ten Mile Rd, Lynden, WA		
High School Gym	EF	3	194 W Laurel Rd, Bellingham, WA		
High School Performing Arts Center	EF	3	194 W Laurel Rd, Bellingham, WA		
Irene Reither Elementary	EF	3	954 East Hemmi Road, Everson, WA		
Meridian Middle School	EF	3	861 Ten Mile Rd, Lynden, WA		
Meridian High School	EF	3	194 W Laurel Rd, Bellingham, WA		School and Emergency Shelter
Meridian Parent Partnership	EF	3	240 West Laurel Road, Bellingham		School

Facility Type: **EF** = Essential Facility; **HMF** = Hazardous Materials Facility; **HPL** = High Potential Loss; **LUS** = Lifeline Utility System

Significance to community function: **1**=Moderate; **2**= High; **3** =Very High



Map of critical facilities identified by the Meridian School District. Across Whatcom County, critical facilities fell into 15 categories. Unique categories developed for this plan update include mass shelter, assisted living, and recovery resources. Mass shelter includes facilities such as fairgrounds and community centers. Recovery resources are facilities that are required post-hazard event, for example public works and private construction companies. Not all judications identified or included critical facilities in each category.

Critical Facility Rankings for the Meridian School District

The table below indicates whether each critical facility falls within known hazard zones for earthquake, liquefaction, landslide, tsunami, volcano, riverine flooding, coastal flooding and wildfire zones. A rank assessment in the last column indicates how the relative risk of community impact. This ranking considers the significance of the facility to the community and the number of hazard zones the facility is within. The frequency of each hazard is also considered, such that being in a low frequency hazard zone would receive a lower ranking than that same facility being in a high frequency hazard zone. Ranking is on a scale of 1 to 10, with 1 being the facility with the highest-ranking score, and 10 being a facility with the lowest ranking score in the jurisdiction.

$$\text{Rank} = \text{Significance} * \left[\frac{\text{EQ\_Zone}}{\text{EQ\_Freq}} + \frac{\text{LQ\_Zone}}{\text{LQ\_Freq}} + \frac{\text{LS\_Zone}}{\text{LS\_Freq}} + \ldots + \frac{\text{WF\_Zone}}{\text{WF\_Freq}} \right]$$

Ranking value will be from 0.0 to 1.0, scaled to the highest ranking in the jurisdiction.

Significance: 1=moderate; 2=high; 3=very high, as assessed in the critical facilities list in the previous section

Zone: 0=facility not in hazard zone; 1 = facility in the hazard zone

Frequency (e.g. EQ_Freq, LQ_Freq) is the most difficult variable to which to assign a value. Frequency varies based upon the magnitude of a hazard event and varies from one place to another. It was not possible within the time constraints to assess frequency of hazard at each critical facility location. Instead, a qualitative assessment of the hazard frequency across the entire county was made, as shown in the chart below.

Description	Freq Value used in formula	Hazards
Frequent, occurring on the order of decades	3	Riverine flooding (FL); Coastal flooding (COA)
Rare, occurring on the order of centuries	2	Earthquake (EQ); Liquefaction (LQ); Landslide (LS); Wildfire (WF)
Very rare, occurring on the order of millennia	1	Tsunami (TSU); Volcano (VOL)

Note: Severe storm, a very frequent hazard, was omitted because it is ubiquitous and because no hazard map of storm severity was available.

Critical Facilities Ranking Table

Facility Name	Facility Type	Signi-ficance	EQ	LQ	LS	TSU	VOL	FL	COA	WF	Rank Assessment
Middle School Gym	EF	3	1	1	0	0	0	0	0	1	1
High School Gym	EF	3	1	1	0	0	0	0	0	1	1
High School Performing Arts Center	EF	3	1	1	0	0	0	0	0	1	1
Irene Reither Elementary	EF	3	1	1	0	0	0	0	0	1	1
Meridian Middle School	EF	3	1	1	0	0	0	0	0	1	1
Meridian High School	EF	3	1	1	0	0	0	0	0	1	1
Meridian Parent Partnership	EF	3	1	1	0	0	0	0	0	1	1

Notes: **EQ** = Earthquake; **LQ** =Liquefaction; **LS** = Landslide; **TSUN** = Tsunami; **VOL** = Volcano; **FL** = Riverine Flooding; **COA** = Coastal Flooding; **WF** = Wildland Fire

Areas and Assets Exposed, Per Hazard

Meridian School District's Exposure to Natural Hazards						
	Hazard Susceptibility	Asset County (% of Total)				Critical Facilities Appraised Value (Million)
		Area (sq.mi.)	Population	Parcels	Critical Facilities	
Geological Hazards	**Earthquake**, Shaking Intensity					
	MMI V	-	-	-	-	-
	MMI VI	83.5%	90.3%	85.6%	75%	$19
	MMI VII	13.9%	9.6%	13.9%	25%	$7
	MMI VIII - IX	-	-	-	-	-
	TOTAL	97.4%	99.9%	99.5%	100%	$26
	Liquefaction					
	Very Low to Low	43.7%	36.8%	51.4%	100%	$25
	Low to Moderate	45.4%	53.6%	44.5%	-	-
	Moderate	-	-	-	-	-
	Moderate to High	3.7%	1.8%	0.8%	-	-
	High	0.01%	0.01%	-	-	-
	TOTAL	92.81%	92.21%	96.7%	100%	$25
	Landslide					
	Landslide Low	-	-	-	-	-
	Landslide Moderate	-	-	-	-	-

	Landslide High	-	-	-	-	-
	Fan Low	0.04%	0.01%	0.03%	-	-
	Fan Moderate	-	-	-	-	-
	Fan High	-	-	-	-	-
	Mine Hazard	-	-	-	-	-
	TOTAL	0.04%	0.01%	0.03%	-	-
	Volcanic Eruption					
	Case 1 Debris Flows	-	-	-	-	-
	Case 2 Debris Flows	-	-	-	-	-
	Case M Flows	7.6%	1.9%	3.4%	-	-
	Pyroclastic Flows, Lava Flows, and Ballistic Debris	-	-	-	-	-
	Lateral Blast Hazard Zone	-	-	-	-	-
	TOTAL	7.6%	1.9%	3.4%	-	-
	Tsunami, Inundation Zone					
	Low to Moderate Inundation Potential	-	-	-	-	-
	Moderate to High Inundation Potential	-	-	-	-	-
	High Inundation Potential	-	-	-	-	-
	TOTAL	-	-	-	-	-

Hydrological Hazards	**Flooding**					
	100-year Flood	2.2%	16.2%	1.6%	-	-
	500-year Flood	-	-	-	-	-
	Floodway	3.8%	5.7%	-	-	-
	Undetermined (Zone D)	-	-	-	-	-
	TOTAL	6%	21.9%	1.6%	-	-
Meteorological	**Wildfire Zones**					
	Interface Very Low-Low Structure Density	1.5%	0.6%	1.7%	-	-
	Interface Medium-High Structure Density	3.9%	16.8%	4.8%	75%	$21
	Intermix Very Low-Low Structure Density	25.4%	14.7%	12.4%	-	-
	Intermix Medium-High Structure Density	33.9%	27.3%	44.3%	25%	$4
	TOTAL	64.7%	59.4%	63.2%	100%	$25

Status of Meridian School District's 2016-2020 and Ongoing Hazard Mitigation Actions

This section describes the status of mitigation actions that were proposed in the 2016 Mitigation Plan and are now 1) currently being implemented and are ongoing, 2) are now completed, or 3) are now discontinued because they are no longer needed. The actions are organized by hazard and indicate the lead agency, funding source, and status.

Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
Funding Source	Local; State; FEMA; Private; Other
Current Status	Action Discontinued / Action Completed / Action ongoing and expected completion date

Education and Outreach

EO-a Drills: Classroom, School, and District. Monthly emergency drills include earthquake, various evacuations, shelter-in-place, and lockdown. Goals 1, 2, and 5.

Lead Agency	Principals, District Office
Funding Source	Local
Current Status	Ongoing

EO-b. Preparedness handbooks. Goals 1, 4, and 5.

Lead Agency	Whatcom County Division of Emergency Management
Funding Source	County
Current Status	Ongoing

EO-c. Annual Correspondence. Ongoing communication with WCDEM to ensure procedures are appropriate and updated. Goal 1.

Lead Agency	WCDEM/ District
Funding Source	County / Local
Current Status	Ongoing

Drought/heat wave

No actions ongoing, discontinued, or completed for this hazard.

Earthquake

EQ-a. Building Inspections/ trained staff for shut offs.

Lead Agency	Director of Maintenance
Funding Source	Local
Current Status	Ongoing

EQ-b. Review and Update Emergency Preparedness Plan

Lead Agency	Supt or Designee
Funding Source	Local
Current Status	Ongoing

EQ-c. Increase Risk Awareness

Lead Agency	Supt or Designee
Funding Source	Local
Current Status	Ongoing

EQ-d. Damage Assessment Plan

Lead Agency	Designee
Funding Source	Local
Current Status	Ongoing

Extreme Temp

No actions ongoing, discontinued, or completed for this hazard.

Flooding

No actions ongoing, discontinued, or completed for this hazard.

Landslide/erosion

No actions ongoing, discontinued, or completed for this hazard.

Landslide Subsidence

No actions ongoing, discontinued, or completed for this hazard.

Lightning

No actions ongoing, discontinued, or completed for this hazard.

Severe Storm

SS-a. Storm Preparedness Check list.

Lead Agency	Director of Maintenance
Funding Source	Local
Current Status	Ongoing

SS-b. Post Storm checklists (debris and damage management).

Lead Agency	Director of Maintenance
Funding Source	Local
Current Status	Ongoing

SS-c. Review and Update Emergency Preparedness Plan

Lead Agency	Supt or Designee
Funding Source	Local
Current Status	Ongoing

Severe Wind

No actions ongoing, discontinued, or completed for this hazard.

Tornadoes

No actions ongoing, discontinued, or completed for this hazard.

Tsunami

No actions ongoing, discontinued, or completed for this hazard.

Wildfire

No actions ongoing, discontinued, or completed for this hazard.

Winter storms/Freezes

No actions ongoing, discontinued, or completed for this hazard.

Multiple Hazards

No actions ongoing, discontinued, or completed for this hazard.

Meridian School District 2021-2025 Hazard Mitigation Strategy

Whatcom County Hazard Mitigation Goals

Whatcom County has identified five overarching hazard mitigation goals, which represent what a community seeks to achieve through mitigation actions.

Goal 1. Protect Life, Property and Public Welfare

Goal 2. Increase Public Awareness

Goal 3. Preserve and Enhance Natural Systems

Goal 4. Encourage Partnership for Implementation

Goal 5. Ensure Continuity of Emergency Services

These countywide goals help guide any prioritization and implementation of mitigation actions, ensuring that the actions contribute to a community's vision for the future.

Meridian School District-Specific Hazard Mitigation Goals

Meridian School District does not add to these county-wide goals.

Mitigation Action Options

Appendix E of the Whatcom County Natural Hazard Mitigation Plan provides a list of mitigation options. Meridian School District considered mitigation options related to earthquakes and severe storms because these hazards have the potential to cause the greatest loss and damage. Not all mitigation options in Appendix E were relevant or a strong priority for Meridian School District. Some options have already been implemented or are ongoing in Meridian School District, as documented in the section above on the status of 2016-2020 and ongoing hazard mitigation actions.

Mitigation Action Prioritization

The mitigation actions in this section are new actions that Meridian School District has prioritized for the 2021-2025 planning period and beyond. Mitigation options were prioritized based upon review of the following two criteria: 1) The action's Overall Feasibility based on engineering, environmental, financial and political considerations, 2) The Criticality of the action, based upon a consideration of which actions had the greatest potential to protect life, property and public welfare. Meridian School District is working in cooperation with the County and other participating communities and special districts to develop a systematic methodology that would use multiple evaluation criteria to determine mitigation action prioritization. This new methodology will be used in future updates of this Plan.

In the following Identified Mitigation Actions 2021-2025 table, each priority action is listed by hazard. Each action is followed by planning goals, lead agency, the priority evaluation, timeline, funding source and estimated cost, where such information is available. This information can be used by local decision makers in pursuing strategies for implementation.

1	Goals	Indicates the hazard mitigation planning goal or goals this action addresses; countywide and/or community-specific
2	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
3	Priority	H (High); M (Medium); L (Low)
4	Timeline	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years)
5	Funding Source	Local; State; FEMA; Private; Other
6	Estimated Cost	Actual; Estimated

Meridian School District Identified Mitigation Actions 2021-2025

MERIDIAN SCHOOL DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Education and Outreach Education and Awareness Actions	These are actions that inform and educate citizens, elected officials, and property owners about hazards and ways to mitigate them.						
	EO-a Ongoing -- Drills: Classroom, School, and District Monthly emergency drills include earthquake, various evacuations, shelter-in-place, and lockdown.	1,2,5	Principals, District office		O		
	EO-b. Ongoing -- Preparedness handbooks.	1,4,5	WCDEM		O		
	EO-c Ongoing -- Annual Correspondence Ongoing communication with WCDEM to ensure procedures are appropriate and updated.	1	WCDEM/ District		O		
Hazard Specific (Reference: Whatcom County Mitigation Ideas)	Actions communities should consider to identify and evaluate a range of potential mitigation actions for reducing risk to natural hazards and disasters.						

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

MERIDIAN SCHOOL DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
Dam/Levee Failures (See: Flooding)	There are no new actions considered/all actions ongoing, discontinued, or completed						
Droughts/Heat Waves	There are no new actions considered/all actions ongoing, discontinued, or completed						
Earthquakes	***EQ-a. Ongoing: Building Inspections/ trained staff for shut offs.***	1,5	Director of Maintenance				
	EQ-b. Ongoing: Review and Update Emergency Preparedness Plan	1, 5	Supt or Designee		O		
	EQ-c. Ongoing: Increase Risk Awareness	2	Supt or Designee		O		
	EQ-d. Ongoing: Damage Assessment Plan	1, 5	Supt or Designee		O		
Extreme Temperatures	There are no new actions considered/all actions ongoing, discontinued, or completed						
Flooding	There are no new actions considered/all actions ongoing, discontinued, or completed						

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

MERIDIAN SCHOOL DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
Landslide/ Erosion	There are no new actions considered/all actions ongoing, discontinued, or completed						
Land Subsidence	There are no new actions considered/all actions ongoing, discontinued, or completed						
Lightning	There are no new actions considered/all actions ongoing, discontinued, or completed						
Severe Storms	***SS-a. Ongoing: Storm Preparedness Checklist.***	1,5	Director of Maintenance		O		
	SS-b. Ongoing: Post Storm checklists (debris and damage management)	1,5	Director of Maintenance		O		
	SS-c. Ongoing: Review and Update Emergency Preparedness Plan	1,5	Supt or Designee		O		
Severe Wind	There are no new actions considered/all actions ongoing, discontinued, or completed						
Tornadoes	There are no new actions considered/all actions ongoing, discontinued, or completed						
Tsunami	There are no new actions considered/all actions ongoing, discontinued, or completed						

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

MERIDIAN SCHOOL DISTRICT IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Wildfires	There are no new actions considered/all actions ongoing, discontinued, or completed						
Winter Storms/ Freezes (Severe Winter Weather)	There are no new actions considered/all actions ongoing.						
Multiple Hazards	There are no new actions considered/all actions ongoing.						

Meridian School District Annual Review and Progress for Hazard-Specific Mitigation Actions 2021-2025

Progress monitoring means tracking the implementation of the hazard specific mitigation actions over time. Each jurisdiction must identify how, when, and by whom action items will be monitored. The responsible agency assigned to each mitigation action is responsible for tracking and reporting on each of their actions.

Annual review and progress reporting includes the following:

Step One: Identify mitigation actions that your planning team has identified for the annual review. The planning team has the option to address ALL action items, or only those that should be acted on during each review cycle.

Step Two: Use the table below to track annual progress. For each action item selected for annual review insert the appropriate letter that indicates the status of that action item.

Step Three: Complete a progress report form as illustrated in Appendix G for each mitigation action item selected for annual review

Step Four: Submit the completed form(s) to the Whatcom County DEM.

Meridian School District Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Education and Outreach						
EO-a Ongoing: Drills-- Classroom, School, and District	B					
EO-b Ongoing: Preparedness handbooks	B					
EO-c Ongoing: Annual Correspondence	B					
Add New Action Items if Applicable						
DAM/LEVEE FAILURES						
Add New Action Items if Applicable	N/A					
DROUGHTS/HEAT WAVES						
Add New Action Items if Applicable	N/A					
EARTHQUAKES						
EQ-a. Ongoing: Building Inspections/ trained staff for shut offs.	B					
EQ-b Ongoing: Review and Update Emergency Preparedness Plan	B					
EQ-c Ongoing: Increase Risk Awareness	B					
EQ-d Ongoing: Damage assessment plan	B					
Add New Action Items if Applicable						
SEVERE STORMS						
SS-a. Ongoing: Storm Preparedness Check list	B					
SS-b. Ongoing: Post Storm checklists (debris and damage management)	B					
SS-c. Ongoing: Review and Update Emergency Preparedness Plan	B					
Add New Action Items if Applicable						

Meridian School District Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
LANDSLIDES/EROSION						
Add New Action Items if Applicable						
LAND SUBSIDENCE						
Add New Action Items if Applicable						
TORNADOES						
Add New Action Items if Applicable						
TSUNAMI						
Add New Action Items if Applicable						
WILDFIRES						
Add New Action Items if Applicable						
EXTREME TEMPERATURES						
Add New Action Items if Applicable						
LANDSLIDE						
Add New Action Items if Applicable						
LIGHTNING						
Add New Action Items if Applicable						
SEVERE WIND						
Add New Action Items if Applicable						
MULTIPLE HAZARDS						
Add New Action Items if Applicable						

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CITY OF NOOKSACK

Contact Information	**Dan MacPhee** Police Chief, City of Everson P.O. Box 315, Everson, WA 98247 (360) 966-4212
Approving Authority	**Mayor Marshall Judy & City Council Members** 103 W. Madison Street Nooksack, WA 98276 (360) 966-2531

Planning Process

The City of Nooksack process of reviewing, updating, and adopting the 2021 update of the Whatcom County Natural Hazards Mitigation Plan (NHMP or Plan) included review by multiple City departments and formal adoption by the City Council. Review of the prior plan began in early 2021. The City Planner reviewed the previous plan and met with the City Clerk and Public Works Director to identify sections of the Plan that might need to be updated. From February through April 2021, the City Planner attended a series of coordination meetings hosted by the County Division of Emergency Management (DEM). Initial guidance was received from DEM regarding the update schedule and the main areas to focus on as part of the update.

In early March 2021, the City provided public notice in the Lynden Tribune regarding the planned update of the NHMP and posted information regarding the update on the City website. Information regarding opportunities to provide public comment was also posted on the City website. During March and April of 2021, the City Planner prepared draft revisions to the NHMP and met with the Public Works Director and the Mayor to review the draft revisions and receive additional input. City staff also coordinated with the Everson Chief of Police regarding details contained in the Nooksack section of the Plan because the Everson Police Department provides police protection services to the city of Nooksack on a contract basis. During the same time period, City staff participated in two virtual public meetings hosted by DEM where the public was invited to receive information and ask questions regarding the 2021 update of the NHMP.

The draft revisions to the NHMP addressing the city of Nooksack, incorporating input received from the Public Works Director, Mayor and Chief of Police, were submitted to DEM in late April of 2021. In May of 2021, DEM notified the public regarding the availability of draft revisions to the full Plan and hosted a third virtual public meeting to receive comments from the public. Following review by the City Council in May 2021, the City Council passed a motion supporting the updates contained in the Nooksack section of draft NHMP. Prior to the Plan being

submitted to the Federal Emergency Management Agency for review, the City Council formally adopted the draft Plan on XX, 2021 through Resolution No. XX. It is anticipated that formal adoption by ordinance will follow approval from FEMA.

Key Contributor List

- Rollin Harper, City Planner
- Mayor Marshall Judy
- Virginia Arnason, City Clerk-Treasurer
- Bob Skillman, Public Works Director
- Everson Chief of Police, Dan MacPhee

Meeting Dates and Attendees

- February 18, 2021 – Harper, Arnason and Skillman
- April 15, 2021 – Harper and Arnason
- April 30, 2021 – Harper and Skillman

The information contained in the Natural Hazards Mitigation Plan update regarding hazards, risks, vulnerability, and potential mitigation is based on the best available science and technology currently available. This information and related data on natural hazards potentially impacting the City of Nooksack will be used as a tool when the City updates other plans and programs, such as the following:

- Comprehensive plan required by the Growth Management Act (GMA);
- Development regulations required by the GMA;
- Critical areas ordinance;
- Capital improvement program;
- Capital facilities planning; and
- Water Resource Inventory Area planning.

As additional information becomes available from other planning sources that can enhance this Plan, that information will be incorporated through the periodic update process.

Plan Maintenance for the City of Nooksack

The City of Nooksack will maintain and update the Natural Hazards Mitigation Plan as needed to respond to changed circumstances, to incorporate best available science and to address

changing community priorities. The Plan update process will include community engagement through public meetings and opportunities for public comment. Formal updates of the Plan will be reviewed by the City Council prior to adoption.

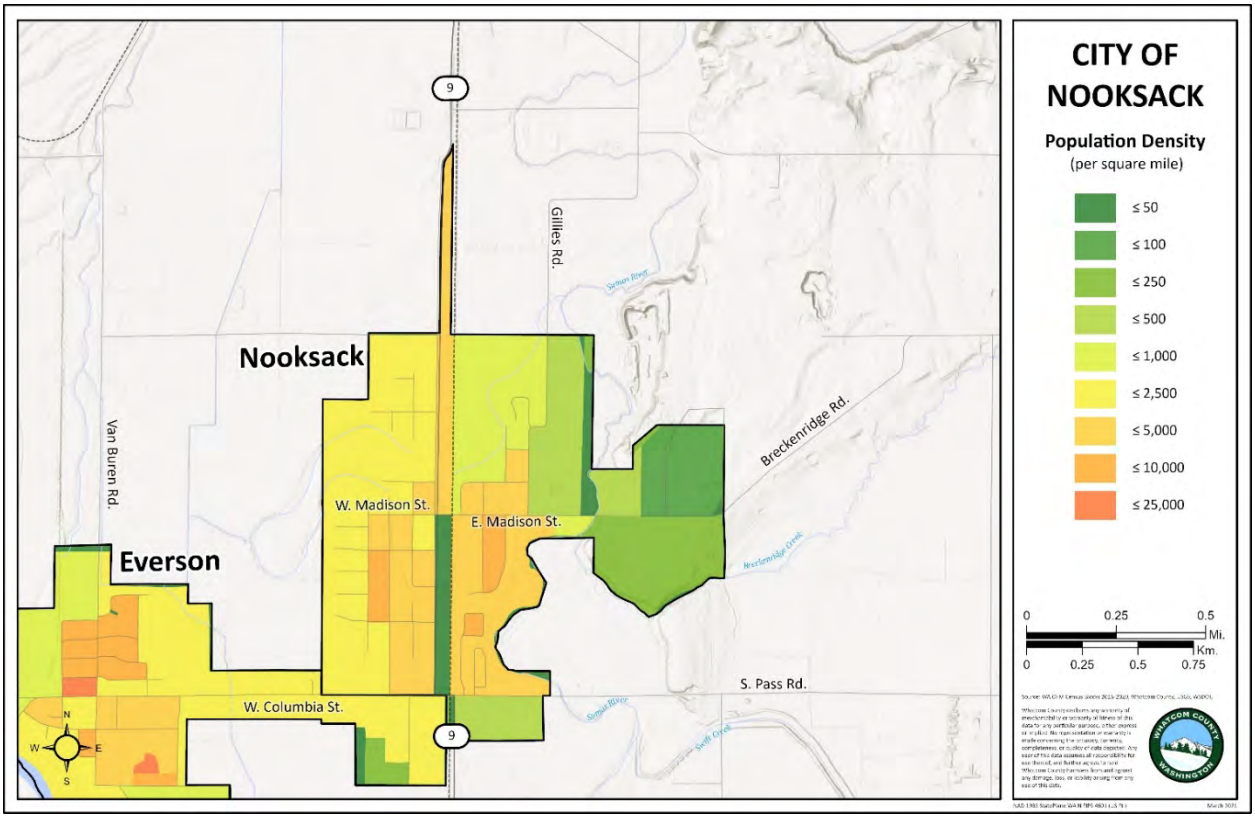
Public Outreach and Education

Program	Yes/No, Year Adopted	Description
Nonprofit organizations or local residents groups focused on hazard mitigation, emergency preparedness, vulnerable populations, etc.	No	
Ongoing public education or information programs	YES 2000-City newsletters	Information regarding water conservation and flood preparedness
School-related programs for natural hazard safety	Yes 2005	Semi-annual in-school drills regarding responses to natural disasters
Public education or information program	Yes 2000-City newsletters	Information regarding water conservation and flood preparedness
StormReady certification	No	Whatcom County is StormReady certified.
Firewise Community certification	No	N/A
Public-Private Partnership initiatives addressing disaster-related issues	No	
Other		

Overview of Nooksack, Hazards, and Assets

Geography of Nooksack

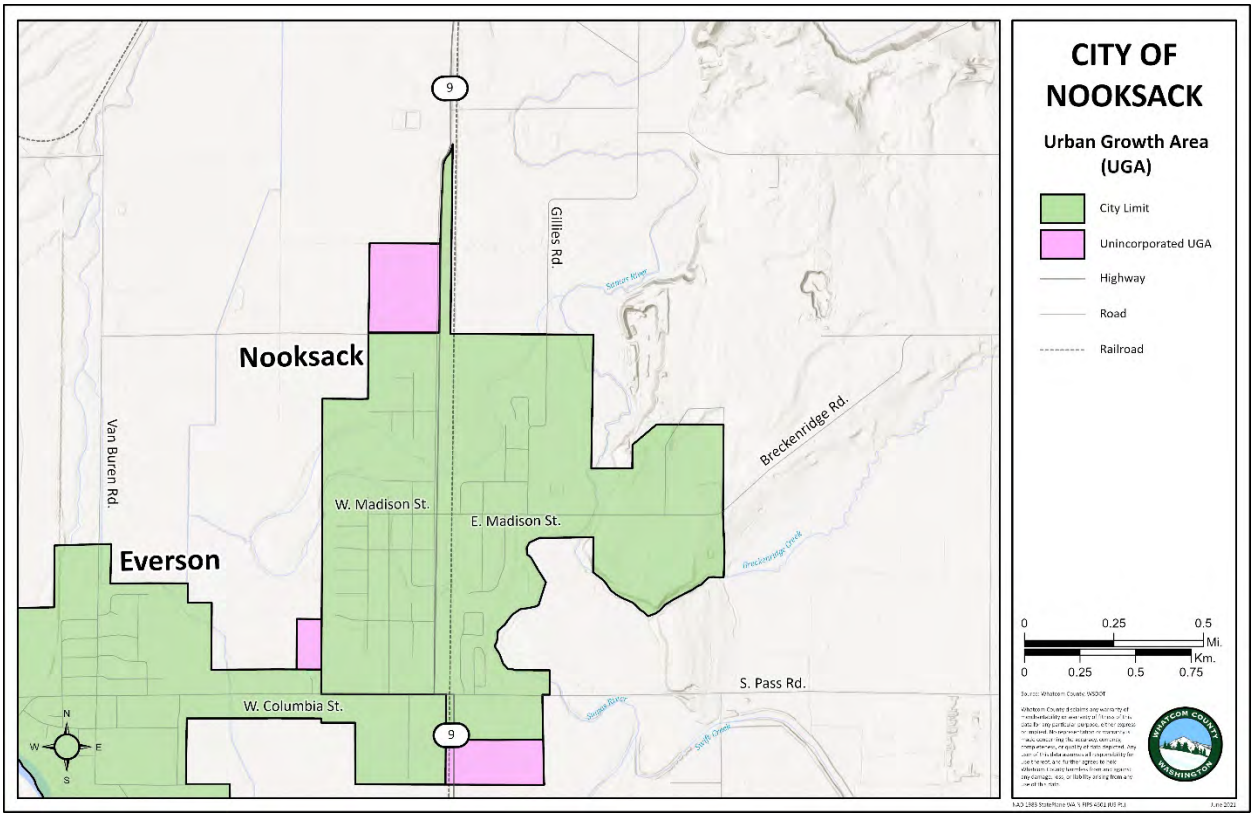
Nooksack Population	1,645 (2020 OFM estimate)
Total area	0.82 sq. mi. (within city limits)



Washington State Office of Financial Management (OFM) 2020 population and housing estimates for 2010-2020 census block data. This map uses the 2016-2020 average population to show population density per square mile.

Growth Trends

This map displays the UGA for the City of Nooksack as designated by the Whatcom County Comprehensive Plan.



Presence of Hazards and their Impacts in the City of Nooksack

Flooding is the main natural hazard that affects the City of Nooksack. Flooding events that affect Nooksack occur about every five to ten years and are associated with flooding of both the Nooksack River along the western border of the city and the Sumas River. That forms a portion of the eastern City limits. The most recent event was in February 2020 when the Nooksack River overflowed its banks to the south of the adjacent city of Everson. As is typical in major flooding events on the Nooksack River, these floodwaters diverged from the main channel and flowed north (through what is referred to as the "Nooksack Overflow Corridor"), flooding the western portions of residential subdivisions in the City of Nooksack and continuing north through the City of Sumas and into Canada. The flow of floodwaters through the Nooksack Overflow Corridor in 2020 resulted in the temporary closure of a portion of State Route 544 (W. Main Street through the City of Everson) that is the main connection route between the wo cities. This closure can significantly interrupt access to police, fire and emergency services that are located on the opposite side of the Overflow Corridor from the City of Nooksack.

During the same event, flooding occurred on the Sumas River that resulted in temporary closure of a major north-south travel route. Flooding of the Sumas River contributes to an additional hazard that affects the City of Nooksack. Floodwaters from the Sumas River often pick up and carry fine particulate matter that contains naturally occurring asbestos that originates from a landslide on the western slope of the nearby Sumas Mountain. These potentially toxic materials are then deposited throughout the Sumas River floodplain, where they can dry and become airborne.

Since the 2016 NHMP was adopted, the City of Nooksack has grown by roughly 170 people. The great majority of this growth has occurred in locations outside the 100-year floodplain. Since 2016, the City has increased residential densities in non-floodplain areas and in areas where structures and building sites can be elevated above he elevation of the 100-year flood event. The City also worked in cooperation with Whatcom County to add approximately 30 acres outside the floodplain to the City's designated urban growth area in exchange for removing a larger area from the UGA that was subject to both flooding from the Sumas River and deposition of naturally occurring asbestos. In December 2019 the City annexed an over 100-acre area of higher ground to the east of the Sumas River that is almost entirely outside the 100-year floodplain.

In the table below is a list of the major hazards that effect Whatcom County. The second column provides the percentage of Nooksack's total area that is exposed to each hazard. The third column indicates the severity of anticipated impacts to community function, considering

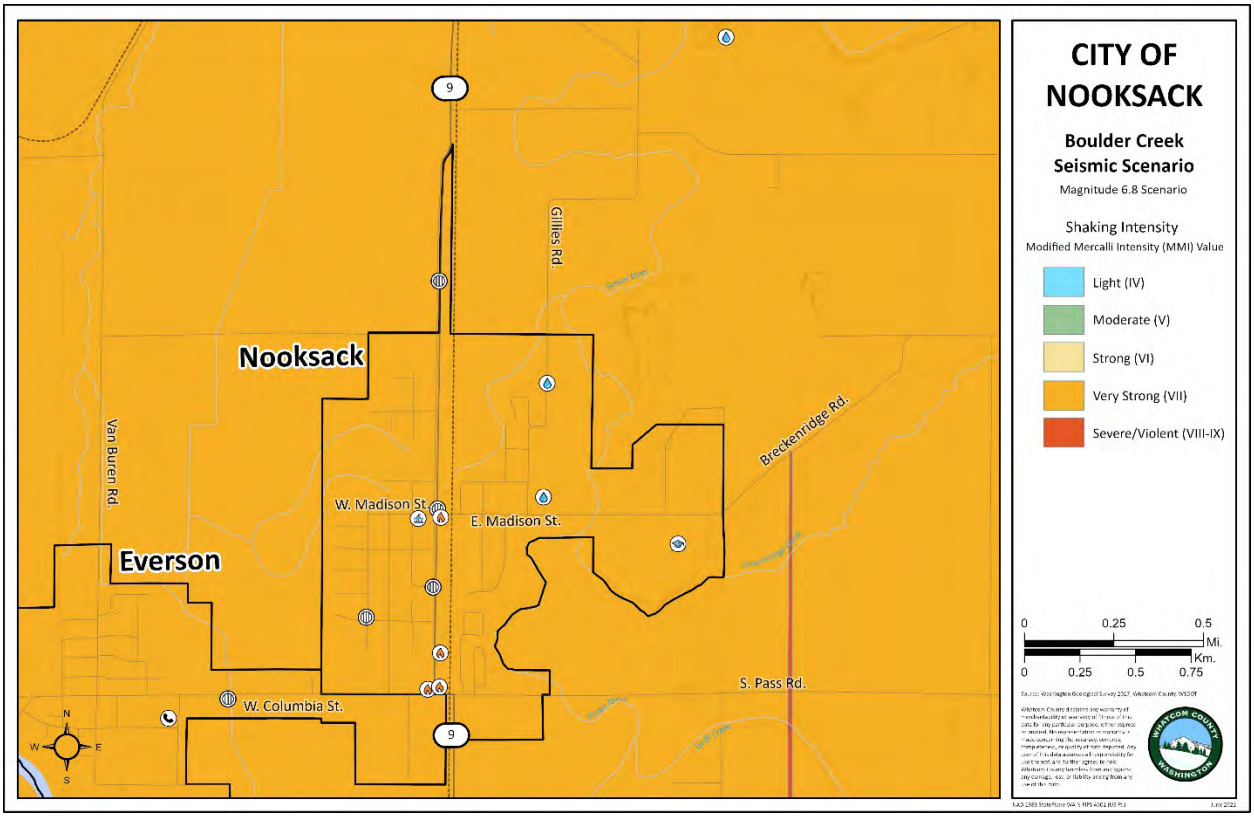
the credible worst-case hazard scenario. Severity of anticipated impacts considers effects on basic community function such as shelter, transportation, utilities, commerce, industry, agriculture, education, health, recreation, and cultural identity. Severity ranges from none to extreme, as shown in the key below the table. Finally, the last column of the table describes where the hazard impacts the community and which services the hazard would most significantly impact.

	Hazard	% area Exposed	Severity of Anticipated Impacts	Hazard Descriptions
Geological	**Earthquake**	100%	Mod	The city is subject to seismic activity.
	Liquefaction	97.2%	Low	Seismically-sensitive soils.
	Landslide	0%	None	N/A
	Volcano	93.9%	Low	All of the area within the city limits would be affected by a Mount Baker lahar.
	Tsunami	0%	None	N/A
	Mine Hazards	0%	None	N/A
Hydrological	**Flooding**	45.5%	High	This hazard occurs frequently and can be severe, especially due the presence of isolated areas. Major flooding occurred in 1989, 1990, and 1995. Flooding begins in the west side of the City and moves east and north up Highway 9, toward Sumas. A dike was extended in 1991 with money from mitigation. The dike runs parallel to the Nooksack River on the West side, ending on Emerson Road. It prevents water from going to Washington St. and on through to Main Street. The dike diverts Nooksack River overflow to the floodway that runs to the north along the western boundary of Nooksack. The Sumas River can flood east of the City, but does not cause severe problems.
Meteorological	**Wildfire**	20.3%	None	N/A

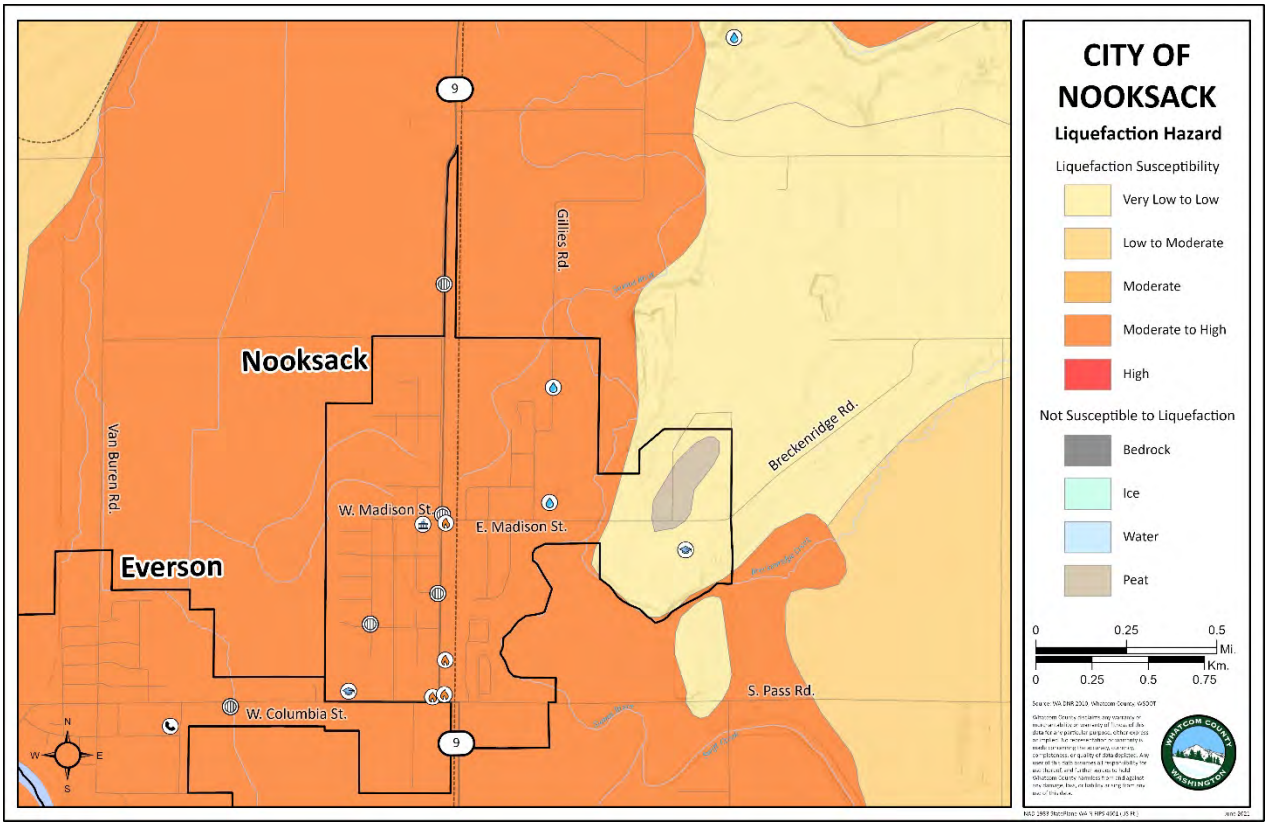
Severity Scale: **None** = no impact to community function
Low = minor degradation of community functions, not widespread
Moderate = moderate degradation over multiple weeks or widespread
High =degradation or loss over many weeks, widespread

Natural Hazard Maps

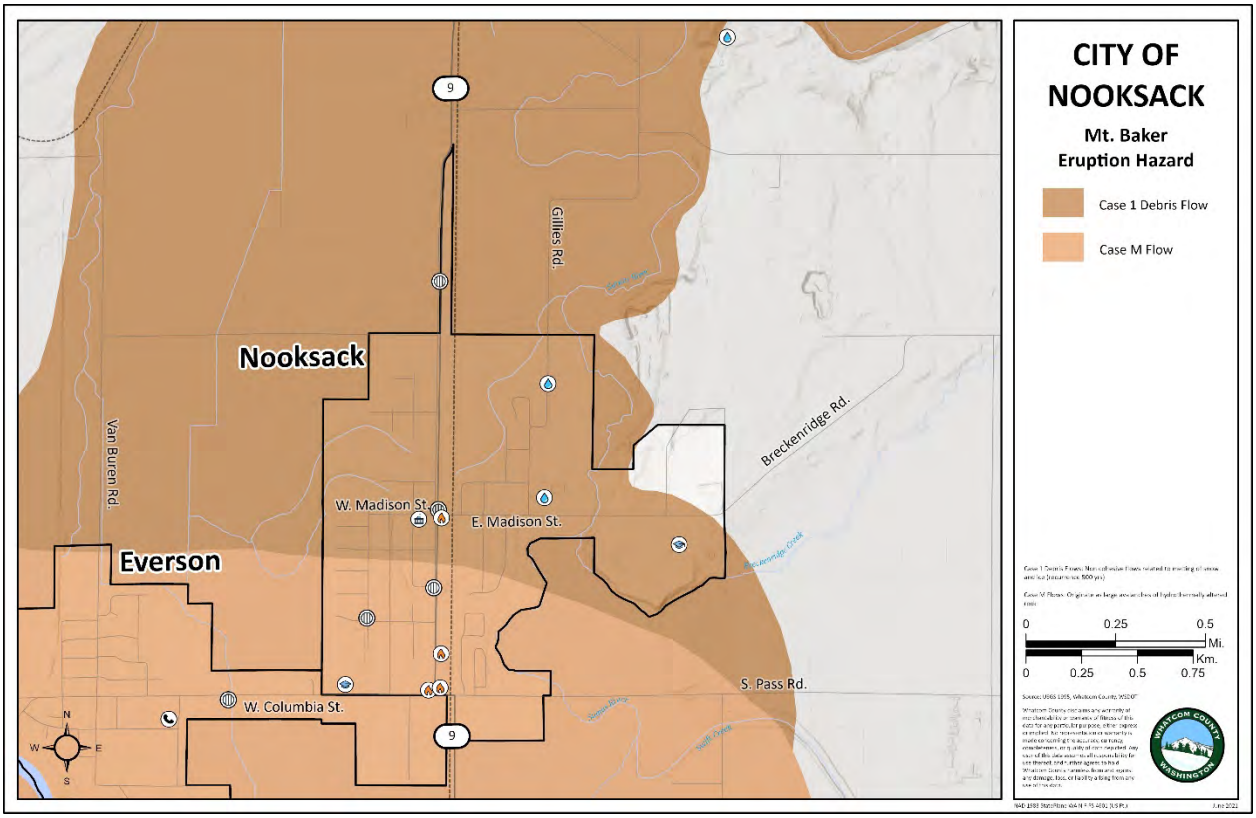
The following figures depict the natural hazards present within the jurisdiction.



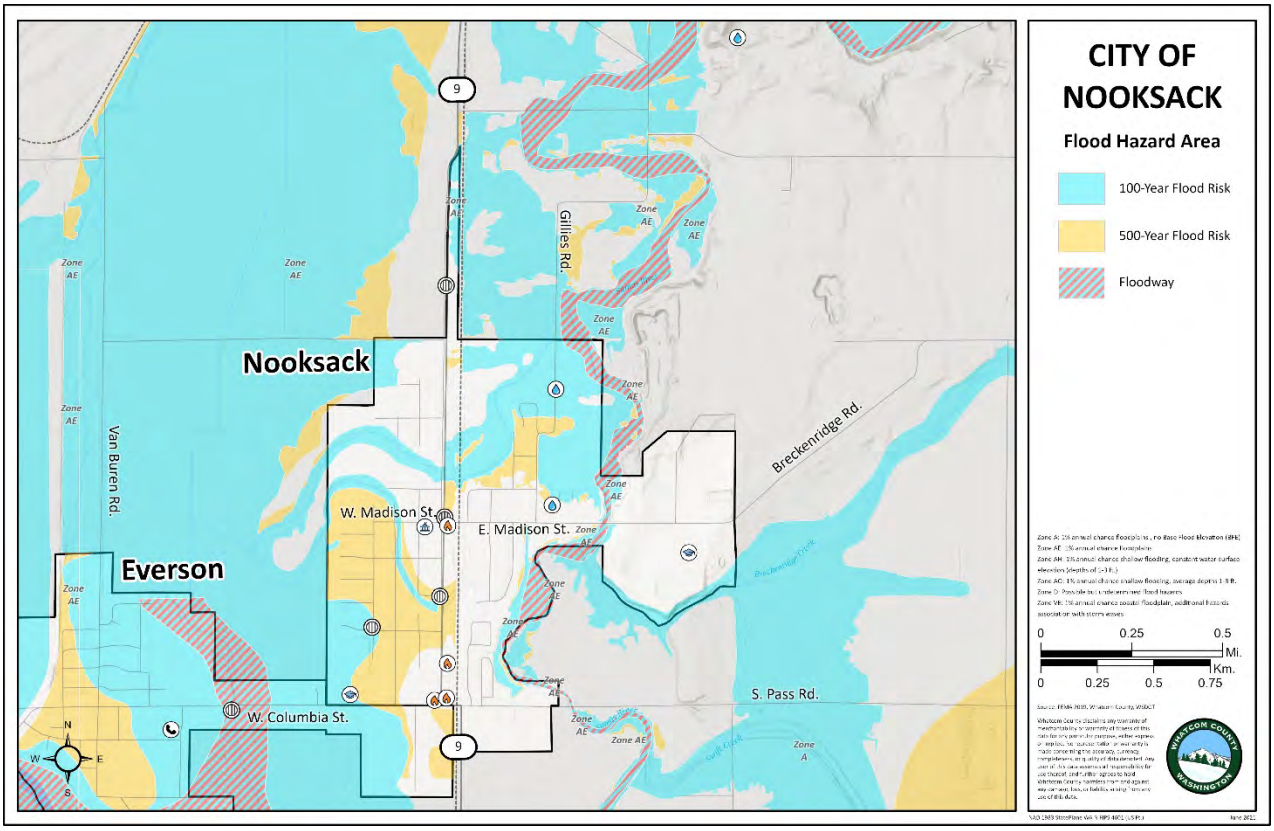
Washington Department of Natural Resources (WA DNR) 2017 Boulder Creek Fault Zone seismic scenario of magnitude 6.8 data. Displays extent and severity of the modeled earthquake in the Modified Mercalli Intensity (MMI) scale.



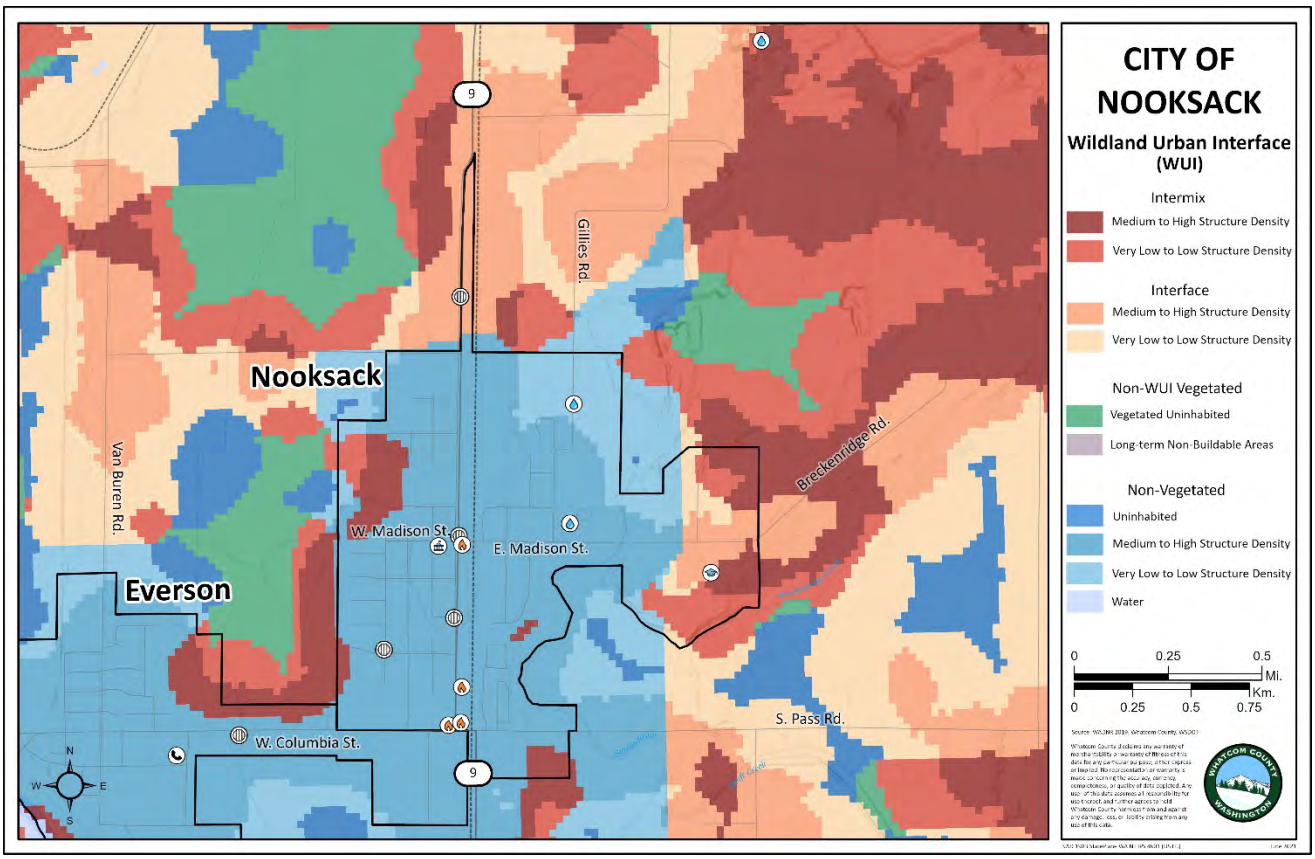
Washington Department of Natural Resources (WA DNR) 2010 liquefaction susceptibility data. This feature class is part of a geodatabase that contains statewide ground response data for Washington State.



USGS Hazards from Future Activity of Mount Baker, WA (1995) data shows different volcanic flows. Case M flows originate as large avalanches of hydrothermally altered rock. Case 1 debris flows are non-cohesive flows related to melting of snow and ice, with a recurrence of 500 years. Case 2 debris flows are cohesive flows from small debris avalanches, with a recurrence of 100 years.



FEMA 2019 flood hazard data showing 100-year flooding, 500-year flooding, floodways, and flood zones. FEMA flood data includes both riverine and coastal flooding.



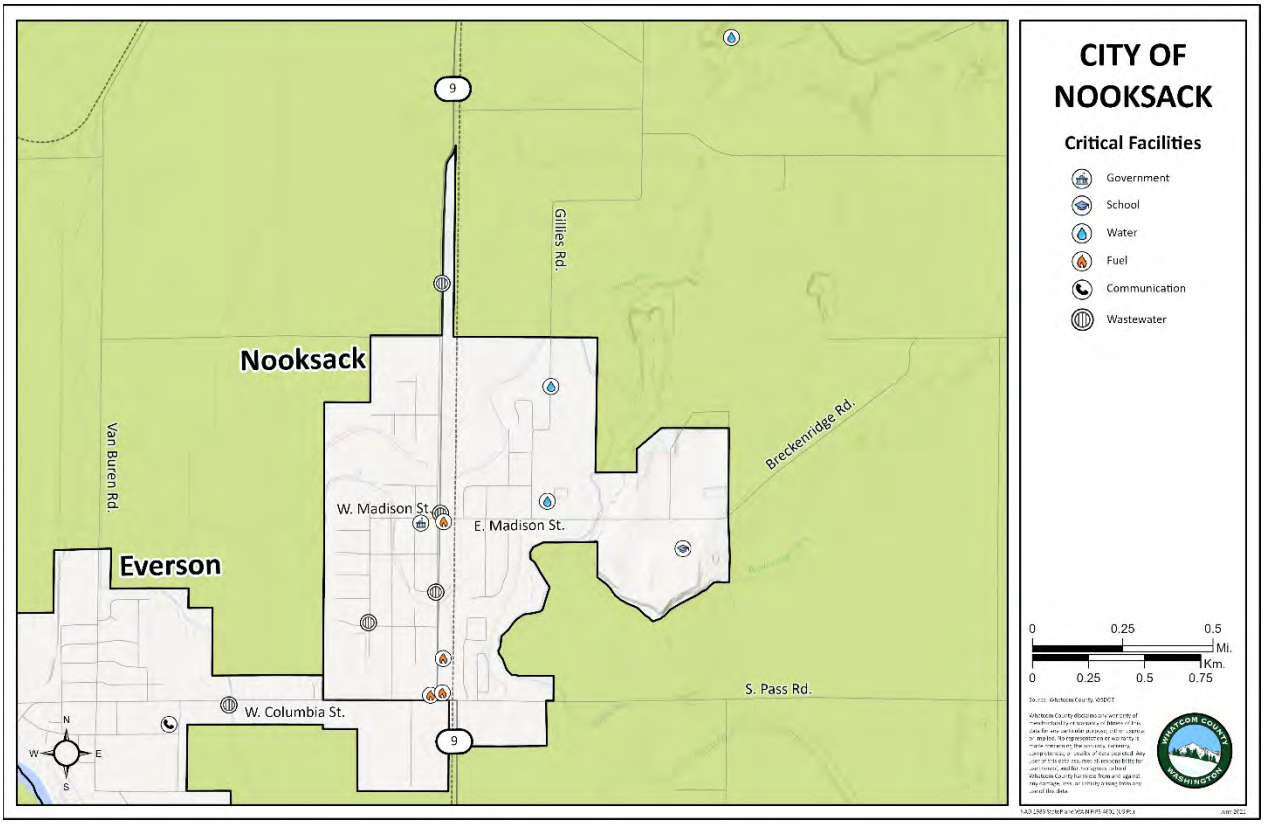
Washington Department of Natural Resources (WA DNR) 2019 mapped data of Washington's Wildland Urban Interface (WUI). The WUI displays areas of WA where structures and wildland overlap with specific structure densities.

Nooksack Critical Facility List

Facility Name	Facility Type	Signi-ficance	Location	Assessed Dollar Value	Notes
Elementary School - Dist. 506	EF	2	3333 Breckenridge Road		Evacuation Center
Nooksack City Hall	EF	3	103 West Madison St		Government
Nooksack Water Tanks	LUS	3	8386 Gillies Rd.		Utility: Water
Post Office	EF	2	108 Blair Drive, Everson		Mail
Pump-Station #1	LUS	3	105 Garfield St.		Utility: Sewer
Pump-Station #2	LUS	2	610 Nooksack Ave.		Utility: Sewer
Pump-Station #3	LUS	2	1216 Nooksack Ave.		Utility: Sewer
Starvin' Sams	HMF	1	102 Columbia St.		Fuel
Pump Station #12	LUS	2	305A West Third St.		Utility: Sewer
Water Booster Pump	LUS	3	1014 Gillies Rd.		Utility: Water
Pacific Pride	HMF	1	204 Nooksack Ave.		Fuel
Whatcom Farmers Co-op Energy	HMF	2	508 Nooksack Ave.		Fuel Propane Depot
Water Pump Station	LUS	2	503 E. Madison St.		Utility: Water
CHS Northwest Store	HMF	1	102 Nooksack Ave.		Fuel
Pump Station #4 (Interceptor)	LUS	3	506 E. Main Street, Everson		Utility: Sewer
CHS Northwest Store	HMF	1	102 Nooksack Avenue		Utility: Sewer
US Border Patrol	EF	3	9648 Garrison Road		

Facility Type: **EF** = Essential Facility; **HMF** = Hazardous Materials Facility; **HPL** = High Potential Loss; **LUS** = Lifeline Utility System

Significance to community function: **1**=Moderate; **2**= High; **3** =Very High



Map of critical facilities identified by the City of Nooksack. Across Whatcom County, critical facilities fell into 15 categories. Unique categories developed for this plan update include mass shelter, assisted living, and recovery resources. Mass shelter includes facilities such as fairgrounds and community centers. Recovery resources are facilities that are required post-hazard event, for example public works and private construction companies. Not all judications identified or included critical facilities in each category.

Critical Facility Rankings for the City of Nooksack

The table below indicates whether each critical facility falls within known hazard zones for earthquake, liquefaction, landslide, tsunami, volcano, riverine flooding, coastal flooding and wildfire zones. A rank assessment in the last column indicates how the relative risk of community impact. This ranking considers the significance of the facility to the community and the number of hazard zones the facility is within. The frequency of each hazard is also considered, such that being in a low frequency hazard zone would receive a lower ranking than that same facility being in a high frequency hazard zone. Ranking is on a scale of 1 to 10, with 1 being the facility with the highest-ranking score, and 10 being a facility with the lowest ranking score in the jurisdiction.

$$\text{Rank} = \text{Significance} * \left[\frac{\text{EQ\_Zone}}{\text{EQ\_Freq}} + \frac{\text{LQ\_Zone}}{\text{LQ\_Freq}} + \frac{\text{LS\_Zone}}{\text{LS\_Freq}} + \ldots + \frac{\text{WF\_Zone}}{\text{WF\_Freq}} \right]$$

Ranking value will be from 0.0 to 1.0, scaled to the highest ranking in the jurisdiction.

Significance: 1=moderate; 2=high; 3=very high, as assessed in the critical facilities list in the previous section

Zone: 0=facility not in hazard zone; 1 = facility in the hazard zone

Frequency (e.g. EQ_Freq, LQ_Freq) is the most difficult variable to which to assign a value. Frequency varies based upon the magnitude of a hazard event and varies from one place to another. It was not possible within the time constraints to assess frequency of hazard at each critical facility location. Instead, a qualitative assessment of the hazard frequency across the entire county was made, as shown in the chart below.

Description	Freq Value used in formula	Hazards
Frequent, occurring on the order of decades	3	Riverine flooding (FL); Coastal flooding (COA)
Rare, occurring on the order of centuries	2	Earthquake (EQ); Liquefaction (LQ); Landslide (LS); Wildfire (WF)
Very rare, occurring on the order of millennia	1	Tsunami (TSU); Volcano (VOL)

Note: Severe storm, a very frequent hazard, was omitted because it is ubiquitous and because no hazard map of storm severity was available.

Critical Facilities Ranking Table

Facility Name	Facility Type	Signi-ficance	EQ	LQ	LS	TSU	VOL	FL	COA	WF	Rank Assessment
Elementary School - Dist. 506	EF	2	1	1	0	0	1	1	0	1	0.81
Nooksack City Hall	EF	3	1	1	0	0	1	0	0	0	0.86
Nooksack Water Tanks	LUS	3	1	1	0	0	0	0	0	1	0.64
Post Office	EF	2	1	1	0	0	1	1	0	0	0.66
Pump-Station #1	LUS	3	1	1	0	0	1	1	0	0	1
Pump-Station #2	LUS	2	1	1	0	0	1	0	0	0	0.57
Pump-Station #3	LUS	2	1	1	0	0	1	1	0	1	0.81
Starvin' Sams	HMF	1	1	1	0	0	1	1	0	0	0.33
Pump Station #12	LUS	2	1	1	0	0	1	1	0	0	0.66
Water Booster Pump	LUS	3	1	1	0	0	1	1	0	0	1
Pacific Pride	HMF	1	1	1	0	0	1	0	0	0	0.29
Whatcom Farmers Co-op Energy	HMF	2	1	1	0	0	1	0	0	0	0.57
Water Pump Station	LUS	2	1	1	0	0	1	1	0	0	0.66
Pump Station #4 (Interceptor)	LUS	1	1	1	0	0	1	1	0	0	1
CHS Northwest Store	HMF	1	1	1	0	0	1	0	0	0	.29
US Border Patrol	EF	3	1	1	0	0	1	1	0	0	1

Notes: **EQ** = Earthquake; **LQ** =Liquefaction; **LS** = Landslide; **TSUN** = Tsunami; **VOL** = Volcano; **FL** = Riverine Flooding; **COA** = Coastal Flooding; **WF** = Wildland Fire

Areas and Assets Exposed, Per Hazard

City of Nooksack Exposure to Natural Hazards						
	Hazard Susceptibility	Asset County (% of Total)				Critical Facilities Appraised Value (Million)
		Area (sq.mi.)	Population	Parcels	Critical Facilities	
Geological Hazards	**Earthquake**, Shaking Intensity					
	MMI V	-	-	-	-	-
	MMI VI	-	-	-	-	-
	MMI VII	100%	100%	100%	93.7%	$7
	MMI VIII - IX	-	-	-	6.3%	$5
	TOTAL	100%	100%	100%	100%	$12
	Liquefaction					
	Very Low to Low	14.4%	1.1%	-	6.3%	$5
	Low to Moderate	-	-	-	-	-
	Moderate	-	-	-	-	-
	Moderate to High	82.8%	98.8%	100%	87.5%	$7
	High	-	-	-	-	-
	TOTAL	97.2%	99.9%	100%	93.8%	$12
	Landslide					
	Landslide Low	-	-	-	-	-
	Landslide Moderate	-	-	-	-	-
	Landslide High	-	-	-	-	-
	Fan Low	-	-	-	-	-
	Fan Moderate	-	-	-	-	-
	Fan High	-	-	-	-	-

	Mine Hazard	-	-	-	-	-
	TOTAL	-	-	-	-	-
	Volcanic Eruption					
	Case 1 Debris Flows	66.4%	58.1%	57.5%	50%	$9
	Case 2 Debris Flows	-	-	-	-	-
	Case M Flows	27.5%	41.6%	42.5%	43.8%	$2
	Pyroclastic Flows, Lava Flows, and Ballistic Debris	-	-	-	-	-
	Lateral Blast Hazard Zone	-	-	-	-	-
	TOTAL	93.9%	99.7%	100%	93.8%	$11
	Tsunami, Inundation Zone					
	Low to Moderate Inundation Potential	-	-	-	-	-
	Moderate to High Inundation Potential	-	-	-	-	-
	High Inundation Potential	-	-	-	-	-
	TOTAL	-	-	-	-	-
Hydrological	**Flooding**					
	100-year Flood	25.7%	20.4%	16.2%	18.8%	$0.8
	500-year Flood	16.9%	25.2%	34.5%	12.5%	$5
	Floodway	2.9%	2%	0.3%	6.3%	-
	Undetermined (Zone D)	-	-	-	-	-
	TOTAL	45.5%	47.6%	51%	37.6%	$5.8
Meteorolog	**Wildfire Zones**					
	Interface Very Low-Low Structure Density	2.3%	0.1%	-	-	-
	Interface Medium-High Structure Density	4.8%	4.3%	4.2%	12.5%	$4

	Intermix Very Low-Low Structure Density	4.9%	1.5%	0.2%	-	-
	Intermix Medium-High Structure Density	8.3%	5.7%	3%	6.3%	$0.3
	TOTAL	20.3%	11.6%	7.4%	18.8%	$4.3

Status of Nooksack's 2016-2020 and Ongoing Hazard Mitigation Actions

The cities of Everson and Nooksack chose to collaborate in their mitigation strategies because Everson provides Nooksack with police and sewer services. (Note: The following information in copied from Everson.)

This section describes the status of mitigation actions that were proposed in the 2016 Mitigation Plan and are now 1) currently being implemented and are ongoing, 2) are now completed, or 3) are now discontinued because they are no longer needed. The actions are organized by hazard and indicate the lead agency, funding source, and status.

Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
Funding Source	Local; State; FEMA; Private; Other
Current Status	Action Discontinued / Action Completed / Action ongoing and expected completion date

General: All Hazards

G-a. Adopt and enforce building codes. This applies to earthquakes, flooding, winter storms/freezes, and severe winds. The City Planning, Building and Public Works Departments continue to adopt and enforce building codes and development regulations that address natural hazards mitigation.

Lead Agency	Nooksack Planning, Building and Public Works Departments
Funding Source	Local
Current Status	Ongoing

Drought/heat wave

D-a. Assess Vulnerability to Drought Risk. The City Planning Department continues to assess risks related to drought, including as part of the 2016 update to the City's critical areas ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

D-b. Monitor Drought Conditions. The City Public Works Department continues to monitor drought conditions on annual basis and implements water-related mitigation strategies as

appropriate.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

D-c. Monitor Water Supply. The City Public Works Department continues to monitor the public water supply and implement water conservation strategies as appropriate.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

D-d. Plan for Drought. The City Planning Department continues to plan for droughts, including as part of the 2016 update of the city comprehensive land use plan.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

D-e. Require Water Conservation During Drought Conditions. The City Public Works Department continues to monitor drought conditions and implement water conservation measures as appropriate.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

D-f. Educate Residents on Water Saving Techniques. The City Administration continues to support education of residents regarding water conservation efforts, including through provision of information along with monthly utility bills.

Lead Agency	City Administration
Funding Source	Local
Current Status	Ongoing

Earthquake

EQ-a. Incorporate Earthquake Mitigation into Local Planning. The City Planning Department continues to incorporate planning related to earthquakes, including as part of the 2016 update to the city comprehensive plan.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

EQ-b. Map and Assess Community Vulnerability to Seismic Hazards. The City Planning Department continues to map and assess vulnerability to seismic hazards, including as part of the 2016 update of the city critical areas ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

EQ-c. Conduct Inspections of Building Safety. The City Building Department continues to conduct inspections related to building safety as required by City building codes.

Lead Agency	City Building Dept.
Funding Source	Local
Current Status	Ongoing

EQ-d. Protect Critical Facilities and Infrastructure. The City Building Department continues to protect critical facilities and infrastructure, including through requiring the local middle school to be constructed with the lowest floor more than 2.5 feet above the FEMA base flood elevation.

Lead Agency	City Building Dept.
Funding Source	Local
Current Status	Ongoing

Extreme Temp

No actions ongoing, discontinued, or completed for this hazard.

Flooding

FL-a. Incorporate Flood Mitigation in Local Planning. The City Planning Department continues to incorporate flood mitigation into local planning, including as part of the 2016 update of the city critical areas ordinance, the 2019 adoption of new FEMA flood insurance rate maps, and updates to the County comprehensive flood hazard management plan currently underway.

Lead Agency	City Planning Dept.
Funding Source	Local

Current Status	Ongoing

FL-b. Form Partnerships to Support Floodplain Management. The City Planning and Public Works Departments continue to work to form partnerships that support floodplain management, including working closely with County long-range and current planning divisions and the County Public Works River and Flood Division.

Lead Agency	City Planning and Public Works Depts.
Funding Source	Local
Current Status	Ongoing

FL-c. Limit or Restrict Development in Floodplain Areas. The City Planning, Building and Public Works Departments continue to limit development in floodplain areas through amendment and enforcement of City critical areas ordinance regulations, national flood insurance program requirements, and city building codes.

Lead Agency	City Planning, Building and Public Works Depts.
Funding Source	Local
Current Status	Ongoing

FL-d. Improve Stormwater Management Planning. The City Planning Department continues to improve planning, regulation and enforcement related to stormwater management, including through 2016 updates to the City comprehensive plan and the 2016 adoption of the state stormwater management manual for Western Washington.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

FL-e. Improve Flood Risk Assessment. The City Public Works Department continues to assess risks related to flooding, including through participation in the federal RISK Map assessment efforts.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

FL-f. Join or Improve Compliance with NFIP. The City continues to participate in the National Flood Insurance Program (NFIP). The City Planning, Building and Public Works Departments

continue to work to improve compliance with the NFIP, including through adoption of 2019 amendments to the City's NFIP ordinance that included updated flood insurance rate maps.

Lead Agency	City Planning, Building and Public Works Depts.
Funding Source	Local
Current Status	Ongoing

FL-g. Manage the Floodplain Beyond Minimum Requirements. The City Planning and Building Departments continue to manage floodplains beyond minimum requirements, including through amendment of critical areas and floodplain management regulations that require extra elevation of critical facilities and prohibit the placement of fill within floodplains except under certain conditions.

Lead Agency	City Planning and Building Depts.
Funding Source	Local
Current Status	Ongoing

FL-h. Establish Local Funding Mechanisms for Flood Mitigation. The County Flood Control Zone District continues to make locally generated district funds available for local projects, including the purchase of open space areas located in designated floodways adjacent to Nooksack.

Lead Agency	County Flood Control Zone District
Funding Source	County
Current Status	Ongoing

FL-i. Improve Stormwater Drainage System Capacity. The City Public Works Department continues to work to improve stormwater drainage system capacity through annual system upgrades and maintenance projects.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

FL-j. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures. The City Public Works Department continues to work to improve stormwater drainage system capacity through annual maintenance projects, such as inspection and clearing of stormwater conveyance systems.

Lead Agency	City Public Works Dept.
Funding Source	Local

Current Status	Ongoing

FL-k. Preserve Floodplains as Open Space. The City Planning Department continues to work to preserve floodplains as open space, including through the recording of restrictive covenants required in conjunction with approved subdivisions.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing; Bi-annual

Landslide/erosion

No actions ongoing, discontinued, or completed for this hazard.

Landslide Subsidence

SU-a. Map and Assess Vulnerability to Subsidence. The City Planning Department continues to map and assess vulnerability to subsidence, including through 2016 updates to the City critical areas ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

SU-b. Manage Development in High-Risk Areas. The City Building Department continues to manage development in high-risk areas, including through required geologically hazardous area site assessment reports.

Lead Agency	City Building Dept.
Funding Source	Local
Current Status	Ongoing

Lightening

No actions ongoing, discontinued, or completed for this hazard.

Severe Storm

No actions ongoing, discontinued, or completed for this hazard.

Severe Wind

SW-a. Protect Power Lines and Infrastructure. The City Public Works Department continues to work to protect power lines and infrastructure through as-needed inspections following major

wind events and coordination with Puget Sound Energy.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

SW-b. Retrofit Public Buildings and Critical Facilities. The City Public Works Department continues to work to protect public buildings and infrastructure, including through undergrounding of power lines and provision of back-up power generation at critical facilities.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

Tornadoes

No actions ongoing, discontinued, or completed for this hazard.

Tsunami

No actions ongoing, discontinued, or completed for this hazard.

Wildfire

No actions ongoing, discontinued, or completed for this hazard.

Winter storms/Freezes

WW-a. Protect Buildings and Infrastructure. The City Public Works Department continues to work to protect public buildings and infrastructure from severe winter storms, including through replacing and upgrading all City water meters to increase system resiliency.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

WW-b. Protect Power Lines. The City Public Works Department continues to work to protect power lines through as-needed inspections following major winter storm events and coordination with Puget Sound Energy.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

WW-c. Reduce Impacts to Roadways. The City Public Works Department continues to work to reduce impacts to roadways, including through implementation of road closures during major freeze/thaw events.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Ongoing

Multiple Hazards

MU-a. Assess Community Risk. The City Planning and Public Works Departments continue to assess risks to the public from natural hazards, including through review of repetitive loss properties and review and adoption of updated hazard maps.

Lead Agency	City Planning and Public Works Depts.
Funding Source	Local
Current Status	Ongoing

MU-b. Map Community Risk. The City Planning Department continues to work to map natural hazard areas and assess the risks associated with such areas, including through the 2016 update of the City's critical areas ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

MU-c. Prevent Development in Hazard Areas. The City Building and Planning Departments continue to prevent development in hazard areas, including through enforcement of floodway, steep slopes and erosion hazard area regulations.

Lead Agency	City Building and Planning Depts.
Funding Source	Local
Current Status	Ongoing

MU-d. Adopt Development Regulations in Hazard Areas. The City Building and Planning Departments continue to work to adopt regulations addressing hazard areas, including through the 2016 update to the City's critical areas ordinance and the 2019 adoption of updated FEMA flood insurance rate maps and National Flood Insurance Program ordinance.

Lead Agency	City Building and Planning Depts.
Funding Source	Local

Current Status	Ongoing

MU-e. Limit Density in Hazard Areas. The City Planning Department continues to work to limit density in hazard areas, including through adoption of floodway regulations and establishment of low-density zones in hazard areas, such as Open Space/Agriculture.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

MU-f. Integrate Mitigation into Local Planning. The City Planning Department continues to integrate mitigation into local planning, including through establishment and enforcement of mitigation requirements under the City's critical areas regulations.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

MU-g. Strengthen Land Use Regulations. The City Planning Department continues to work to strengthen local land use regulations, including through the 2016 update of the City's critical areas ordinance and 2019 updates to the City's National Flood Insurance Program ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local
Current Status	Ongoing

MU-h. Monitor Mitigation Plan Implementation. The City Planning and Public Works Departments continue to monitor implementation of the Natural Hazards Mitigation Plan through the required annual review process.

Lead Agency	City Planning and Public Works Depts.
Funding Source	Local
Current Status	Ongoing

MU-i. Protect Structures. The City Building and Public Works Departments continue to work to protect structures within the City through enforcement of local building codes and critical areas regulations.

Lead Agency	City Building and Public Works Depts.
Funding Source	Local
Current Status	Ongoing

MU-j. Protect Infrastructure and Critical Facilities. The City Public Works Department continues to work to protect infrastructure and critical facilities, including through regular inspections, annual maintenance projects and capital improvement projects, such as elevating critical facilities above minimum standards.

Lead Agency	Public Works Dept.
Funding Source	Local
Current Status	Ongoing

MU-k. Increase Hazard Education and Risk Awareness. The City Public Works Department continues to work to increase hazard education and risk awareness, including through informational materials sent out with monthly utility bills.

Lead Agency	Public Works Dept.
Funding Source	Local
Current Status	Ongoing

Nooksack 2021-2025 Hazard Mitigation Strategy

Whatcom County Hazard Mitigation Goals

Whatcom County has identified five overarching hazard mitigation goals, which represent what a community seeks to achieve through mitigation actions.

Goal 1. Protect Life, Property and Public Welfare

Goal 2. Increase Public Awareness

Goal 3. Preserve and Enhance Natural Systems

Goal 4. Encourage Partnership for Implementation

Goal 5. Ensure Continuity of Emergency Services

These countywide goals help guide any prioritization and implementation of mitigation actions, ensuring that the actions contribute to a community's vision for the future.

Nooksack-Specific Hazard Mitigation Goals

Nooksack supports the above county-wide goals. No additional community-specific mitigation planning goals have been identified at this time.

Mitigation Action Options

Appendix E of the Whatcom County Natural Hazard Mitigation Plan provides a list of mitigation options. Nooksack considered mitigation options related to earthquakes, drought, land subsidence, winter storms, severe wind, and erosion, especially those related to flooding, because these hazards have the potential to cause the greatest loss and damage. Not all mitigation options in Appendix E were relevant or a strong priority for Nooksack. Some options have already been implemented or are ongoing in Nooksack, as documented in the section above on the status of 2016-2020 and ongoing hazard mitigation actions.

Mitigation Action Prioritization

The mitigation actions in this section are new actions that Nooksack has prioritized for the 2021-2025 planning period and beyond. Mitigation options were prioritized based upon review of the following two criteria: 1) The action's Overall Feasibility based on engineering, environmental, financial and political considerations, 2) The Criticality of the action, based upon a consideration of which actions had the greatest potential to protect life, property and public welfare. Nooksack is working in cooperation with the County and other participating communities and special districts to develop a systematic methodology that would use multiple evaluation criteria to determine mitigation action prioritization. This new methodology will be

used in future updates of this Plan.

In the following Identified Mitigation Actions 2021-2025 table, each priority action is listed by hazard. Each action is followed by planning goals, lead agency, the priority evaluation, timeline, funding source and estimated cost, where such information is available. This information can be used by local decision makers in pursuing strategies for implementation.

1	Goals	Indicates the hazard mitigation planning goal or goals this action addresses; countywide and/or community-specific
2	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
3	Priority	H (High); M (Medium); L (Low)
4	Timeline	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years)
5	Funding Source	Local; State; FEMA; Private; Other
6	Estimated Cost	Actual; Estimated

Nooksack Identified Mitigation Actions 2021-2025

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
GENERAL: ALL HAZARDS Education and Awareness Actions	These are actions that inform and educate citizens, elected officials, and property owners about hazards and ways to mitigate them.						
	G-a. Ongoing -- Adopt and enforce building codes. This applies to earthquakes, flooding, winter storms/freezes, and severe winds. The City Planning, Building and Public Works Departments continue to adopt and enforce building codes and development regulations that address natural hazards mitigation.	1,5	Nooksack Planning, Building and Public Works		O		
Hazard Specific (Reference: Whatcom County Mitigation Ideas)	Actions communities should consider to identify and evaluate a range of potential mitigation actions for reducing risk to natural hazards and disasters.						
Dam/Levee Failures (See: Flooding)	No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Droughts/Heat Waves	***D-a. Ongoing -- Assess Vulnerability to Drought Risk.*** The City Planning Department continues to assess risks related to drought, including as part of the 2016 update to the City's critical areas ordinance. .	1, 2	City Planning Dept		O		
	D-b. Ongoing -- Monitor Drought Conditions. The City Public Works Department continues to monitor drought conditions on annual basis and implements water-related mitigation strategies as appropriate.	1, 2	City Public Works Dept.		O		
	D-c. Ongoing -- Monitor Water Supply. The City Public Works Department continues to monitor the public water supply and implement water conservation strategies as appropriate.	1, 2	City Public Works Dept.		O		
	D-d. Ongoing -- Plan for Drought. The City Planning Department continues to plan for droughts, including as part of the 2016 update of the city comprehensive land use plan.	1	City Planning Dept		O		

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	D-e. Ongoing -- Require Water Conservation During Drought Conditions. The City Public Works Department continues to monitor drought conditions and implement water conservation measures as appropriate.	1, 5	City Public Works Dept.		O		
	D-f. Ongoing -- Educate Residents on Water Saving Techniques. The City Administration continues to support education of residents regarding water conservation efforts, including through provision of information along with monthly utility bills.	2, 5	City Administration		O		
Volcano	**VOL-1 Lahar Early Warning System** The USGS has designed a number of systems that automatically detect lahars as they descend neighboring valleys. These systems then automatically trigger various types of early warning systems, such as sirens or telephone-based warning systems.	1, 2, 5	Whatcom County Fire District 1, Everson Police Department, Whatcom County Department of Emergency Management, Whatcom County	L	L	Local sources, and state and federal grants	Unknown

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
			Public Works				
Earthquakes	***EQ-a. Ongoing -- Incorporate Earthquake Mitigation into Local Planning.*** The City Planning Department continues to incorporate planning related to earthquakes, including as part of the 2016 update to the city comprehensive plan.	1	City Planning Dept	O			
	EQ-b. Ongoing -- Map and Assess Community Vulnerability to Seismic Hazards. The City Planning Department continues to map and assess vulnerability to seismic hazards, including as part of the 2016 update of the city critical areas ordinance.	1,2	City Planning Dept	O			
	EQ-c. Ongoing -- Conduct Inspections of Building Safety. The City Building Department continues to conduct inspections related to building safety as required by City building codes.	1	City Building Dept	O			
	EQ-d. Ongoing -- Protect Critical Facilities	1,5	City Building Dept	O			

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	***and Infrastructure*.** The City Building Department continues to protect critical facilities and infrastructure, including through requiring the local middle school to be constructed with the lowest floor more than 2.5 feet above the FEMA base flood elevation.						
	EQ-1 Retrofit City Hall Nooksack City Hall would suffer significant damage in the event of an earthquake. This facility should be retrofitted, replaced, or relocated so that it can survive a 6.0 magnitude or greater earthquake event.	1, 5	Nooksack City Council, Whatcom County Building Department, Whatcom County Fire District 1 Commissioners	L	L	Local sources, and state and federal grants	$1 Million
Extreme Temperatures	ET-1 No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						
Flooding	***FL-a. Ongoing -- Incorporate Flood Mitigation in Local Planning*.** The City Planning Department continues to incorporate flood mitigation into local	1	City Planning Dept.		O		

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	planning, including as part of the 2016 update of the city critical areas ordinance, the 2019 adoption of new FEMA flood insurance rate maps, and updates to the County comprehensive flood hazard management plan currently underway.						
	FL-b. Ongoing -- Form Partnerships to Support Floodplain Management. The City Planning and Public Works Departments continue to work to form partnerships that support floodplain management, including working closely with County long-range and current planning divisions and the County Public Works River and Flood Division.	4	City Planning and Public Works Dept.		O		
	FL-c. Ongoing -- Limit or Restrict Development in Floodplain Areas. The City Planning, Building and Public Works Departments continue to limit development in floodplain areas through amendment and enforcement of City critical areas ordinance regulations, national flood insurance program requirements, and city building codes.	1,3	City Planning, Building, and Public Works Dept		O		
	FL-d. Ongoing -- Improve Stormwater	1,5	City Planning		O		

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	***Management Planning*.** The City Planning Department continues to improve planning, regulation and enforcement related to stormwater management, including through 2016 updates to the City comprehensive plan and the 2016 adoption of the state stormwater management manual for Western Washington.		Dept.				
	***FL-e. Ongoing -- Improve Flood Risk Assessment*.** The City Public Works Department continues to assess risks related to flooding, including through participation in the federal RISK Map assessment efforts.	1,2	City Public Works Dept		O		
	***FL-f. Ongoing -- Join or Improve Compliance with NFIP*.** The City continues to participate in the National Flood Insurance Program (NFIP). The City Planning, Building and Public Works Departments continue to work to improve compliance with the NFIP, including through adoption of 2019 amendments to the City's NFIP ordinance that included updated flood insurance rate maps.	1,4	City Planning, Building, and Public Works Dept		O		
	FL-g. Ongoing -- Manage the Floodplain	1,3,5	City Planning,		O		

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	Beyond Minimum Requirements. The City Planning and Building Departments continue to manage floodplains beyond minimum requirements, including through amendment of critical areas and floodplain management regulations that require extra elevation of critical facilities and prohibit the placement of fill within floodplains except under certain conditions.		Building Dept				
	FL-h. Ongoing -- Establish Local Funding Mechanisms for Flood Mitigation. The County Flood Control Zone District continues to make locally generated district funds available for local projects, including the purchase of open space areas located in designated floodways adjacent to Nooksack.	1	County Flood Control Zone District		O		
	FL-i. Ongoing -- Improve Stormwater Drainage System Capacity. The City Public Works Department continues to work to improve stormwater drainage system capacity through annual system upgrades and maintenance projects.	1,5	City Public Works Dept.		O		
	FL-j. Ongoing -- Conduct Regular	1,5	City Public Works		O		

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	Maintenance for Drainage Systems and Flood Control Structures. The City Public Works Department continues to work to improve stormwater drainage system capacity through annual maintenance projects, such as inspection and clearing of stormwater conveyance systems.		Dept.				
	FL-k. Ongoing -- Preserve Floodplains as Open Space. The City Planning Department continues to work to preserve floodplains as open space, including through the recording of restrictive covenants required in conjunction with approved subdivisions.	1,3	City Planning Dept.		O		
	FL-1 Mitigate Nooksack Slough. Remove sediment deposited from the Sumas River that blocks the section of the Nooksack Slough Between Gillies Road and the Sumas River	1, 3, 4	Nooksack City Council. Whatcom County	H	M	Local sources, and state and federal grants	$300,000
Landslide/ Erosion	ER-1 No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
Land Subsidence	***SU-a. Ongoing -- Map and Assess Vulnerability to Subsidence.*** The City Planning Department continues to map and assess vulnerability to subsidence, including through 2016 updates to the City critical areas ordinance.	1,2	City Planning Dept.		O		
	SU-b. Ongoing -- Manage Development in High-Risk Areas. The City Building Department continues to manage development in high-risk areas, including through required geologically hazardous area site assessment reports.	1	City Building Dept.		O		
Lightning	L-1 No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						
Severe Storms	SS-1 No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						
Severe Wind	***SW-a. Ongoing -- Protect Power Lines and Infrastructure.*** The City Public Works	1,5	City Public Works Dept.		O		

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	Department continues to work to protect power lines and infrastructure through as-needed inspections following major wind events and coordination with Puget Sound Energy.						
	SW-b. Retrofit Public Buildings and Critical Facilities. The City Public Works Department continues to work to protect public buildings and infrastructure, including through undergrounding of power lines and provision of back-up power generation at critical facilities.	1,5	City Public Works Dept.		O		
Tornadoes	T-1 No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						
Tsunami	NA						
Wildfires	WF-1 No actions are currently being considered/All mitigation actions are						

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	ongoing, discontinued, or complete.						
Winter Storms/ Freezes (Severe Winter Weather)	***WW-a. Ongoing -- Protect Buildings and Infrastructure.*** The City Public Works Department continues to work to protect public buildings and infrastructure from severe winter storms, including through replacing and upgrading all City water meters to increase system resiliency.	1,5	City Public Works		O		
	WW-b. Ongoing -- Protect Power Lines. The City Public Works Department continues to work to protect power lines through as-needed inspections following major winter storm events and coordination with Puget Sound Energy.	1,5	City Public Works		O		
	WW-c. Ongoing -- Reduce Impacts to Roadways. The City Public Works Department continues to work to reduce impacts to roadways, including through implementation of road closures during major freeze/thaw events.	1,5	City Public Works		O		
Multi Hazard	***MU-a. Ongoing -- Assess Community Risk.*** The City Planning and Public Works	1,2	City Planning Public Works		O		

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	Departments continue to assess risks to the public from natural hazards, including through review of repetitive loss properties and review and adoption of updated hazard maps.		Depts.				
	MU-b. Ongoing -- Map Community Risk. The City Planning Department continues to work to map natural hazard areas and assess the risks associated with such areas, including through the 2016 update of the City's critical areas ordinance.	1,2	City Planning Dept.		O		
	MU-c. Ongoing -- Prevent Development in Hazard Areas. The City Building and Planning Departments continue to prevent development in hazard areas, including through enforcement of floodway, steep slopes and erosion hazard area regulations.	1,3	City Building and Planning Depts.		O		
	MU-d. Ongoing -- Adopt Development Regulations in Hazard Areas. The City Building and Planning Departments continue to work to adopt regulations addressing hazard areas, including through the 2016 update to the City's critical areas ordinance	1	City Building and Planning Depts.		O		

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	and the 2019 adoption of updated FEMA flood insurance rate maps and National Flood Insurance Program ordinance.						
	MU-e. Ongoing -- Limit Density in Hazard Areas. The City Planning Department continues to work to limit density in hazard areas, including through adoption of floodway regulations and establishment of low-density zones in hazard areas, such as Open Space/Agriculture.	1	City Planning Dept.		O		
	MU-f. Ongoing -- Integrate Mitigation into Local Planning. The City Planning Department continues to integrate mitigation into local planning, including through establishment and enforcement of mitigation requirements under the City's critical areas regulations.	1,4	City Planning Dept.		O		
	MU-g. Ongoing -- Strengthen Land Use Regulations. The City Planning Department continues to work to strengthen local land use regulations, including through the 2016 update of the City's critical areas ordinance and 2019 updates to the City's National Flood	1,4	City Planning Dept.		O		

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	Insurance Program ordinance.						
	MU-h. Ongoing -- Monitor Mitigation Plan Implementation. The City Planning and Public Works Departments continue to monitor implementation of the Natural Hazards Mitigation Plan through the required annual review process.	1	City Planning and Public Works Depts.		O		
	MU-i. Ongoing -- Protect Structures. The City Building and Public Works Departments continue to work to protect structures within the City through enforcement of local building codes and critical areas regulations.	1	City Building and Public Works Depts.		O		
	MU-j. Ongoing -- Protect Infrastructure and Critical Facilities. The City Public Works Department continues to work to protect infrastructure and critical facilities, including through regular inspections, annual maintenance projects and capital improvement projects, such as elevating critical facilities above minimum standards.	1,5	Public Works Dept.		O		
	MU-k. Ongoing -- Increase Hazard Education and Risk Awareness. The City Public Works	2	Public Works Dept.		O		

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	Department continues to work to increase hazard education and risk awareness, including through informational materials sent out with monthly utility bills.						
	MU-1 Tone Radio Based Early Warning System Tone Radios turn on when triggered by a central transmitter and then information or instructions are announced over the radio. Such a system is currently used for various types of weather radios, for tornados and severe storms hazard areas. A similar system could be put into place for warning of flooding, lahars, and other related natural hazards.	1, 2, 5	Whatcom County Department of Emergency Management, NOAA Radio		L	Local sources, and state and federal grants	
Advanced Mitigation Projects (Dream List)	**Earthquake Early Warning System** Such a system could warn residence of an impending earthquake. Technology doesn't currently exist for such a system, but will likely be possible in the future.	1, 2, 5	Federal, State, County, and local entities	L	L	Local sources, and state and federal grants	Unknown

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

City of Nooksack IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	Mitigate against 100-year flood event or volcanic lahar	1, 2, 5	DEM	L	L	Local sources, and state and federal grants	Unknown
	Cell Phone-Based Early Warning System A computerized early warning system that automatically dials each landline telephone number within a specified area, and play a recorded message when the phone is answered is currently provided to the City by the Whatcom County Sheriff's Office Division of Emergency Management. A larger capacity system that can also contact cell phones through the use of a federally licensed COG would help to address a variety of natural and manmade problems.	1, 2, 5	WCDEM/LFD	L	L	Local sources, and state and federal grants	Unknown

Nooksack Annual Review and Progress for Hazard-Specific Mitigation Actions 2021-2025

Progress monitoring means tracking the implementation of the hazard specific mitigation actions over time. Each jurisdiction must identify how, when, and by whom action items will be monitored. The responsible agency assigned to each mitigation action is responsible for tracking and reporting on each of their actions.

Annual review and progress reporting includes the following:

Step One: Identify mitigation actions that your planning team has identified for the annual review. The planning team has the option to address ALL action items, or only those that should be acted on during each review cycle.

Step Two: Use the table below to track annual progress. For each action item selected for annual review insert the appropriate letter that indicates the status of that action item.

Step Three: Complete a progress report form as illustrated in Appendix G for each mitigation action item selected for annual review

Step Four: Submit the completed form(s) to the Whatcom County DEM.

City of Nooksack Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
GENERAL: ALL HAZARDS						
G-a. Adopt and enforce building codes.						
Add New Action Items if Applicable						
DAM/LEVEE FAILURES						
Add New Action Items if Applicable						
DROUGHTS/HEAT WAVES						
D-a. Assess Vulnerability to Drought Risk.						
D-b. Monitor Drought Conditions.						
D-c. Monitor Water Supply.						
D-d. Plan for Drought.						
D-e. Require Water Conservation During Drought Conditions.						
D-f. Educate Residents on Water Saving Techniques.						
Add New Action Items if Applicable						
EARTHQUAKES						
EQ-a. Incorporate Earthquake Mitigation into Local Planning.						
EQ-b. Map and Assess Community Vulnerability to Seismic Hazards.						
EQ-c. Conduct Inspections of Building Safety.						
EQ-d. Protect Critical Facilities and						

City of Nooksack Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Infrastructure.						
EQ-1 Retrofit City Hall						
Add New Action Items if Applicable						
VOLCANO						
VOL-1 Lahar Early Warning System						
Add New Action Items if Applicable						
FLOODING						
FL-a. Incorporate Flood Mitigation in Local Planning.						
FL-b. Form Partnerships to Support Floodplain Management.						
FL-c. Limit or Restrict Development in Floodplain Areas.						
FL-d. Improve Stormwater Management Planning.						
FL-e. Improve Flood Risk Assessment.						
FL-f. Join or Improve Compliance with NFIP.						
FL-g. Manage the Floodplain Beyond Minimum Requirements.						
FL-h. Establish Local Funding Mechanisms for Flood Mitigation.						
FL-i. Improve Stormwater Drainage System Capacity						
FL-j. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures.						

City of Nooksack Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
FL-k. Preserve Floodplains as Open Space.						
FL-1 Mitigate Nooksack Slough						
Add New Action Items if Applicable						
LANDSLIDES/EROSION						
Add New Action Items if Applicable						
LAND SUBSIDENCE						
SU-a. Map and Assess Vulnerability to Subsidence.						
SU-b. Manage Development in High-Risk Areas.						
Add New Action Items if Applicable						
TORNADOES						
Add New Action Items if Applicable						
TSUNAMI						
Add New Action Items if Applicable						
WILDFIRES						
Add New Action Items if Applicable						
WINTER STORMS/FREEZES (SEVERE WINTER WEATHER)						
WW-a. Protect Buildings and Infrastructure.						
WW-b. Protect Power Lines.						
WW-c. Reduce Impacts to Roadways.						
Add New Action Items if Applicable						

City of Nooksack Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
EXTREME TEMPERATURES						
Add New Action Items if Applicable						
LANDSLIDE						
Add New Action Items if Applicable						
LIGHTNING						
Add New Action Items if Applicable						
SEVERE WIND						
SW-a. Protect Power Lines and Infrastructure.						
SW-b. Retrofit Public Buildings and Critical Facilities.						
Add New Action Items if Applicable						
MULTIPLE HAZARDS						
MU-a. Assess Community Risk.						
MU-b. Map Community Risk.						
MU-c. Prevent Development in Hazard Areas.						
MU-d. Adopt Development Regulations in Hazard Areas.						
MU-e. Limit Density in Hazard Areas.						
MU-f. Integrate Mitigation into Local Planning.						
MU-g. Strengthen Land Use Regulations.						
MU-h. Monitor Mitigation Plan Implementation.						

City of Nooksack Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
MU-i. Protect Structures.						
MU-j. Protect Infrastructure and Critical Facilities.						
MU-k. Increase Hazard Education and Risk Awareness.						
MU-1 Tone Radio Based Early Warning System						
Add New Action Items if Applicable						

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PORT OF BELLINGHAM

Contact Information	**Dave Warter** Marine Terminals and Emergency Services Manager 1801 Roeder Avenue Bellingham, WA 98225 (360) 676-2500
Approving Authority	**Executive Director Rob Fix & Port Commission** 1801 Roeder Avenue Bellingham, WA 98225 (360) 676-2500

The Port of Bellingham is a Washington State special purpose municipal corporation serving all of Whatcom County. It is a unique organization that makes significant contributions to the local community through leveraging its resources by direct participation in revenue-earning lines of business, as well as by capitalizing on its strategic assets through special public agency powers. Special districts have a vested interest in reducing threat and hazard impacts, particularly if they provide services critical to recovery efforts.

By combining expertise in both the business and government sectors, the Port has a role in job preservation and job creation, as well as a role in the operation of transportation facilities for seaports and airports. This combination is distinct from that of either the private sector or other government entities.

The Port of Bellingham's mission is:

"Promote sustainable economic development, optimize transportation gateways, and manage publicly owned land and facilities to benefit Whatcom County."

Planning Process

The Port ensures that local and state building codes and land use laws are followed in a fair and equitable manner in all Port projects. Our Environmental and Planning Services division works closely with our Facilities and Engineering divisions to plan new developments with a focus on mitigating risk wherever practicable. One example is a former Georgia Pacific Mill property that the Port acquired in 2005. Demolition and cleanup of the 36-acre waterfront brown field was completed with the fronting waterway dredged of contaminated soils. Meanwhile the upland property was raised several feet to prepare it for further development and to mitigate against possible tsunami and sea-level rise.

The Port is a member of the Whatcom County Emergency Management Council and supports the Whatcom County Sheriff's Office Division of Emergency Management (WCSO-DEM) with annual funding based on the budget needs of the Division. The Port supports and participates in

the Division's on-going public education, planning, training, and exercise program, as appropriate, including presentations about various risks within the Port, including earthquake, tsunami, and flood risk and examination of other various natural hazard risks and risk mitigation models. This coordination allows the Port to collaborate with other jurisdictions on natural hazard mitigation efforts and provides additional outlets to reach visitors to Port facilities and reach County residents that may use Port asset areas.

Port properties and assets are located within the jurisdictional boundaries of the City of Bellingham, the City of Blaine, the City of Sumas, and unincorporated Whatcom County. As such, the Port is subject to the community plans and policies of that guide and influence land use, land development and population growth within each of these jurisdictions. Such existing plans and policies include local building codes, comprehensive plans, zoning ordinances and technical reports or studies. Land use and comprehensive and strategic plans are updated regularly and can adapt easily to changing conditions and needs. This Natural Hazard Mitigation Plan will be used to identify potential risks to Port properties and inform future development and mitigation efforts. It will also be used to ensure that Port tenants are aware of these natural hazard risks.

The 2021 update of the Port's section of this Plan was conducted through a collaborative effort by the Port's Emergency Management, Environmental and Planning Services, Engineering, and Facilities/Maintenance functions. This team reviewed and updated the Plan to reflect progress against, or completion of, Mitigation Actions since the last Plan update, as appropriate. It also evaluated potential future Mitigation Actions against updated natural hazard risk information, resulting in a list of Mitigation Actions for the period 2021-2025 that reflects jurisdiction risks, authorities, and priorities.

The Port's section of this Plan update was also informed by participation in the Natural Hazard Mitigation Plan update process facilitated by the Whatcom County Sheriff's Office Division of Emergency Management, which included a series of meetings of representatives from all Whatcom County jurisdictions represented in this Plan. Throughout the Plan update process, the WCSO-DEM's website (whatcomready.org) maintained a virtual town hall related to the Natural Hazard Mitigation Plan, which allowed residents to leave feedback regarding the Port's portion of the plan, as well as read the plan's current iteration in its entirety. Port-specific comments were shared with the Port and incorporated into this Plan update. This collaborative county-wide update process facilitated the sharing of best practices and identification of multi-jurisdiction mitigation opportunities by all Whatcom County jurisdictions.

Key Contributor List

- Scott McCreery, Emergency Management/Security Officer

- Kurt Baumgarten, Environmental Planner
- Brian Gouran, Environmental & Planning Services Director
- Greg Nicoll, Senior Engineer
- Alex Hildreth, Maintenance Manager
- Alice Cords, Environmental Specialist
- Adrienne Hegedus, Environmental Specialist
- Dave Warter, Marine Terminals and Emergency Services Manager

The information contained in the Natural Hazards Mitigation Plan update regarding hazards, risks, vulnerability and potential mitigation is based on the best available science and technology currently available. This information and related data on natural hazards potentially impacting the Port of Bellingham will be used as a tool when creating or updating Port planning, strategic investment, and capital improvement documents and plans.

As additional information becomes available from other planning sources that can enhance this Plan, that information will be incorporated through the periodic update process.

Plan Maintenance for the Port of Bellingham

The WCSO-DEM is responsible for facilitating annual review of the Plan per the process and schedule reflected in Section 4 of this Plan. The Port participates in the WCSO-DEM's annual Plan maintenance process and in public meetings called as part of this process. Information regarding changes to the Plan as part of this annual review process are shared on the Port's social media outlets and through the WCSO-DEM website (whatcomready.org), as appropriate.

During the process of adopting and updating the Natural Hazard Mitigation Plan, the Bellingham Port Commission and Executive Director are provided with an Executive Summary of the plan and the Port's role in the plan. An Action Memo that goes to the Executive Director and Commission also outlines the history of the plan and why formal adoption is recommended. The Commission agenda, along with the Action Memo are published on the Port's website. The adoption process is recorded and is available for public review.

Public Outreach and Education

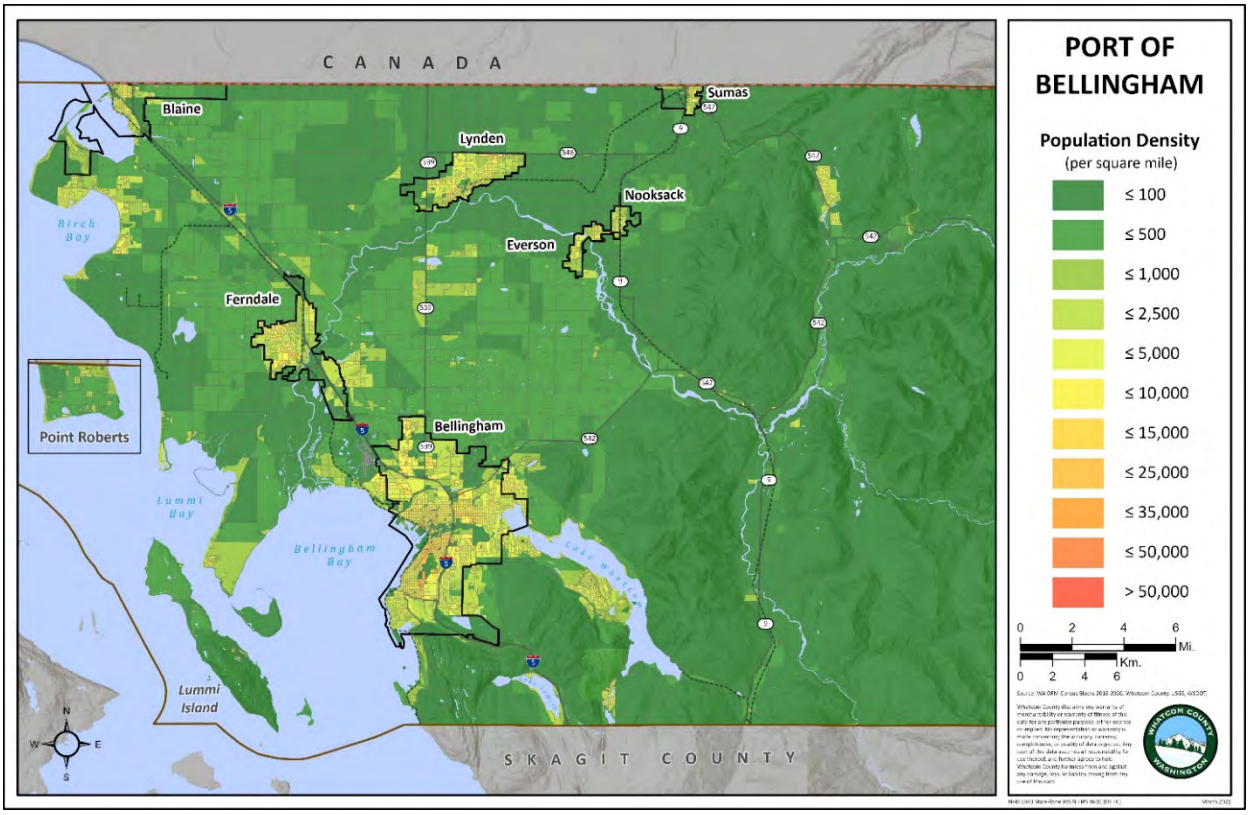
Natural Hazard education and outreach capabilities undertaken by the Port of Bellingham are typically done in conjunction with our local jurisdiction partners in the jurisdictions in which Port facilities are located, i.e., the City of Bellingham, City of Blaine, City of Sumas, and Whatcom County, and other community partners. include ongoing programs that local-to-federal government, nonprofit, and other organizations provide to communities which may be leveraged to implement hazard mitigation actions and build community resilience.

Program	Yes/No, Year Adopted	Description
Nonprofit organizations or local residents groups focused on hazard mitigation, emergency preparedness, vulnerable populations, etc.	No	N/A
Ongoing public education or information programs	Yes, 2019	Bellingham Tsunami Evacuation Walk Time maps and associated outreach.
School-related programs for natural hazard safety	No	N/A
Public education or information program	No	N/A
StormReady certification	No	N/A
Firewise Community certification	No	N/A
Public-Private Partnership initiatives addressing disaster-related issues	No	N/A
Other	No	N/A

Overview of Port of Bellingham, Hazards, and Assets

Geography of the Port of Bellingham

Port of Bellingham property lies within the political boundaries of several different Whatcom County governmental jurisdictions – the City of Bellingham, the City of Blaine, the City of Sumas, and unincorporated Whatcom County. Natural hazards identified as present within the Port reflect those with the potential to affect facilities critical to the Port's continuity of operations. Refer to the Jurisdiction Overviews for the City of Bellingham, City of Blaine, and City of Sumas for a complete description of the natural hazard characteristics affecting Port properties within those jurisdictions.



Washington State Office of Financial Management (OFM) 2020 population and housing estimates for 2010-2020 census block data. This map uses the 2016-2020 average population to show population density per square mile.

Presence of Hazards and their Impacts in the Port of Bellingham

The Port of Bellingham includes infrastructure and facilities that are critical to maritime, air, and ground transportation between Whatcom County, the region, North America, and the world. These Port resources and critical services have not been impacted by natural hazards in the past.

Shoreline erosion mitigation was required in the area of the Fairhaven Station Multi-Modal Facility because of winter storm-induced coastal flooding during the winter of 2015-2016. These impacts did not disrupt the provision of critical transportation services by the Port.

Refer to the City of Bellingham, City of Blaine, City of Sumas, and Whatcom County jurisdictional Overviews regarding community change and natural hazard interface impacting Port facilities in these jurisdictions.

In the table below is a list of the major hazards that effect Whatcom County. The second column provides the percentage of the Port of Bellingham's total area that is exposed to each hazard. The third column indicates the severity of anticipated impacts to community function, considering the credible worst-case hazard scenario. Severity of anticipated impacts considers effects on basic community function such as shelter, transportation, utilities, commerce, industry, agriculture, education, health, recreation, and cultural identity. Severity ranges from none to extreme, as shown in the key below the table. Finally, the last column of the table describes where the hazard impacts the community and which services the hazard would most significantly impact.

	Hazard	% area Exposed	Severity of Anticipated Impacts	Hazard Descriptions
Geological	**Earthquake**	86.4%	High	Subject to the intensity of seismic activity. The location of Critical Port Facilities on seismically sensitive soils and coastal fill make these community-wide transportation infrastructure assets vulnerable to earthquake hazards.
	Liquefaction	25.5%	High	Subject to the intensity of seismic activity. The location of Bellingham International Airport on seismically sensitive ancient lakebed soils and other Critical Port Facilities on coastal fill material make these community-wide transportation infrastructure assets vulnerable to earthquake hazards.
	Landslide	5.9%	Moderate	Breakwater structures that protect Squalicum Harbor and Blaine Harbor from heavy marine weather are subject to seismically induced landslide damage.
	Volcano	33.9%	Low	Depending on wind direction, ash fall could significantly impact Port operations especially at Bellingham International Airport over a period of days to weeks.
	Tsunami	1.2%	High	The Bellingham Cruise Terminal, Fairhaven Station Multi-Modal Transportation Facility, Bellingham Shipping Terminal, Squalicum Harbor, and Blaine Harbor are all located within the modeled tsunami inundation zone. Breakwater structures that protect Squalicum Harbor and Blaine Harbor from heavy marine weather are subject to tsunami-induced landslide/erosion damage.
	Mine Hazards	0%	None	While abandoned mine workings may be located beneath some Port properties, they are believed to be at depths that limit their potential risk to Port facilities and services.
H	**Flooding**	4.8%	Mod	The Port's Sumas International Cargo Terminal

				is subject to Nooksack River flooding events. All Port of Bellingham facilities on Bellingham Bay and Blaine Harbor are subject to coastal flooding risk, with increasing risk associated with sea level rise
Meteorological	**Wildfire**	12.3%	Low	Wildfire risk is generally limited to the Bellingham International Airport and mitigated by buffers between surrounding forested areas and critical airport infrastructure; however, wildfire in these surrounding areas could impact general Port operations.

Severity Scale: **None** = no impact to port function
Low = minor degradation of port functions, not widespread
Moderate = moderate degradation over multiple weeks or widespread
High =degradation or loss over many weeks, widespread

Natural Hazard Maps

For natural hazards present within the Port of Bellingham, see the natural hazard maps for the following jurisdictions:

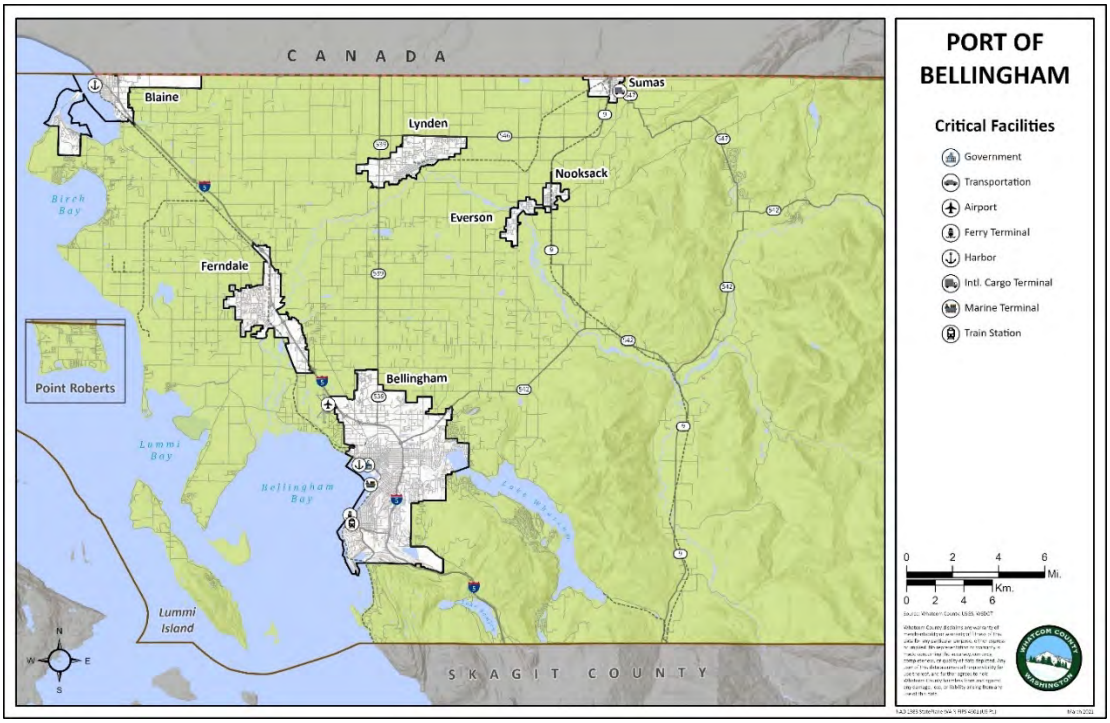
- Whatcom County
- City of Bellingham
- City of Blaine
- City of Sumas

Port of Bellingham Critical Facility List

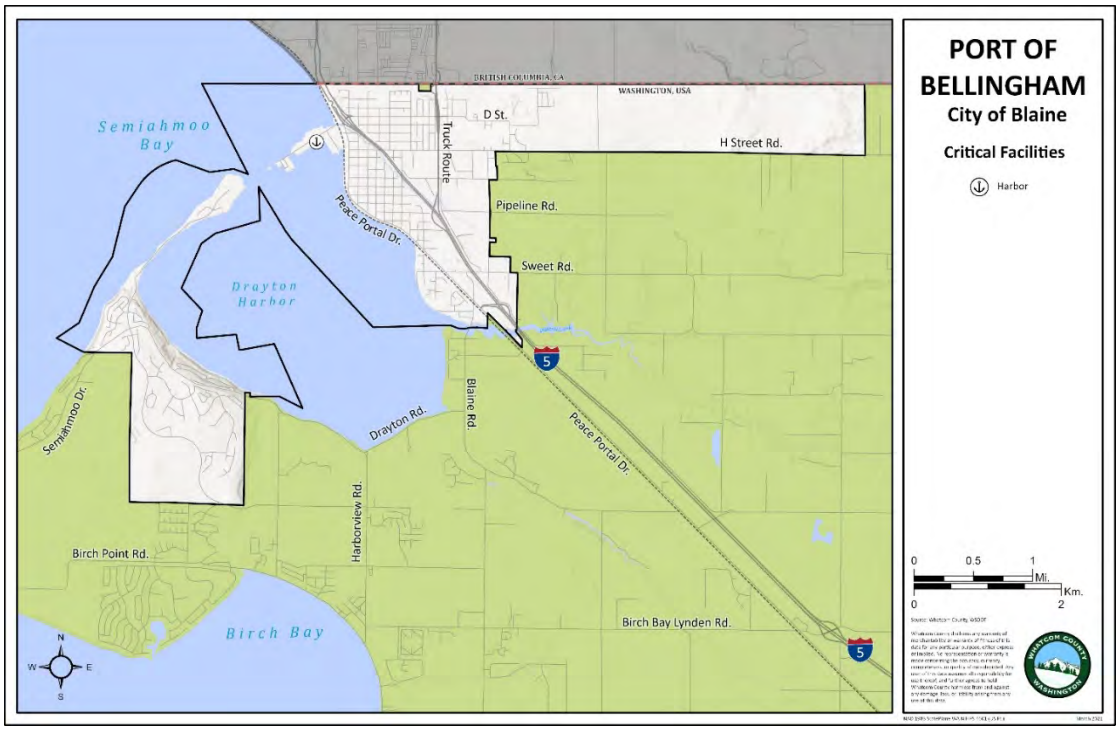
Facility Name	Facility Type	Signi-ficance	Location	Assessed Dollar Value	Notes
Bellingham Cruise Terminal	EF	2	355 Harris Ave. Bellingham, WA	$22,823,000	BCT serves as the southern terminus of the Alaska Marine Highway System and is a critical transportation hub for personnel and goods between WA and AK. In the event that highways are damaged or unavailable, BCT, along with BST, provide the only facilities in Whatcom County capable of accommodating larger vessels and barges.
Bellingham International Airport	EF	2	4255 Mitchell Way Bellingham, WA	$130,820,000	BLI is the only commercial aviation terminal located between Everett, WA and Vancouver, B.C.
Bellingham Shipping Terminal #1 & #2	EF	1	629 Cornwall Bellingham, WA	$49,068,000	While nominally a bulk and break bulk shipping terminal, BST could be used, along with BCT, to accommodate larger vessels and barges in the event that I-5 was damaged or unavailable.
Blaine Harbor	EF	2	235 Marine Drive Blaine, WA	$49,133,000	Marine harbor serving recreational and

					commercial fishing vessels.
Fairhaven Station - Multi-Modal Facility	EF	2	401 Harris Ave. Bellingham, WA	$33,917,000	Rail and bus transportation hub.
Harbor Center Building	EF	1	1801 Roeder Ave. Bellingham, WA	$11,668,000	Building housing Port administrative functions.
Squalicum Harbor	EF	2	722 Coho Way Bellingham, WA	$95,045,000	Marine harbor serving recreational and commercial fishing vessels
Sumas International Cargo Terminal	EF	1	530 Front Street Sumas, WA	$10,282,000	Rail and truck trans-load facility.

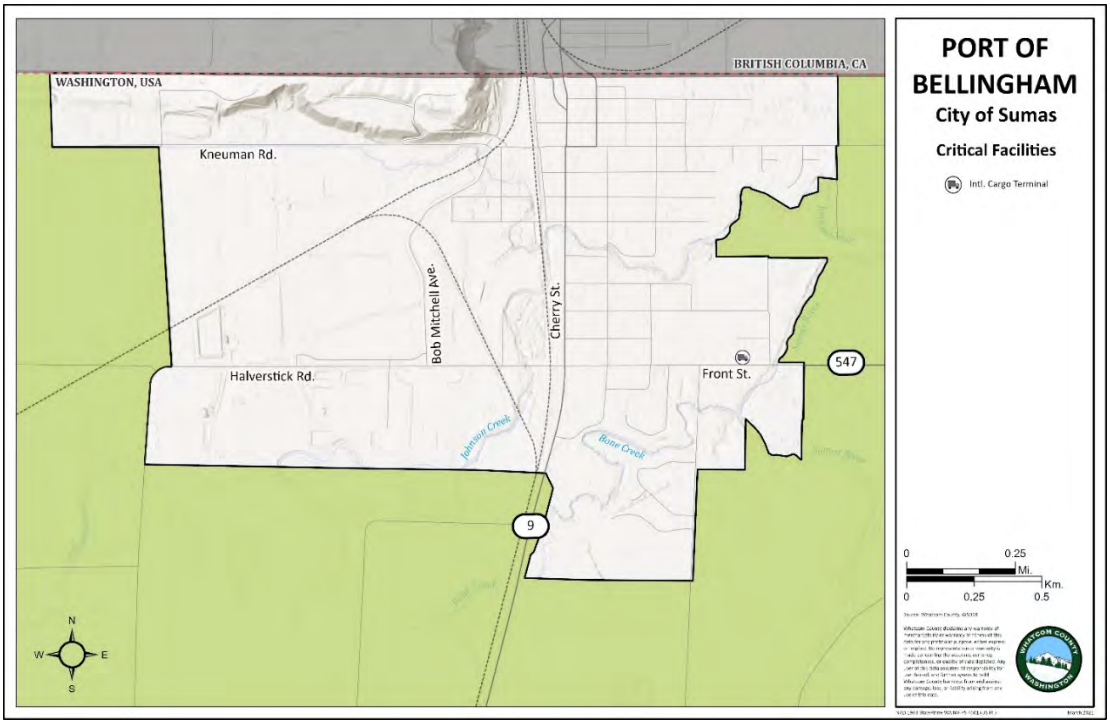
Facility Type: **EF** = Essential Facility; **HMF** = Hazardous Materials Facility; **HPL** = High Potential Loss; **LUS** = Lifeline Utility System
Significance to community function: **1**=Moderate; **2**= High; **3** =Very High



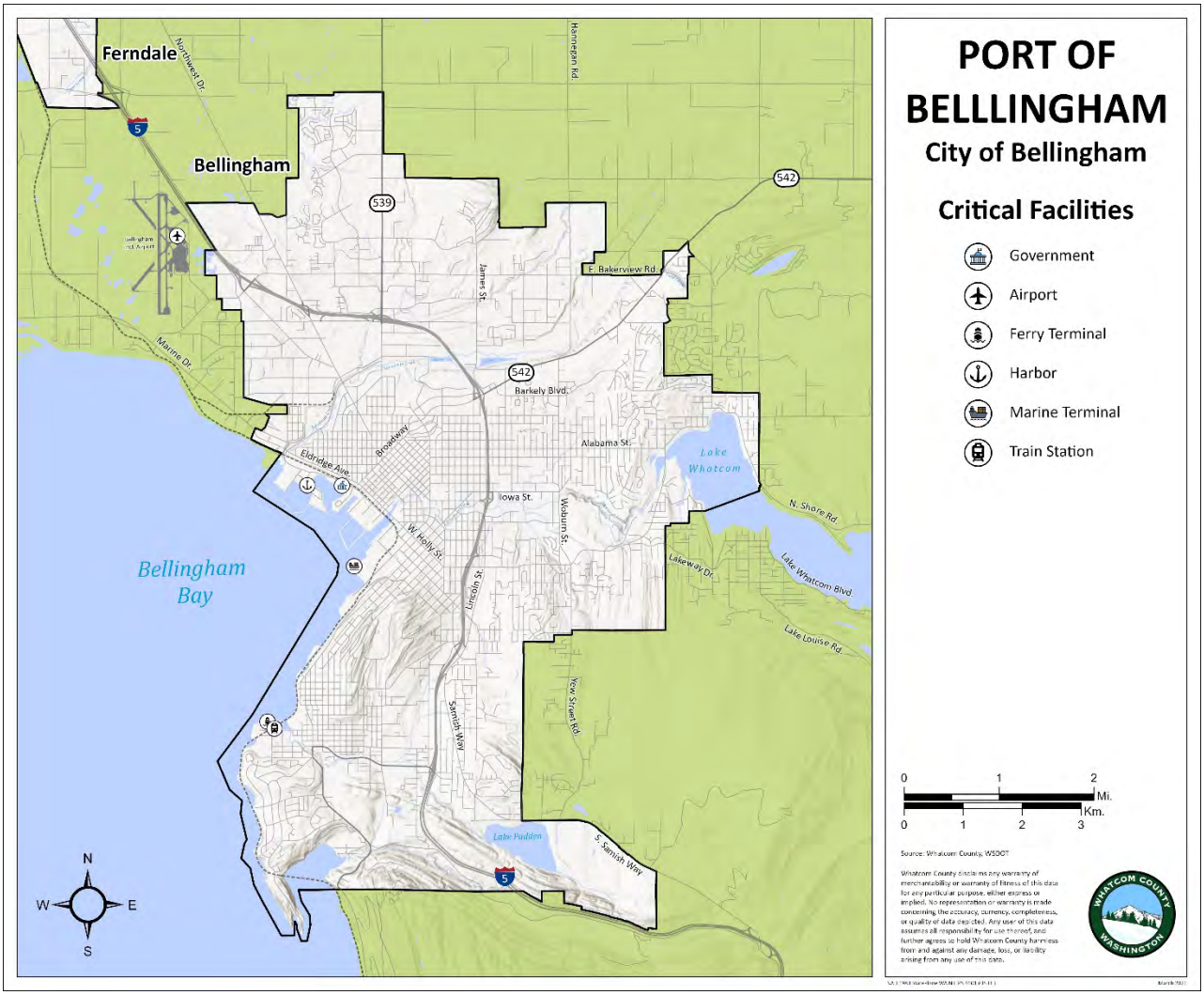
Map of critical facilities identified by the Port of Bellingham. Across Whatcom County, critical facilities fell into 6 categories. Facilities were categorized according to Port of Bellingham's critical facility table, including: government, airport, ferry terminal, harbor, marine terminal, and train station. Not all judications identified or included critical facilities in each category.



Location of critical facilities for the Port of Bellingham in Blaine.



Location of critical facilities for the Port of Bellingham in Sumas.



Location of critical facilities for the Port of Bellingham in the City of Bellingham.

Critical Facility Rankings for the Port of Bellingham

The table below indicates whether each critical facility falls within known hazard zones for earthquake, liquefaction, landslide, tsunami, volcano, riverine flooding, coastal flooding, and wildfire zones. A rank assessment in the last column indicates how the relative risk of community impact. This ranking considers the significance of the facility to the community and the number of hazard zones the facility is within. The frequency of each hazard is also considered, such that being in a low frequency hazard zone would receive a lower ranking than that same facility being in a high frequency hazard zone. Ranking is on a scale of 1 to 10, with 1 being the facility with the highest-ranking score, and 10 being a facility with the lowest ranking score in the jurisdiction.

$$\text{Rank} = \text{Significance} * \left[\frac{EQ\_Zone}{EQ\_Freq} + \frac{LQ\_Zone}{LQ\_Freq} + \frac{LS\_Zone}{LS\_Freq} + \ldots \frac{WF\_Zone}{WF\_Freq} \right]$$

Ranking value will be from 0.0 to 1.0, scaled to the highest ranking in the jurisdiction.

Significance: 1=moderate; 2=high; 3=very high, as assessed in the critical facilities list in the previous section

Zone: 0=facility not in hazard zone; 1 = facility in the hazard zone

Frequency (e.g. EQ_Freq, LQ_Freq) is the most difficult variable to which to assign a value. Frequency varies based upon the magnitude of a hazard event and varies from one place to another. It was not possible within the time constraints to assess frequency of hazard at each critical facility location. Instead, a qualitative assessment of the hazard frequency across the entire county was made, as shown in the chart below.

Description	Freq Value used in formula	Hazards
Frequent, occurring on the order of decades	3	Riverine flooding (FL); Coastal flooding (COA)
Rare, occurring on the order of centuries	2	Earthquake (EQ); Liquefaction (LQ); Landslide (LS); Wildfire (WF)
Very rare, occurring on the order of millennia	1	Tsunami (TSU); Volcano (VOL)

Note: Severe storm, a very frequent hazard, was omitted because it is ubiquitous and because no hazard map of storm severity was available.

Critical Facilities Ranking Table

Facility Name	Facility Type	Signi-ficance	EQ	LQ	LS	TSU	VOL	FL	COA	WF	Rank Assessment
Bellingham Cruise Terminal	EF - Transportation	2	1	0	0	1	0	1	1	0	0.93
Bellingham International Airport	EF - Transportation: Airport	2	1	1	0	0	0	0	0	0	0.43
Bellingham Shipping Terminal #1 & #2	EF - Transportation	1	1	1	0	1	0	0	0	0	0.43
Blaine Harbor	EF - Transportation	2	1	1	0	1	0	0	1	0	1
Fairhaven Station - Multi-Modal Facility	EF - Transportation	2	1	0	0	1	0	0	0	1	0.86
Harbor Center Building	EF – Transportation, Administrative	1	1	1	0	1	0	0	0	0	0.43
Squalicum Harbor	EF - Transportation	2	1	1	0	1	0	0	1	0	1
Sumas International Cargo Terminal	EF - Transportation	1	1	1	0	0	1	1	0	0	0.5

Notes: **EQ** = Earthquake; **LQ** =Liquefaction; **LS** = Landslide; **TSUN** = Tsunami; **VOL** = Volcano; **FL** = Riverine Flooding; **COA** = Coastal Flooding; **WF** = Wildland Fire

Areas and Assets Exposed, Per Hazard

Port of Bellingham Exposure to Natural Hazards				
	Hazard Susceptibility	Asset County (% of Total)		Critical Facilities Appraised Value (Million)
		Area (sq.mi.)	Critical Facilities	
Geological Hazards	**Earthquake**, Shaking Intensity			
	MMI IV	7.7%	-	-
	MMI V	31.7%	12.5%	$49 [1]
	MMI VI	29.6%	75%	$343 [1]
	MMI VII	11.7%	-	-
	MMI VIII - IX	5.7%	12.5%	$10 [1]
	TOTAL	86.4%	100%	$402
	Liquefaction			
	Very Low to Low	14.6%	-	-
	Low to Moderate	6.5%	12.5%	$131 [1]
	Moderate	-	-	-
	Moderate to High	4.4%	12.5%	$10 [1]
	High	0.02%	50%	$205 [1]
	TOTAL	25.5%	75%	$346
	Landslide			
	Landslide Low	0.7%	-	-
	Landslide Moderate	1%	-	-

	Landslide High	2.9%	-	-
	Fan Low	0.1%	-	-
	Fan Moderate	0.3%	-	-
	Fan High	0.8%	-	-
	Mine Hazard	0.1%	-	-
	TOTAL	5.9%	-	-
	Volcanic Eruption			
	Case 1 Debris Flows	1.6%	12.5% [2]	$10 [1/2]
	Case 2 Debris Flows	0.9%	-	-
	Case M Flows	2.9%	-	-
	Pyroclastic Flows, Lava Flows, and Ballistic Debris	5.8	-	-
	Lateral Blast Hazard Zone	22.7%	-	-
	TOTAL	33.9%	12.5%	$10
	Tsunami, Inundation Zone			
	Low to Moderate Inundation Potential	0.3%	-	-
	Moderate to High Inundation Potential	0.3%	-	-
	High Inundation Potential	0.6%	75%	$262 [1]
	TOTAL	1.2%	75%	$262
Hydrol	**Flooding**			
	100-year Flood	3.5%	12.5%	$10 [1]

	500-year Flood	0.4%	-	-
	Floodway	0.9%	-	-
	Undetermined (Zone D)	52.1%	-	-
	TOTAL	4.8%	12.5%	$10
Meteorological	**Wildfire Zones**			
	Interface Very Low-Low Structure Density	0.9%	-	-
	Interface Medium-High Structure Density	1.4%	25%	$57 [1]
	Intermix Very Low-Low Structure Density	5.9%	-	-
	Intermix Medium-High Structure Density	4.1%	-	-
	TOTAL	12.3%	25%	$57

[1]Shows the assessed dollar value provided by the community in their critical facilities list. Does not include the appraised total value.

[2]Some critical facilities located in multiple hazard zone

Status of Port of Bellingham's 2016-2020 and Ongoing Hazard Mitigation Actions

This section describes the status of mitigation actions that were proposed in the 2016 Mitigation Plan and are now 1) currently being implemented and are ongoing, 2) are now completed, or 3) are now discontinued because they are no longer needed. The actions are organized by hazard and indicate the lead agency, funding source, and status.

Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
Funding Source	Local; State; FEMA; Private; Other
Current StatuS	Action Discontinued / Action Completed / Action ongoing and expected completion date

Tsunami

TSU-a. Map and Assess Vulnerability to Tsunami – In 2019, the Port of Bellingham, in conjunction with jurisdictional partner the City of Bellingham and the Washington Military Department Division of Emergency Management, the Washington Department of Natural Resources, and the National Oceanic and Atmospheric Administration, developed tsunami inundation models and Tsunami Evacuation Walk Time Maps for the City of Bellingham and Port properties within Bellingham.

Lead Entity	WDNR, City of Bellingham
Funding Source	State, Federal, Local
Current Status	Ongoing

TSU-b. Increase Public Awareness of Tsunami Hazard – In 2017, All Hazards Alert Broadcast (AHAB) Warning Sirens were installed on Port of Bellingham property at Squalicum Harbor at geographic coordinates 48.7559 N, 122.50193 W, and on City of Blaine property at geographic coordinates 48.99449 N, 122.7602850193 W, adjacent to Blaine Harbor. An additional AHAB Siren was installed on Port of Bellingham property adjacent to the Bellingham Cruise Terminal at geographic coordinates 48.720249 N, 122.513427 W, in 2020.

Lead Entity	WDNR, Whatcom County, City of Bellingham, Port of Bellingham
Funding Source	State, Federal, Local
Current Status	Ongoing

Flooding

No actions ongoing, discontinued, or completed for this hazard.

Winter Storms/Freezes

No actions ongoing, discontinued, or completed for this hazard.

Severe Wind

No actions ongoing, discontinued, or completed for this hazard.

Multiple Hazards

MU-a. Increase Hazard Education and Risk Awareness – The Whatcom County Sheriff's Office Division of Emergency Management and City of Bellingham Office of Emergency Management have adopted use of the AlertSense messaging system to notify the public and the media of emergency events throughout Whatcom County, including Port of Bellingham facilities and tenants. AlertSense allows a pre-formatted message to be sent to an email address, to a mobile phone as a text message, and/or as a voice message to a landline or mobile phone number. Messages can be sent to all individuals who voluntarily register in the system (free of charge), or to targeted groups for specific geographic areas (i.e. cities, towns or communities).

Lead Entity	City of Bellingham, Whatcom County
Funding Source	Local
Current Status	Ongoing

MU-b. Protect Structures – This Mitigation Action generally relies on the relocation of structures outside hazard areas. This Mitigation Action is now considered infeasible and, as such, has been discontinued.

Lead Entity	N/A
Funding Source	
Current Status	Discontinued

Earthquake

EQ-a. Conduct Outreach to Builders, Architects, Engineers and Inspectors – The Port of Bellingham relies on the jurisdictions with code establishment and enforcement authority within which Port facilities are located to implement this Mitigation Action. As such, this Mitigation Action is not considered applicable to the Port and has been discontinued.

Lead Entity	N/A
Funding Source	
Current Status	Discontinued

EQ-c. Design all Critical Facilities and Infrastructure for design earthquake event – The port follows the International Building Code adopted by the county, which includes design for seismic hazard.

Lead Entity	Facilities/E&PS
Funding Source	Local, State and Federal
Current Status	Ongoing

Landslide/Erosion

ER-a. Increase Awareness of Erosion Hazard – The Port of Bellingham relies on those jurisdictions with code establishment and enforcement authority within which Port facilities are located to implement this Mitigation Action. The only identified erosion hazard on Port properties is to Port-owned breakwater structures at Squalicum and Blaine Harbors and the appropriate Port Engineering and Facilities leads are aware of this hazard as part of their core functions. As such, this Mitigation Action is not considered applicable to the Port and has been discontinued.

Lead Entity	N/A
Funding Source	
Current Status	Discontinued

Port of Bellingham 2021-2025 Hazard Mitigation Strategy

Whatcom County Hazard Mitigation Goals

Whatcom County has identified five overarching hazard mitigation goals, which represent what a community seeks to achieve through mitigation actions.

Goal 1. Protect Life, Property and Public Welfare

Goal 2. Increase Public Awareness

Goal 3. Preserve and Enhance Natural Systems

Goal 4. Encourage Partnership for Implementation

Goal 5. Ensure Continuity of Emergency Services

These countywide goals help guide any prioritization and implementation of mitigation actions, ensuring that the actions contribute to a community's vision for the future.

Port of Bellingham-Specific Hazard Mitigation Goals

The Port of Bellingham supports the county-wide planning goals. No additional community-specific mitigation planning goals have been identified at this time.

Mitigation Action Options

Appendix E of the Whatcom County Natural Hazard Mitigation Plan provides a list of mitigation options. Port of Bellingham considered mitigation options related to earthquake, flooding, erosion, tsunami, winter storms, severe wind, especially those related to flooding because these hazards have the potential to cause the greatest loss and damage. Not all mitigation options in Appendix E were relevant or a strong priority for Port of Bellingham. Some options have already been implemented or are ongoing in Port of Bellingham, as documented in the section above on the status of 2016-2020 and ongoing hazard mitigation actions.

Mitigation Action Prioritization

The mitigation actions in this section are new actions that Port of Bellingham has prioritized for the 2021-2025 planning period and beyond. Mitigation options were prioritized based upon review of the following two criteria: 1) The action's Overall Feasibility based on engineering, environmental, financial and political considerations, 2) The Criticality of the action, based upon a consideration of which actions had the greatest potential to protect life, property and public welfare. Port of Bellingham is working in cooperation with the County and other participating communities and special districts to develop a systematic methodology that would use multiple

evaluation criteria to determine mitigation action prioritization. This new methodology will be used in future updates of this Plan.

In the following Identified Mitigation Actions 2021-2025 table, each priority action is listed by hazard. Each action is followed by planning goals, lead agency, the priority evaluation, timeline, funding source and estimated cost, where such information is available. This information can be used by local decision makers in pursuing strategies for implementation.

1	Goals	Indicates the hazard mitigation planning goal or goals this action addresses; countywide and/or community-specific
2	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
3	Priority	H (High); M (Medium); L (Low)
4	Timeline	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years)
5	Funding Source	Local; State; FEMA; Private; Other
6	Estimated Cost	Actual; Estimated

Port of Bellingham Identified Mitigation Actions 2021-2025

PORT OF BELLINGHAM IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
GENERAL: ALL HAZARDS Education and Awareness Actions	These are actions that inform and educate citizens, elected officials, and property owners about hazards and ways to mitigate them.						
	G-1 Distribute Whatcom County Emergency Preparedness Guide.	2	Emergency Management	M	M	Local	15,000
Hazard Specific (Reference: Whatcom County Mitigation Ideas)	Actions communities should consider to identify and evaluate a range of potential mitigation actions for reducing risk to natural hazards and disasters.						
Droughts/Heat Waves	D-1 There are no new actions considered/all actions ongoing, discontinued, or completed						
Earthquakes	***EQ-c. Design all Critical Facilities and Infrastructure for design earthquake event***	1	Facilities/E&PS	M	O	Local, State, and Federal	
	EQ-1 Incorporate Earthquake Mitigation into Port Planning	1	Environmental and Planning	M	M	Local	unknown

Priority:	**Timeline:**	**Funding Source:**	**Estimated Cost:**
H (High); M (Medium); L (Low)	**Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing**	**Local; State; FEMA; Private; Other**	**Actual; Estimated**

			Services (E&PS)				
	EQ-2 Map and Assess Port Vulnerability to Seismic Hazards	1, 2	E&PS	M	M	Local, State & Federal	unknown
	EQ-3 Increase Earthquake Risk Awareness	2	Emergency Mgmt	M	M	Local	15,000
	EQ-4 Provide Information on Structural and Non-Structural Retrofitting	1	Emergency Mgmt/Real Estate	M	M	Local	15,000.
	EQ-5. Conduct Inspections of Building Safety –	1	Facilities	M	M	Local, State and Federal	Unknown
Extreme Temperatures	ET-1 There are no new actions considered/all actions ongoing, discontinued, or completed						
Flooding	**FL-1 Participate in Partnerships to Support Floodplain Management**	4, 1	E&PS	L	M	Local	unknown
	FL-2 Increase Awareness of Flood Risk and Safety	2	Emergency Mgmt	M	M	Local	15,000.
	FL-3. Incorporate Flood Mitigation in Local Planning	1, 2	Facilities/E&PS	M	M	Local, State and Federal	Unknown
	FL-4. Follow Current Building Codes and Development Standards	1	Facilities	M	M	Local	Unknown
	FL-5. Stormwater Management Planning	1, 2	Facilities/E&PS	M	M	Local, State	Cost of current staff
	FL-6. Adopt Polices to Reduce Stormwater Runoff	1	Facilities/E&PS	M	M	Local, State	Cost of Current staff
	FL-7. Conduct Regular Maintenance for	1	Facilities/E&PS	M	M	Local,	Unknown

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

	Drainage Systems and Flood Control Structures					State	
	FL-8. Protect Infrastructure	1	Facilities	M	M	Local	Unknown
	FL-9. Design and construct Critical Facilities to prevent flooding and future sea level rise.	1, 5	Facilities	M	M	Local	Unknown
Landslide/ Erosion	**ER-1 Manage Development in Erosion Hazard Areas**	1, 3	E&PS	M	M	Local	Unknown
	ER-2. Stabilize Erosion Hazard Areas	1, 5	Facilities	M	M	Local	Unknown
Land Subsidence	LS-1 There are no new actions considered/all actions ongoing, discontinued, or completed						
Lightning	L-1 There are no new actions considered/all actions ongoing, discontinued, or completed						
Severe Storms	SS-1 There are no new actions considered/all actions ongoing, discontinued, or completed						
Severe Wind	**SW-1. Apply Site and Building Design Standards that Minimize Wind Damage**	1	Facilities and E&PS	M	M	Local	Unknown
	SW-2. Assess Vulnerability to Severe Wind	1,	Facilities	M	M	Local	Unknown
	SW-3. Protect Power Lines and Infrastructure	1, 5	Facilities	M	M	Federal, State and Local	Unknown
Tornadoes	T-1 There are no new actions considered/all actions ongoing, discontinued, or completed						
Tsunami	***TSU-a Ongoing -- Map and Assess Vulnerability to Tsunami***	1, 5	WDNR, City of Bellingham	M	O	Federal, State, and	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

						Local	
	TSU-b Ongoing -- Increase Public Awareness of Tsunami Hazard	2	WDNR, Whatcom County, City of Bellingham, Port of Bellingham	M	O	Federal, State, and Local	
	TSU-1 Manage Development of Port infrastructure in Tsunami Hazard Areas	1, 5	Environmental and Planning Services (E&PS)	M	M	Local	Unknown
Wildfires	WF-1 There are no new actions considered/all actions ongoing, discontinued, or completed						
Winter Storms/ Freezes (Severe Winter Weather)	**WW-1 Conduct Winter Weather Risk Awareness Activities**	2	Emergency Mgmt/Facilities	M	M	Local	15,000
	WW-2. Design and construct Buildings and Infrastructure to withstand design storm events	1	Facilities	M	M	Local	Unknown
	WW-3. Reduce Impacts to Roadways	1, 5	Facilities	M	M	Local	Unknown
Multiple Hazards	***MU-a Ongoing -- Increase Hazard Education and Risk Awareness***	2	City of Bellingham, Whatcom County	M	O	Local	
	MU-1 Increase Port Live Aboard Disaster Preparedness Awareness	1, 2	Emergency Mgmt	M	M	Local	15,000.
	MU-2 Promote Private Mitigation Efforts	4	Emergency Mgmt	M	M	Local	15,000.
	MU-3. Assess Community Risk	1, 2, 5	Emergency Management	M	M	Local and State	Current Staff

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

	MU-4 Map Risk	1, 2, 5	Emergency Management	M	M	Local and State	Current Staff
	MU-5. Prevent Development in Hazard Areas	1, 2, 5	E&PS	M	M	Local and State	Current Staff
	MU-6 Integrate Mitigation into Local Planning	1, 2, 5	E&PS	M	M	Local	Current Staff
	MU-7. Monitor Mitigation Plan Implementation	1, 2, 5	Emergency Management	M	M	Local	Current Staff
	MU-8 Construct and improve Infrastructure and Critical Facilities to mitigate damage from multiple hazards.	1	Facilities	M	M	Local and State	Unknown
Advanced Mitigation Projects (Dream List)	**International Cargo Terminal Flooding at Sumas**	1	Port	M	L	Local	unknown
	Survey of existing mines – Bellingham International Airport	1	Port	L	L	State, Federal	Unknown
	Survey of existing mines- Bellingham Shipping Terminal	1	Port	L	L	State, Federal	Unknown
	Survey of existing mines-Squalicum Harbor	1	Port	L	L	State, Federal	Unknown
	Survey of existing mines- Fairhaven Station	1	Port	L	L	State, Federal	Unknown

Port of Bellingham Annual Review and Progress for Hazard-Specific Mitigation Actions 2021-2025

Progress monitoring means tracking the implementation of the hazard specific mitigation actions over time. Each jurisdiction must identify how, when, and by whom action items will be monitored. The responsible agency assigned to each mitigation action is responsible for tracking and reporting on each of their actions.

Annual review and progress reporting includes the following:

Step One: Identify mitigation actions that your planning team has identified for the annual review. The planning team has the option to address ALL action items, or only those that should be acted on during each review cycle.

Step Two: Use the table below to track annual progress. For each action item selected for annual review insert the appropriate letter that indicates the status of that action item.

Step Three: Complete a progress report form as illustrated in Appendix G for each mitigation action item selected for annual review

Step Four: Submit the completed form(s) to the Whatcom County DEM.

Port of Bellingham Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
GENERAL: ALL HAZARDS						
G-1 Distribute Whatcom County Emergency Preparedness Guide.						
Add New Action Items if Applicable						
DAM/LEVEE FAILURES						
Add New Action Items if Applicable						
DROUGHTS/HEAT WAVES						

Port of Bellingham Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Add New Action Items if Applicable						
EARTHQUAKES						
EQ-a. Ongoing -- Conduct Outreach to Builders, Architects, Engineers and Inspectors						
EQ-c. Ongoing -- Design all Critical Facilities and Infrastructure for design earthquake event						
EQ-1 Incorporate Earthquake Mitigation into Port Planning						
EQ-2 Map and Assess Port Vulnerability to Seismic Hazards						
EQ-3 Increase Earthquake Risk Awareness						
EQ-4 Provide Information on Structural and Non-Structural Retrofitting						
EQ-5. Conduct Inspections of Building Safety						
Add New Action Items if Applicable						
FLOODING						
FL-1 Participate in Partnerships to Support Floodplain Management						
FL-2 Increase Awareness of Flood Risk and Safety						
FL-3. Incorporate Flood Mitigation in Local Planning –						
FL-4. Follow Current Building Codes and Development Standards						
FL-5. Stormwater Management Planning						
FL-6. Adopt Polices to Reduce Stormwater Runoff						
FL-7. Conduct Regular Maintenance for						

Port of Bellingham Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Drainage Systems and Flood Control Structures						
FL-8 Protect Infrastructure						
FL-9. Design and construct Critical Facilities to prevent flooding and future sea level rise.						
Add New Action Items if Applicable						
LANDSLIDES/EROSION						
ER-a. Ongoing -- Increase Awareness of Erosion Hazard						
ER-1. Manage Development in Erosion Hazard Areas						
ER-2. Stabilize Erosion Hazard Areas						
Add New Action Items if Applicable						
LAND SUBSIDENCE						
Add New Action Items if Applicable						
TORNADOES						
Add New Action Items if Applicable						
TSUNAMI						
TSU-a. Ongoing -- Map and Assess Vulnerability to Tsunami						
TSU-b. Ongoing -- Increase Public Awareness of Tsunami Hazard						
TSU-1. Manage Development of Port infrastructure in Tsunami Hazard Areas						
Add New Action Items if Applicable						
WILDFIRES						

Port of Bellingham Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Add New Action Items if Applicable						
WINTER STORMS/FREEZES (SEVERE WINTER WEATHER)						
WW-1 Conduct Winter Weather Risk Awareness Activities						
WW-2. Design and construct Buildings and Infrastructure to withstand design storm events						
WW-3 Reduce Impacts to Roadways						
Add New Action Items if Applicable						
EXTREME TEMPERATURES						
Add New Action Items if Applicable						
LANDSLIDE						
Add New Action Items if Applicable						
LIGHTNING						
Add New Action Items if Applicable						
SEVERE WIND						
SW-a. Ongoing -- Apply Site and Building Design Standards that Minimize Wind Damage						
SW-b. Ongoing -- Assess Vulnerability to Severe Wind						
SW-c. Ongoing -- Protect Power Lines and Infrastructure						
Add New Action Items if Applicable						
MULTIPLE HAZARDS						

Port of Bellingham Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
MU-a. Ongoing -- Increase Hazard Education and Risk Awareness						
MU-b. Ongoing -- Protect Structures						
MU-1 Increase Port Live Aboard Disaster Preparedness Awareness						
MU-2 Promote Private Mitigation Efforts						
MU-3. Assess Community Risk						
MU-4. Map Community Risk						
MU-5. Prevent Development in Hazard Areas						
MU-6. Integrate Mitigation into Local Planning						
MU-7. Monitor Mitigation Plan Implementation						
MU-8. Construct and improve Infrastructure and Critical Facilities to mitigate damage from multiple hazards.						
Add New Action Items if Applicable						

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CITY OF SUMAS

Contact Information	**Daniel DeBruin** Chief of Police 433 Cherry Street / P.O. Box 9 Sumas, WA 98295 (360) 988-5711
Approving Authority	**Mayor Kyle Christensen & City Council Members** 433 Cherry Street / P.O. Box 9 Sumas, WA 98295 (360) 988-5711

Planning Process

The City of Sumas process of reviewing, updating, and adopting the 2021 update of the Whatcom County Natural Hazards Mitigation Plan (NHMP or Plan) included review by multiple City departments and formal adoption by the City Council. Review of the prior plan began in early 2021. The City Planner reviewed the previous plan and met with the Public Works Director and Chief of Police to identify details that might need to be updated. From January through April of 2021, City staff attended a series of coordination meetings hosted by the County Division of Emergency Management (DEM). Initial guidance was received from DEM regarding the update schedule and the main areas to focus on as part of the update.

In early March 2021, the City provided public notice in the Lynden Tribune regarding the planned update of the NHMP and posted information regarding the update on the City website. Information regarding opportunities to provide public comment was also posted on the City website. During March and April of 2021, the City Planner prepared draft revisions to the NHMP and met with the Public Works Director and the Chief of Police to review the draft revisions and receive additional input. During the same time period, City staff participated in two virtual public meetings hosted by DEM where the public was invited to receive information and ask questions regarding the 2021 update of the NHMP.

The draft revisions to the NHMP addressing the city of Sumas, incorporating input received from the Public Works Director, Mayor and Chief of Police, were submitted to DEM in late April 2021. In May of 2021, DEM notified the public regarding the availability of draft revisions to the full Plan and hosted a third virtual public meeting to receive comments from the public. Following review by the City Council in May 2021, the City Council passed a motion supporting the updates contained in the Sumas section of draft NHMP. Prior to the Plan being submitted to the Federal Emergency Management Agency for review, the City Council formally adopted the draft Plan on XX, 2021 through Resolution No. XX. It is anticipated that formal adoption by ordinance will follow approval from FEMA.

Key Contributor List

- Rollin Harper, City Planner
- Chief of Police Daniel DeBruin
- Sunny Aulakh, Public Works Director
- Mayor Kyle Christensen

Meeting Dates and Attendees

- February 18, 2021 – Harper, Aulakh and DeBruin
- April 15, 2021 – Harper, Aulakh and DeBruin
- April 29, 2021 – Harper, Aulakh and DeBruin

The information contained in the Natural Hazards Mitigation Plan update regarding hazards, risks, vulnerability, and potential mitigation is based on the best available science and technology currently available. This information and related data on natural hazards potentially impacting the City of Sumas will be used as a tool when the City updates other plans and programs, such as the following:

- Comprehensive plan required by the Growth Management Act (GMA);
- Development regulations required by the GMA;
- Critical areas ordinance;
- Capital improvement program;
- Capital facilities planning; and
- Water Resource Inventory Area planning.

As additional information becomes available from other planning sources that can enhance this Plan, that information will be incorporated through the periodic update process.

Plan Maintenance for the City of Sumas

The City of Sumas will maintain and update the Natural Hazards Mitigation Plan as needed to respond to changed circumstances, to incorporate best available science and to address changing community priorities. The Plan update process will include community engagement through public meetings and opportunities for public comment. Formal updates of the Plan will be reviewed by the City Council prior to adoption.

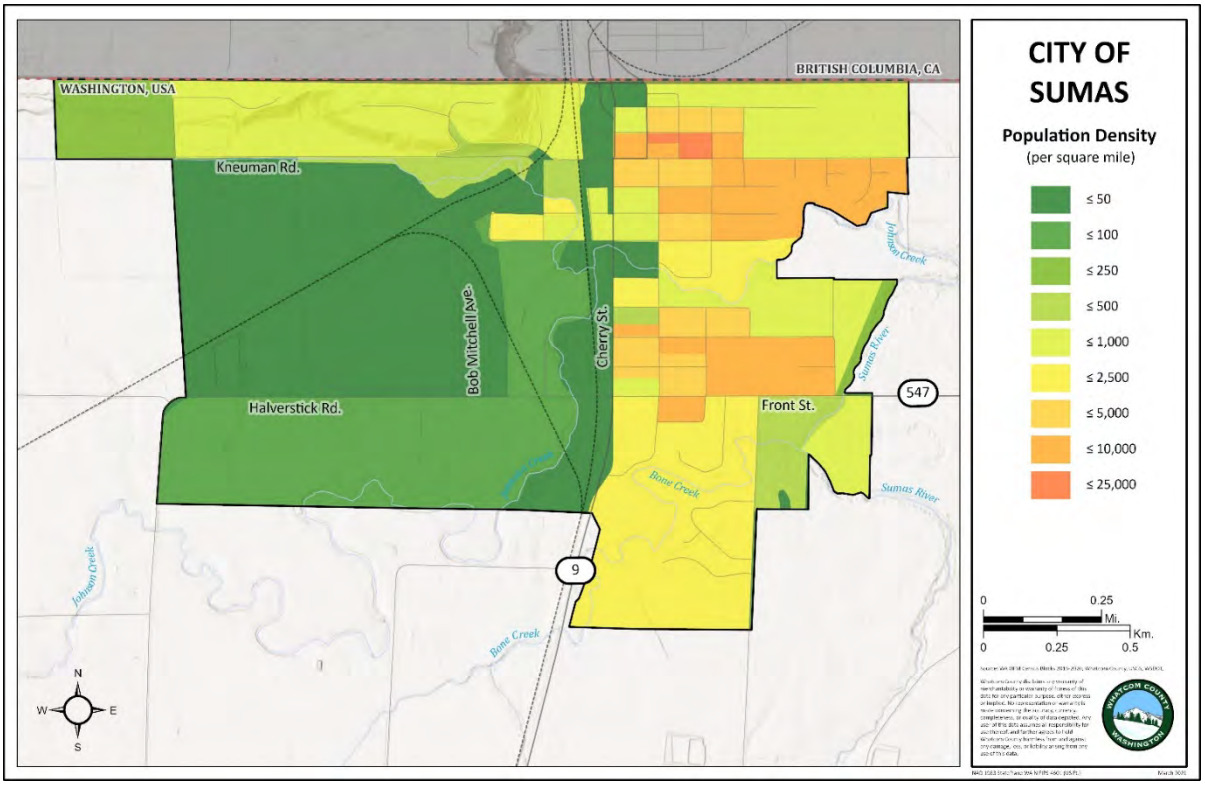
Public Outreach and Education

Program	Yes/No, Year Adopted	Description
Nonprofit organizations or local residents groups focused on hazard mitigation, emergency preparedness, vulnerable populations, etc.	No	
Ongoing public education or information programs	Yes 2006-Quarterly newsletters 2008-CRS notifications 2014- City website postings 2018-City Facebook postings	/nformation regarding water conservation, repetitive loss, winter storm preparedness, flood hazard preparedness.
School-related programs for natural hazard safety	Yes 2010 to present	Semiannual drills in schools regarding disaster preparedness
Public education or information program	Yes 2006-Quarterly newsletters 2008-CRS notifications 2014- City website postings 2018-City Facebook postings	Information regarding water conservation, repetitive loss, winter storm preparedness, flood hazard preparedness.
StormReady certification	No	Whatcom County is a StormReady County.
Firewise Community certification	No	The Paradise Lakes Country Club is a Firewise Site, but is located outside the City.
Public-Private Partnership initiatives addressing disaster-related issues	No	
Other		

Overview of Sumas, Hazards, and Assets

Geography of Sumas

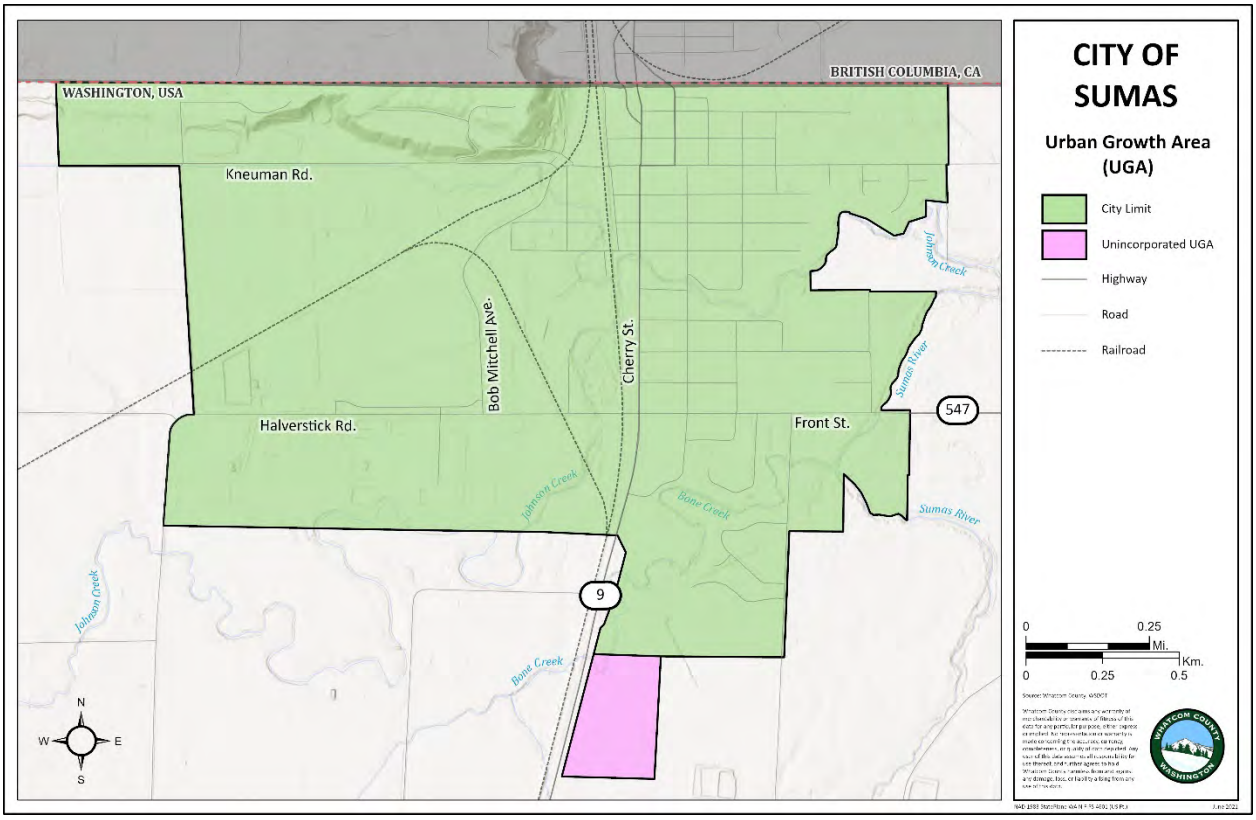
Sumas Population	1,665 (2020 OFM estimate)
Total Area	1.44 sq. mi. (within city limits)



Washington State Office of Financial Management (OFM) 2020 population and housing estimates for 2010-2020 census block data. This map uses the 2016-2020 average population to show population density per square mile.

Growth Trends

This map displays the UGA for the City of Sumas, as designated by the Whatcom County Comprehensive Plan.



Presence of Hazards and their Impacts in the City of Sumas

Flooding is a major hazard impacting the City of Sumas. Moderate to major flooding events occur approximately every five to ten years, with the most recent event taking place in February 2020. During that event, floodwaters from the Nooksack River flowed north through the Nooksack Overflow Corridor and through Sumas on the way to the Fraser River in Canada. That event saw major flooding through much of the City, with floodwater depths from one to three feet through much of the downtown commercial and residential areas. Numerous travel routes were unavailable and access to local businesses and services was also interrupted.

Since the 2016 NHMP was adopted, the City of Sumas has grown by roughly 150 people. While some of this growth has occurred on Moe Hill (the high ground outside the floodplain located adjacent to the Canadian border), the majority of new growth has occurred within the 100-year floodplain because nearly all of the remaining undeveloped land is in the floodplain. The presence of the floodplain throughout much of Sumas has resulted in the local school district

moving forward with construction of a new elementary school on the site of the existing school, which is in the floodplain. However, based on requirements set forth in the City's Flood Damage Prevention Ordinance, the new school will be constructed to have the lowest floor elevated three feet above the base elevation of the 100-year flood event.

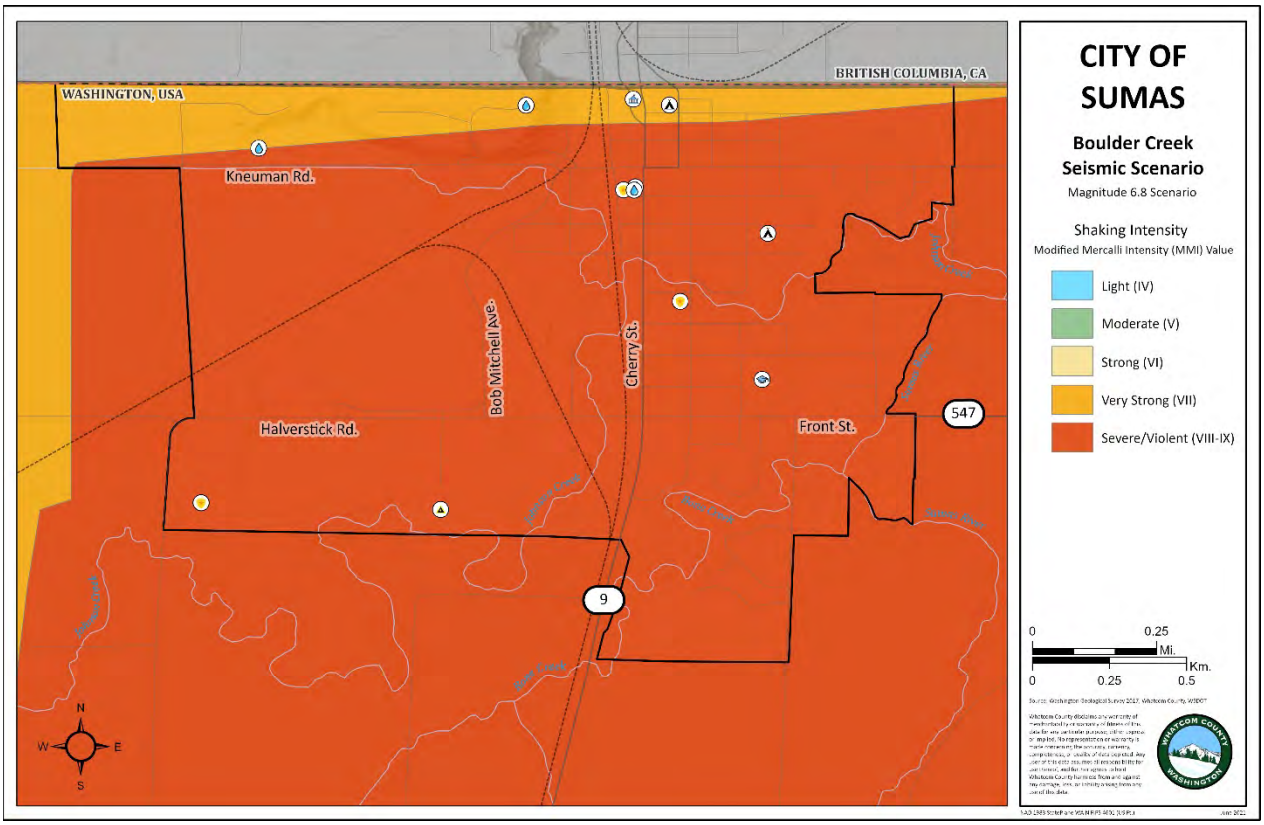
In the table below is a list of the major hazards that effect Whatcom County. The second column provides the percentage of Sumas' total area that is exposed to each hazard. The third column indicates the severity of anticipated impacts to community function, considering the credible worst-case hazard scenario. Severity of anticipated impacts considers effects on basic community function such as shelter, transportation, utilities, commerce, industry, agriculture, education, health, recreation, and cultural identity. Severity ranges from none to extreme, as shown in the key below the table. Finally, the last column of the table describes where the hazard impacts the community and which services the hazard would most significantly impact.

	Hazard	% area Exposed	Severity of Anticipated Impacts	Hazard Descriptions
Geological	**Earthquake**	99.9%	Mod	Subject to seismic activity. Significant risk due to Sumas' highest concentration of older homes in the county.
	Liquefaction	91.5%	Low	Seismically-sensitive soils.
	Landslide	0%	Low	The steep slopes along the southern margin of Moe Hill present a low severity risk of landslide.
	Volcano	88.9%	Low	The City is at risk of a Mount Baker lahar.
	Tsunami	0%	None	N/A
	Mine Hazards	0%	None	N/A
Hydrological	**Flooding**	88.5%	High	During a flooding event, the majority of the City floods from the Nooksack River, from west to east, in a northeasterly flow.
Meteorological	**Wildfire**	17.5%	None	N/A

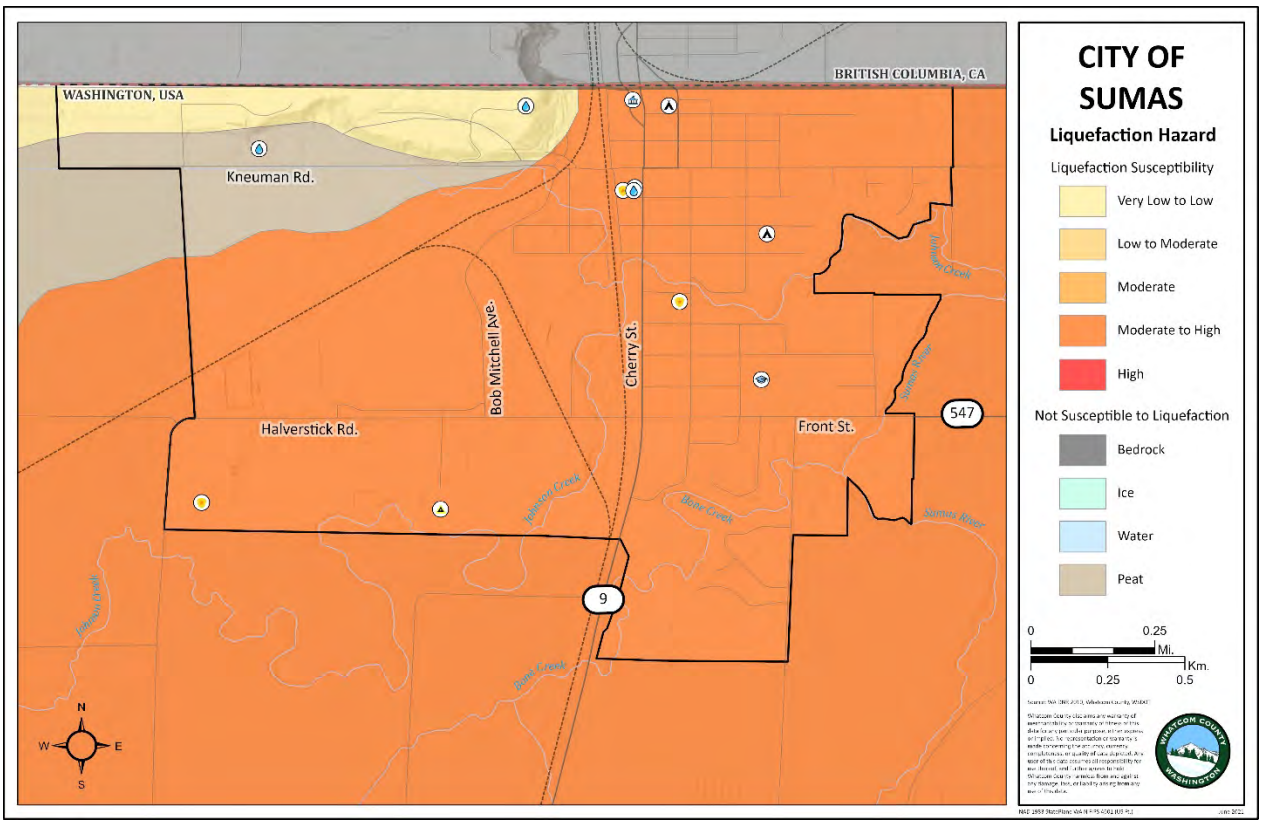
Severity Scale: **None** = no impact to community function
Low = minor degradation of community functions, not widespread
Moderate = moderate degradation over multiple weeks or widespread
High =degradation or loss over many weeks, widespread

Natural Hazard Maps

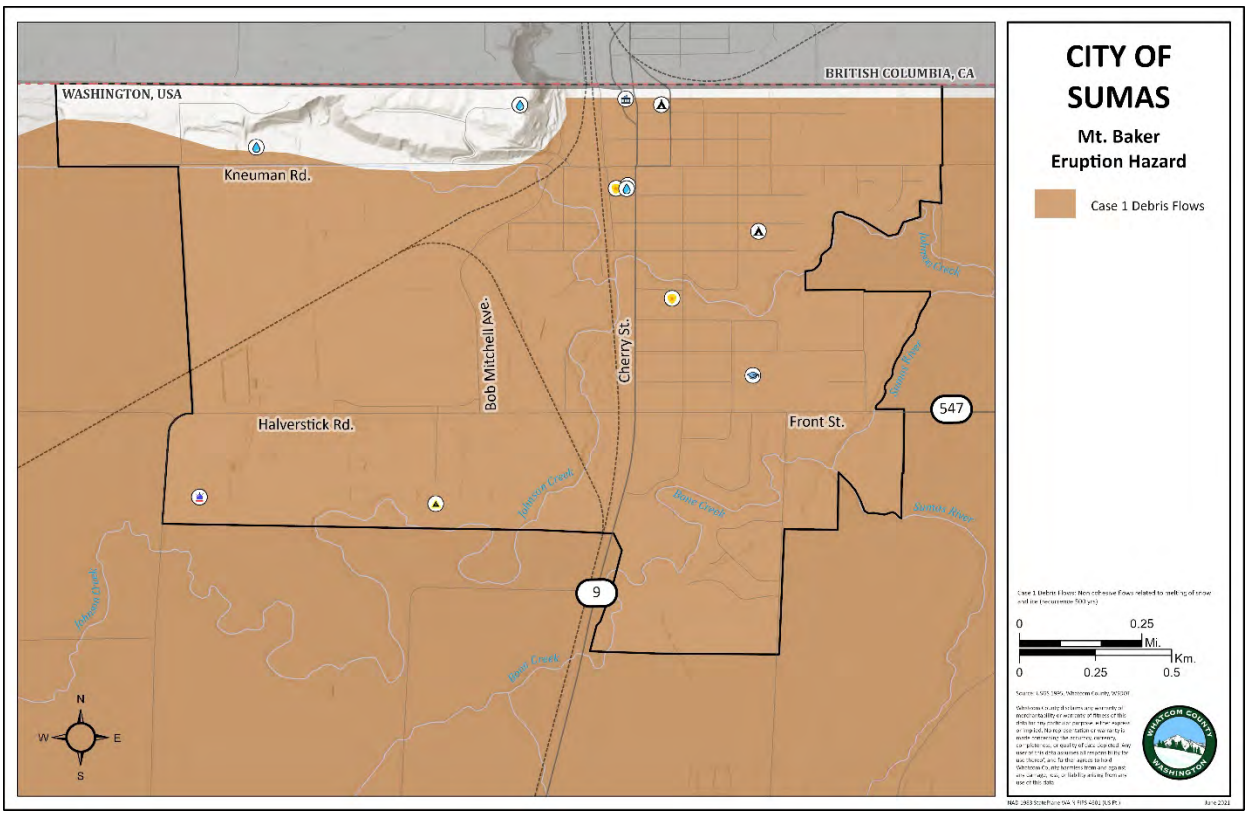
The following figures depict the natural hazards present within the jurisdiction.



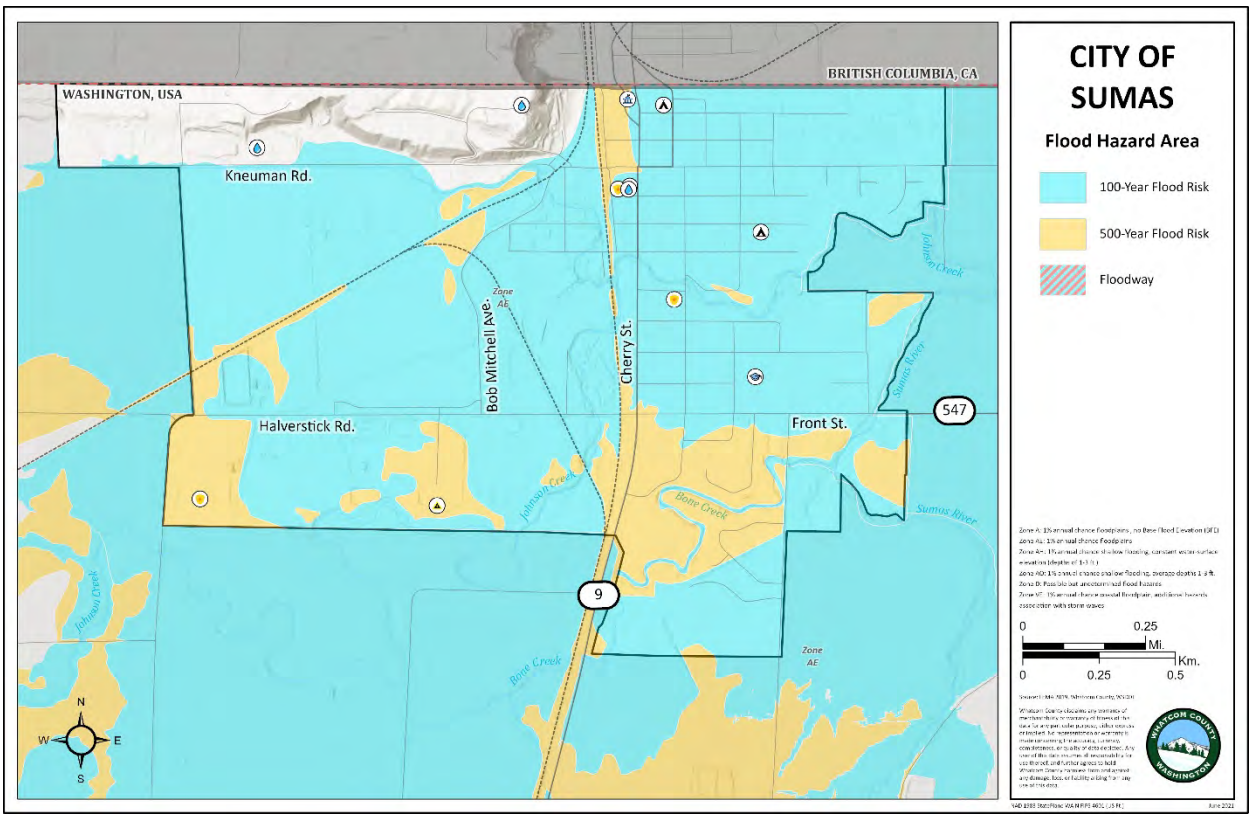
Washington Department of Natural Resources (WA DNR) 2017 Boulder Creek Fault Zone seismic scenario of magnitude 6.8 data. Displays extent and severity of the modeled earthquake in the Modified Mercalli Intensity (MMI) scale.



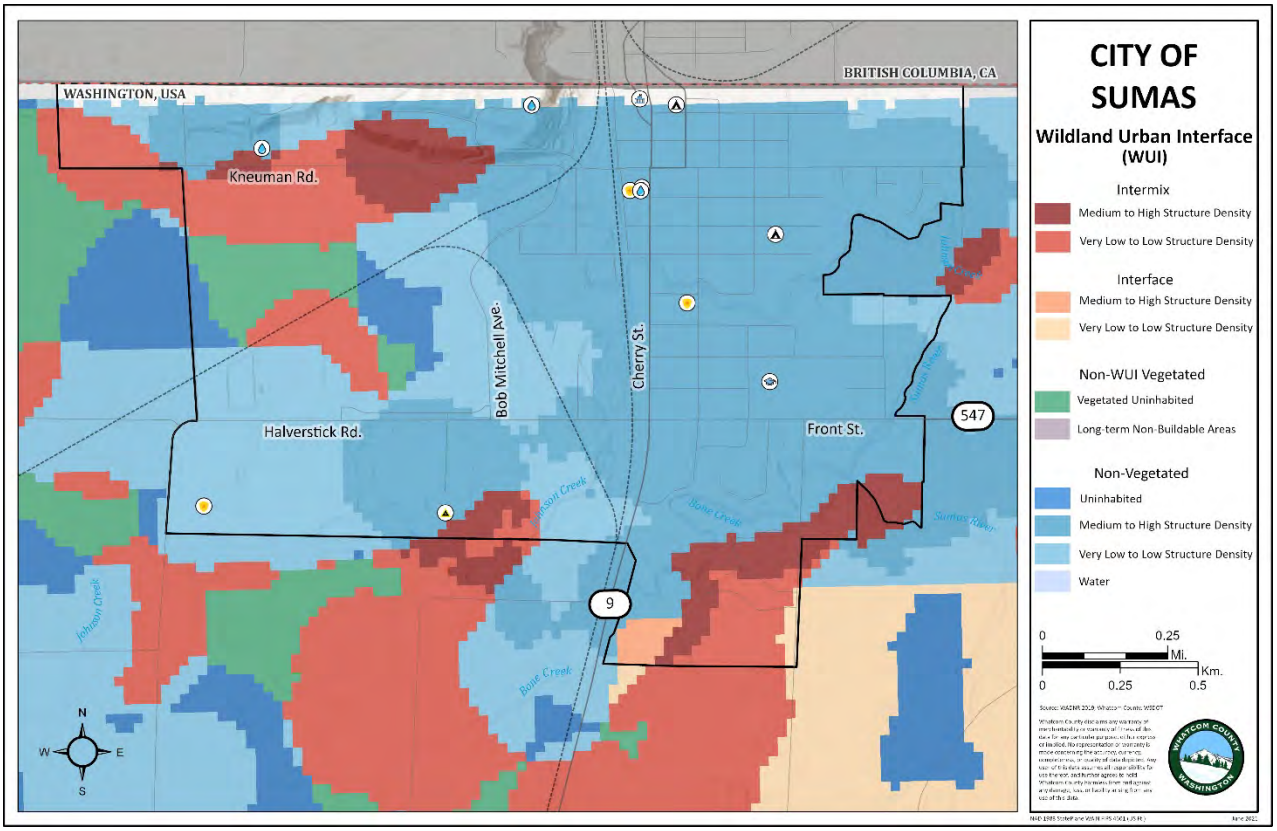
Washington Department of Natural Resources (WA DNR) 2010 liquefaction susceptibility data. This feature class is part of a geodatabase that contains statewide ground response data for Washington State.



USGS Hazards from Future Activity of Mount Baker, WA (1995) data shows different volcanic flows. Case M flows originate as large avalanches of hydrothermally altered rock. Case 1 debris flows are non-cohesive flows related to melting of snow and ice, with a recurrence of 500 years. Case 2 debris flows are cohesive flows from small debris avalanches, with a recurrence of 100 years.



FEMA 2019 flood hazard data showing 100-year flooding, 500-year flooding, floodways, and flood zones. FEMA flood data includes both riverine and coastal flooding.



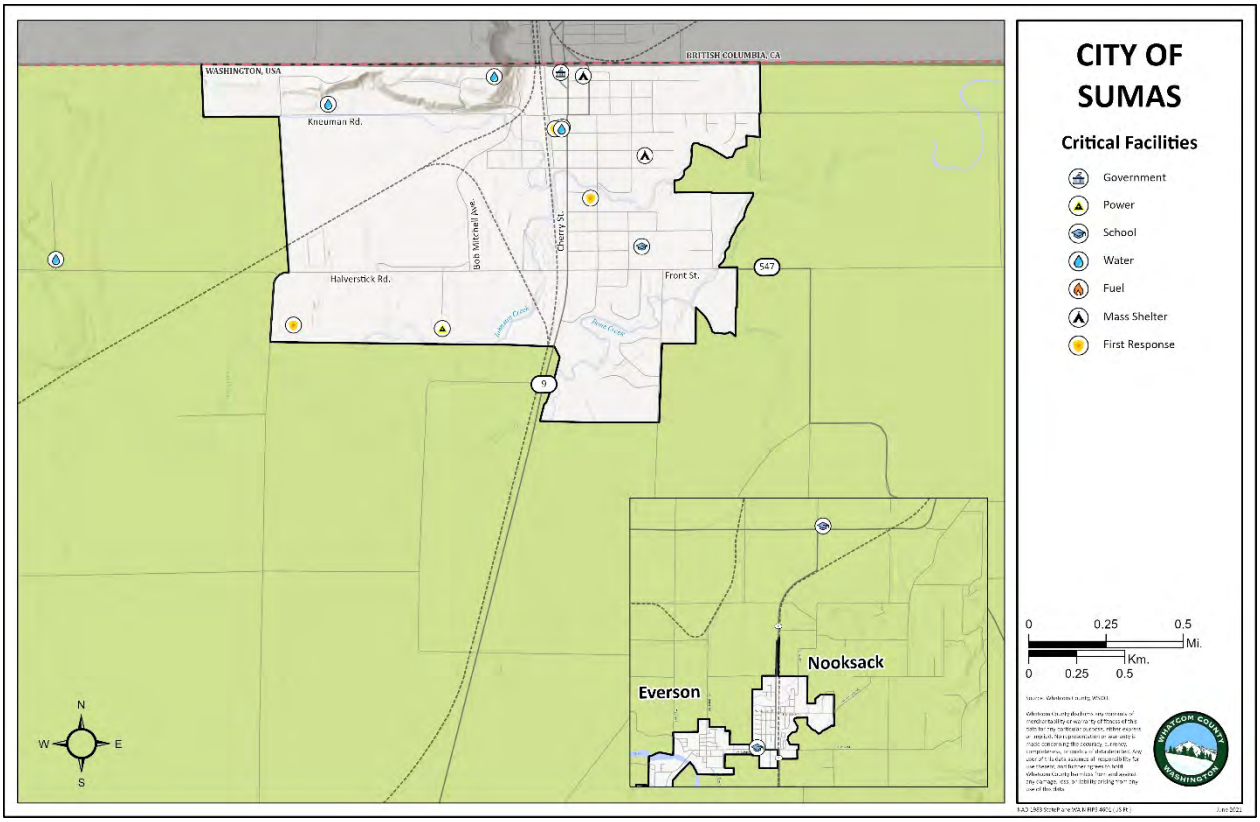
Washington Department of Natural Resources (WA DNR) 2019 mapped data of Washington's Wildland Urban Interface (WUI). The WUI displays areas of WA where structures and wildland overlap with specific structure densities.

Sumas' Critical Facility List

Facility Name	Facility Type	Signi-ficance	Location	Assessed Dollar Value	Notes
American Legion Hall	EF	1	134 Harrison Avenue		Emergency Services
Elementary School - Dist. 506	EF	2	1024 Lawson Street		Evacuation Center
High School - District 506	EF	2	3326 E. Badger Road (County)		Evacuation Center
May Road Wellfield	LUS	3	9700 May Road		Utility: Water
Middle School - District 506	EF	1	404 W. Columbia Street, Nooksack		Evacuation Center
Sumas City Hall	EF	3	433 Cherry Street		Government
Sumas City Reservoir	LUS	3	205 Washington Street		Utility: Water
Sumas City Wellfield	LUS	3	3670 Kneuman Road		Utility: Water
Puget Sound Energy	LUS	1	601-B W. Front Street		Utility: Power
Sumas Fire Station	EF	3	143 Columbia Street		
Sumas Police Dept.	EF	3	433 Cherry Street		Law Enforcement
Sumas Senior Center	EF	2	451 Second Street		Evacuation Center
Sumas Water & Lights	EF	3	433 Cherry Street		Government
Sumas – Customs and Border Patrol	EF	2	109 Cherry Street		Law Enforcement
Williams Gas Pipeline	HMF	2	4378 Jones Road		Fuel
U.S. Border Patrol	EF	3	9648 Garrison Road		Law Enforcement

Facility Type: **EF** = Essential Facility; **HMF** = Hazardous Materials Facility; **HPL** = High Potential Loss; **LUS** = Lifeline Utility System

Significance to community function: **1**=Moderate; **2**= High; **3** =Very High



Map of critical facilities identified by the City of Sumas. Across Whatcom County, critical facilities fell into 15 categories. Unique categories developed for this plan update include mass shelter, assisted living, and recovery resources. Mass shelter includes facilities such as fairgrounds and community centers. Recovery resources are facilities that are required post-hazard event, for example public works and private construction companies. Not all judications identified or included critical facilities in each category.

Critical Facility Rankings for the City of Sumas

The table below indicates whether each critical facility falls within known hazard zones for earthquake, liquefaction, landslide, tsunami, volcano, riverine flooding, coastal flooding and wildfire zones. A rank assessment in the last column indicates how the relative risk of community impact. This ranking considers the significance of the facility to the community and the number of hazard zones the facility is within. The frequency of each hazard is also considered, such that being in a low frequency hazard zone would receive a lower ranking than that same facility being in a high frequency hazard zone. Ranking is on a scale of 1 to 10, with 1 being the facility with the highest-ranking score, and 10 being a facility with the lowest ranking score in the jurisdiction.

$$\text{Rank} = \text{Significance} * \left[\frac{\text{EQ\_Zone}}{\text{EQ\_Freq}} + \frac{\text{LQ\_Zone}}{\text{LQ\_Freq}} + \frac{\text{LS\_Zone}}{\text{LS\_Freq}} + \ldots \frac{\text{WF\_Zone}}{\text{WF\_Freq}} \right]$$

Ranking value will be from 0.0 to 1.0, scaled to the highest ranking in the jurisdiction.

Significance: 1=moderate; 2=high; 3=very high, as assessed in the critical facilities list in the previous section

Zone: 0=facility not in hazard zone; 1 = facility in the hazard zone

Frequency (e.g. EQ_Freq, LQ_Freq) is the most difficult variable to which to assign a value. Frequency varies based upon the magnitude of a hazard event and varies from one place to another. It was not possible within the time constraints to assess frequency of hazard at each critical facility location. Instead, a qualitative assessment of the hazard frequency across the entire county was made, as shown in the chart below.

Description	Freq Value used in formula	Hazards
Frequent, occurring on the order of decades	3	Riverine flooding (FL); Coastal flooding (COA)
Rare, occurring on the order of centuries	2	Earthquake (EQ); Liquefaction (LQ); Landslide (LS); Wildfire (WF)
Very rare, occurring on the order of millennia	1	Tsunami (TSU); Volcano (VOL)

Note: Severe storm, a very frequent hazard, was omitted because it is ubiquitous and because no hazard map of storm severity was available.

Critical Facilities Ranking Table

Facility Name	Facility Type	Signi-ficance	EQ	LQ	LS	TSU	VOL	FL	COA	WF	Rank Assessment
American Legion Hall	EF	1	1	1	0	0	1	1	0	0	0.33
Elementary School - Dist. 506	EF	2	1	1	0	0	1	1	0	0	0.66
High School - District 506	EF	2	1	1	0	0	1	1	0	0	0.66
May Road Wellfield	LUS	3	1	1	0	0	1	1	0	0	1
Middle School - District 506	EF	1	1	1	0	0	1	1	0	0	0.33
Sumas City Hall	EF	3	1	1	0	0	1	1	0	0	1
Sumas City Reservoir	LUS	3	1	1	0	0	1	0	0	0	0.86
Sumas City Wellfield	LUS	3	1	0	0	0	1	0	0	1	0.86
Puget Sound Energy	LUS	1	1	1	0	0	1	1	0	0	0.33
Sumas Fire Station	EF	3	1	1	0	0	1	1	0	0	1
Sumas Police Dept.	EF	3	1	1	0	0	1	1	0	0	1
Sumas Senior Center	EF	2	1	1	0	0	1	1	0	0	0.66
Sumas Water & Lights	EF	3	1	1	0	0	1	1	0	0	1
Sumas – CBP	EF	2	1	1	0	0	1	1	0	0	0.66
Williams Gas Pipeline	HMF	2	1	1	0	0	1	1	0	0	0.66
U.S. Border Patrol	EF	3	1	1	0	0	1	1	0	0	1

Notes: **EQ** = Earthquake; **LQ** =Liquefaction; **LS** = Landslide; **TSUN** = Tsunami; **VOL** = Volcano; **FL** = Riverine Flooding; **COA** = Coastal Flooding; **WF** = Wildland Fire

Areas and Assets Exposed, Per Hazard

City of Sumas Exposure to Natural Hazards						
	Hazard Susceptibility	Asset County (% of Total)				Critical Facilities Appraised Value (Million)
		Area (sq.mi.)	Population	Parcels	Critical Facilities	
Geological	**Earthquake**, Shaking Intensity					
	MMI IV	-	-	-	-	-
	MMI V	-	-	-	-	-
	MMI VI	-	-	-	-	-
	MMI VII	11.9%	6.4%	10.6%	43.7%	$18
	MMI VIII - IX	88%	93.1%	89.4%	56.3%	$36
	TOTAL	99.9%	99.5%	100%	100%	$54
	Liquefaction					
	Very Low to Low	7.9%	4.1%	6.8%	12.5%	$0.3
	Low to Moderate	-	-	-	-	-
	Moderate	-	-	-	81.3%	$53
	Moderate to High	83.6%	93.5%	91.2%	-	-
	High	-	-	-	-	-
	TOTAL	91.5%	97.6%	98%	93.8%	$53.3
	Volcanic Eruption					
	Case 1 Debris Flows	88.9%	93.6%	91.4%	75% [1]	$49 [1]
	Case 2 Debris Flows	-	-	-	-	-
	Case M Flows	-	-	-	6.3% [1]	$5 [1]

	Pyroclastic Flows, Lava Flows, and Ballistic Debris	-	-	-	-	-
	Lateral Blast Hazard Zone	-	-	-	-	-
	TOTAL	88.9%	93.6%	91.4%	81.3%	$54
	Tsunami, Inundation Zone					
	Low to Moderate Inundation Potential	-	-	-	-	-
	Moderate to High Inundation Potential	-	-	-	-	-
	High Inundation Potential	-	-	-	-	-
	TOTAL	-	-	-	-	-
Hydrological	**Flooding**					
	100-year Flood	72.2%	82.8%	73.9%	56.2%	$11
	500-year Flood	16.3%	11%	19%	18.8%	$33
	Floodway	-	-	-	-	-
	Undetermined (Zone D)	-	-	-	-	-
	TOTAL	88.5%	93.8%	92.9%	75%	$44
Meteorological	**Wildfire Zones**					
	Interface Very Low-Low Structure Density	0.3%	0.3%	0.1%	-	-
	Interface Medium-High Structure Density	0.6%	0.9%	0.2%	-	-
	Intermix Very Low-Low Structure Density	9.5%	3.7%	2.5%	6.3%	-
	Intermix Medium-High Structure Density	7.1%	4.8%	5.9%	-	-
	TOTAL	17.5%	9.7%	8.7%	6.3%	-

[1]Some critical facilities located in multiple hazard zones.

Status of Sumas's 2016-2020 and Ongoing Hazard Mitigation Actions

This section describes the status of mitigation actions that were proposed in the 2016 Mitigation Plan and are now 1) currently being implemented and are ongoing, 2) are now completed, or 3) are now discontinued because they are no longer needed. The actions are organized by hazard and indicate the lead agency, funding source, and status.

1	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
5	Funding Source:	Local; State; FEMA; Private; Other
6	Current Status	Action Discontinued / Action Completed / Action ongoing and expected completion date

General: All Hazards

G-a. Adopt and Enforce Building Codes. This applies to earthquakes, flooding, winter storms/freezes, and severe wind. The City Building Department continues to adopt and enforce local building codes to reduce risks from natural hazards.

Lead Agency	City Building Department
Funding Source	Local; City General Fund
Current Status	Ongoing

Education and Outreach

EO-a. Emergency preparedness education programs for schools. Emergency preparedness and emergency management is delegated to school districts by Washington State RCW's. The Whatcom County Sheriff's Office Division of Emergency Management does support all the school districts in Whatcom County with emergency planning.

Lead Agency	School District
Funding Source	Local, Homeland Security Grant Funding
Current Status	Action Ongoing and continuous

EO-b. Drills, exercises in homes, workplaces, classrooms, etc. Emergency drills and exercises are delegated to school districts by Washington State RCW's. The Whatcom County Sheriff's Office Division of Emergency Management does support all the school districts in Whatcom

County with emergency drills and exercises.

Lead Agency	School District
Funding Source	Local; Annual budget / Member dues
Current Status	Ongoing

EO-c. Distribution of severe weather guides, preparedness handbooks, brochures homeowner's retrofit guide, etc. The Whatcom County Sheriff's Office Division of Emergency Management is the county focal point for the distribution of brochures, handbooks and guides for emergency and disaster management.

Lead Agency	Whatcom County Sheriff's Office Division of Emergency Management
Funding Source	Local, state, FEMA, Private, Other
Current Status	Action Ongoing and continuous

EO-d. Newsletters and utility bill inserts. The City Public Works Department continues provide hazard information to citizens, including through quarterly newsletters and information included with monthly utility bills.

Lead Agency	City Public Works Department
Funding Source	Local; City General Fund
Current Status	Ongoing

Drought/heat wave

D-a. Assess Vulnerability to Drought Risk. The City Planning Department continues to assess risks related to drought, including as part of the 2016 update to the City's critical areas ordinance.

Lead Agency	City Planning Department
Funding Source	Local; City Water Fund
Current Status	Ongoing

D-b. Monitor Drought Conditions. The City Public Works Department continues to monitor drought conditions on annual basis and implements water-related mitigation strategies as appropriate.

Lead Agency	City Public Works Department
Funding Source	Local; City Water Fund
Current Status	Ongoing

D-c. Monitor Water Supply. The City Public Works Department continues to monitor the public water supply and implement water conservation strategies as appropriate.

Lead Agency	City Public Works Department
Funding Source	Local; City Water Fund
Current Status	Ongoing

D-e. Plan for Drought. The City Planning Department continues to plan for droughts, including as part of the 2016 update of the city comprehensive land use plan.

Lead Agency	City Planning Department
Funding Source	Local; City Water Fund
Current Status	Ongoing

D-f. Require Water Conservation During Drought Conditions. The City Public Works Department continues to monitor drought conditions and implement water conservation measures as appropriate.

Lead Agency	City Public Works Department
Funding Source	Local; City Water Fund
Current Status	Ongoing

D-g. Educate Residents on Water Saving Techniques. The City Administration continues to support education of residents regarding water conservation efforts, including through information provided with quarterly newsletters and monthly utility bulls.

Lead Agency	City Administration
Funding Source	Local; City Water Fund
Current Status	Ongoing

Earthquake

EQ-a. Incorporate Earthquake Mitigation into Local Planning. The City Planning Department continues to incorporate planning related to earthquakes, including as part of the 2016 update to the city comprehensive plan.

Lead Agency	City Planning Dept.
Funding Source	Local; City General Fund
Current Status	Ongoing

EQ-b. Map and Assess Community Vulnerability to Seismic Hazards. The City Planning

Department continues to map and assess vulnerability to seismic hazards, including as part of the 2016 update of the city critical areas ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local; City General Fund
Current Status	Ongoing

EQ-c. Conduct Inspections of Building Safety. The City Building Department continues to conduct inspections related to building safety as required by City building codes.

Lead Agency	City Building Dept.
Funding Source	Local; City General Fund
Current Status	Ongoing

EQ-d. Protect Critical Facilities and Infrastructure. The City Building, Planning and Public Works Departments continue to protect critical facilities and infrastructure, including requiring critical facilities to be elevated three feet above the FEMA base flood elevation.

Lead Agency	City Building, Planning and Public Works Depts.
Funding Source	Local; City General Fund
Current Status	Ongoing

EQ-e- Protect Wellfield Backup Power.

Lead Agency	City Public Works Dept.
Funding Source	Local
Current Status	Discontinued

Volcano

No actions ongoing, discontinued, or completed for this hazard.

Extreme Temp

No actions ongoing, discontinued, or completed for this hazard.

Flooding

FL-a. Incorporate Flood Mitigation in Local Planning. The City Planning Department continues to incorporate flood mitigation into local planning, including as part of the 2016 update of the city critical areas ordinance, the 2019 adoption of new FEMA flood insurance rate maps, and updates to the County comprehensive flood hazard management plan currently underway.

Lead Agency	City Planning Dept.
Funding Source	Local; City General Fund
Current Status	Ongoing

FL-b. Form Partnerships to Support Floodplain Management. The City Planning and Public Works Departments continue to work to form partnerships that support floodplain management, including working closely with County long-range and current planning divisions and the County Public Works River and Flood Division.

Lead Agency	City Planning and Public Works Depts.
Funding Source	Local; City General Fund
Current Status	Ongoing

FL-c. Limit or Restrict Development in Floodplain Areas. The City Planning, Building and Public Works Departments continue to limit development in floodplain areas through amendment and enforcement of City critical areas ordinance regulations, flood damage prevention regulations, and city building codes.

Lead Agency	City Planning, Building and Public Works Depts.
Funding Source	Local; City General Fund
Current Status	Ongoing

FL-d. Improve Stormwater Management Planning. The City Planning Department continues to improve planning, regulation and enforcement related to stormwater management, including through 2016 updates to the City comprehensive plan and the 2016 adoption of the state stormwater management manual for Western Washington.

Lead Agency	City Planning Dept.
Funding Source	Local; City General Fund
Current Status	Ongoing

FL-e. Improve Flood Risk Assessment. The City Public Works Department continues to assess risks related to flooding, including through participation in the federal CRS Program and RISK Map assessment efforts.

Lead Agency	City Public Works Dept
Funding Source	Local; City General Fund
Current Status	Ongoing

FL-f. Join or Improve Compliance with NFIP. The City continues to participate in the National Flood Insurance Program (NFIP). The City Planning, Building and Public Works Departments continue to work to improve compliance with the NFIP, including through adoption of 2019 amendments to the City's flood damage prevention ordinance that included updated flood insurance rate maps.

Lead Agency	City Planning, Building and Public Works Depts.
Funding Source	Local; City General Fund
Current Status	Ongoing

FL-g. Manage the Floodplain Beyond Minimum Requirements. The City Planning and Building Departments continue to manage floodplains beyond minimum requirements, including through amendment of critical areas and floodplain management regulations that require extra elevation of critical facilities and prohibit the placement of fill within floodplains except under certain conditions

Lead Agency	City Planning and Building Depts.
Funding Source	Local; City General Fund
Current Status	Ongoing

FL-h. Establish Local Funding Mechanisms for Flood Mitigation. The County Flood Control Zone District continues to make locally generated district funds available for local projects, including the buyout of property in high hazard areas.

Lead Agency	County Flood Control Zone District
Funding Source	Local; County Flood Fund
Current Status	Ongoing

FL-i. Improve Stormwater Drainage System Capacity. The City Public Works Department continues to work to improve stormwater drainage system capacity through annual system upgrades and maintenance projects.

Lead Agency	City Public Works Dept
Funding Source	Local; City General Fund
Current Status	Ongoing

FL-j. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures. The City Public Works Department continues to work to improve stormwater drainage system capacity through annual maintenance projects, such as inspection and clearing of stormwater conveyance systems.

Lead Agency	City Public Works Dept
Funding Source	Local; City General Fund
Current Status	Ongoing

FL-k. Preserve Floodplains as Open Space. The City Planning Department continues to work to preserve floodplains as open space, including through the recording of restrictive covenants required in conjunction with approved subdivisions.

Lead Agency	City Planning Dept.
Funding Source	Local; City General Fund
Current Status	Ongoing

FL-l. FL-5 Sumas Avenue Replacement.

Lead Agency	WSDOT
Funding Source	State and Federal
Current Status	Discontinued

Landslide/erosion

No actions ongoing, discontinued, or completed for this hazard.

Landslide Subsidence

SU-a. Map and Assess Vulnerability to Subsidence. The City Planning Department continues to map and assess vulnerability to subsidence, including through 2016 updates to the City critical areas ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local; City General Fund
Current Status	Ongoing

SU-b. Manage Development in High-Risk Areas. The City Building Department continues to manage development in high risk areas, including through required geologically hazardous area site assessment reports.

Lead Agency	City Building Dept.
Funding Source	Local; City General Fund
Current Status	Ongoing

Lightning

No actions ongoing, discontinued, or completed for this hazard.

Winter Storms/Freezes

WW-a. Protect Buildings and Infrastructure. The City Public Works Department continues to work to protect public buildings and infrastructure from severe winter storms, including through annual maintenance and upgrades to increase system resiliency.

Lead Agency	City Public Works Dept
Funding Source	Local; City General, Water and Sewer Funds
Current Status	Ongoing

WW-b. Protect Power Lines. The City Public Works Department continues to work to protect power lines through as-needed inspections and repairs following major winter storm events.

Lead Agency	City Public Works Dept
Funding Source	Local; City General Funds
Current Status	Ongoing

WW-c. Reduce Impacts to Roadways. The City Public Works Department continues to work to reduce impacts to roadways, including through implementation of road closures during major freeze/thaw events.

Lead Agency	City Public Works Dept
Funding Source	Local; City Street Funds
Current Status	Ongoing

Severe Storm

No actions ongoing, discontinued, or completed for this hazard.

Severe Wind

SW-a. Protect Power Lines and Infrastructure. The City Public Works Department continues to work to protect power lines and infrastructure through as-needed inspections and repairs following major wind events.

Lead Agency	City Public Works Dept
Funding Source	Local; City General Funds
Current Status	Ongoing

SW-b. Retrofit Public Buildings and Critical Facilities. The City Public Works Department continues to work to protect public buildings and infrastructure, including through undergrounding of power lines and provision of back-up power generation at critical facilities.

Lead Agency	City Public Works Dept
Funding Source	Local; City General Funds
Current Status	Ongoing

Tornadoes

No actions ongoing, discontinued, or completed for this hazard.

Tsunami

No actions ongoing, discontinued, or completed for this hazard.

Wildfire

No actions ongoing, discontinued, or completed for this hazard.

Winter storms/Freezes

No actions ongoing, discontinued, or completed for this hazard.

Multiple Hazards

MU-a. Assess Community Risk. The City Planning and Public Works Departments continue to assess risks to the public from natural hazards, including through review of repetitive loss properties and review and adoption of updated hazard maps.

Lead Agency	City Planning and Public Works Depts.
Funding Source	Local; City General Funds
Current Status	Ongoing

MU-b. Map Community Risk. The City Planning Department continues to work to map natural hazard areas and assess the risks associated with such areas, including through the 2016 update of the City's critical areas ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local; City General Funds
Current Status	Ongoing

MU-c. Prevent Development in Hazard Areas. The City Building and Planning Departments continue to prevent development in hazard areas, including through enforcement of floodplain, steep slopes and other critical areas regulations,

Lead Agency	City Building and Planning Depts.
Funding Source	Local; City General Funds
Current Status	Ongoing

MU-d. Adopt Development Regulations in Hazard Areas. The City Building and Planning Departments continue to work to adopt regulations addressing hazard areas, including through the 2016 update to the City's critical areas ordinance and the 2019 adoption of updated FEMA flood insurance rate maps and Flood Damage Prevention ordinance.

Lead Agency	City Building and Planning Depts.
Funding Source	Local; City General Funds
Current Status	Ongoing

MU-e. Limit Density in Hazard Areas. The City Planning Department continues to work to limit density in hazard areas, including through adoption of flood corridor regulations and establishment of low-density zones in hazard areas, such as Agriculture and Residential, Low-Density.

Lead Agency	City Planning Dept.
Funding Source	Local; City General Funds
Current Status	Ongoing

MU-f. Integrate Mitigation into Local Planning. The City Planning Department continues to

integrate mitigation into local planning, including through establishment and enforcement of mitigation requirements under the City's critical areas regulations.

Lead Agency	City Planning Dept.
Funding Source	Local; City General Funds
Current Status	Ongoing

MU-g. Strengthen Land Use Regulations. The City Planning Department continues to work to strengthen local land use regulations, including through the 2016 update of the City's critical areas ordinance and 2019 updates to the City's Flood Damage Prevention ordinance.

Lead Agency	City Planning Dept.
Funding Source	Local; City General Funds
Current Status	Ongoing

MU-h. Monitor Mitigation Plan Implementation. The City Planning and Public Works Departments continue to monitor implementation of the Natural Hazards Mitigation Plan through the required annual review process.

Lead Agency	City Planning and Public Works Depts.
Funding Source	Local; City General Funds
Current Status	Ongoing

MU-i. Protect Structures. The City Building and Public Works Departments continue to work to protect structures within the City through enforcement of local building codes and critical areas regulations.

Lead Agency	City Building and Public Works Depts.
Funding Source	Local; City General Funds
Current Status	Ongoing

MU-j. Protect Infrastructure and Critical Facilities. The City Public Works Department continues to work to protect infrastructure and critical facilities, including through regular inspections, annual maintenance projects and capital improvement projects, such as elevating critical facilities above minimum standards.

Lead Agency	City Public Works Dept.
Funding Source	Local; City General, Water and Sewer Funds
Current Status	Ongoing

MU-k. Increase Hazard Education and Risk Awareness. The City Public Works Department continues to work to increase hazard education and risk awareness, including through informational materials included in quarterly newsletters and posted on the City website.

Lead Agency	City Public Works Dept.
Funding Source	Local; City General Fund
Current Status	Ongoing

Sumas 2021-2025 Hazard Mitigation Strategy

Whatcom County Hazard Mitigation Goals

Whatcom County has identified five overarching hazard mitigation goals, which represent what a community seeks to achieve through mitigation actions.

Goal 1. Protect Life, Property and Public Welfare

Goal 2. Increase Public Awareness

Goal 3. Preserve and Enhance Natural Systems

Goal 4. Encourage Partnership for Implementation

Goal 5. Ensure Continuity of Emergency Services

These countywide goals help guide any prioritization and implementation of mitigation actions, ensuring that the actions contribute to a community's vision for the future.

Sumas-Specific Hazard Mitigation Goals

Sumas supports the above county-wide goals. No additional community-specific mitigation planning goals have been identified at this time.

Mitigation Action Options

Appendix E of the Whatcom County Natural Hazard Mitigation Plan provides a list of mitigation options. Sumas considered mitigation options related to earthquakes, droughts, land subsidence, winter storms, severe winds, severe storms, and especially those related to flooding, because these hazards have the potential to cause the greatest loss and damage. Not all mitigation options in Appendix E were relevant or a strong priority for Sumas. Some options have already been implemented or are ongoing in Sumas, as documented in the section above on the status of 2016-2020 and ongoing hazard mitigation actions.

Mitigation Action Prioritization

The mitigation actions in this section are new actions that Sumas has prioritized for the 2021-2025 planning period and beyond. Mitigation options were prioritized based upon review of the following two criteria: 1) The action's Overall Feasibility based on engineering, environmental, financial, and political considerations, 2) The Criticality of the action, based upon a consideration of which actions had the greatest potential to protect life, property, and public welfare. Sumas is working in cooperation with the County and other participating communities

and special districts to develop a systematic methodology that would use multiple evaluation criteria to determine mitigation action prioritization. This new methodology will be used in future updates of this Plan.

In the following Identified Mitigation Actions 2021-2025 table, each priority action is listed by hazard. Each action is followed by planning goals, lead agency, the priority evaluation, timeline, funding source and estimated cost, where such information is available. This information can be used by local decision makers in pursuing strategies for implementation.

1	Goals	Indicates the hazard mitigation planning goal or goals this action addresses; countywide and/or community-specific
2	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
3	Priority	H (High); M (Medium); L (Low)
4	Timeline	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years)
5	Funding Source	Local; State; FEMA; Private; Other
6	Estimated Cost	Actual; Estimated

Sumas Identified Mitigation Actions 2021-2025

CITY OF SUMAS IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
GENERAL: ALL HAZARDS Education and Awareness Actions	These are actions that inform and educate citizens, elected officials, and property owners about hazards and ways to mitigate them.						
	G-a. Ongoing -- Adopt and Enforce Building Codes.	1,2	City Building Dept		O		
Education and Outreach	***EO-a. Ongoing -- Emergency preparedness education programs for schools.***	2	School District		O		
	EO-b. Ongoing -- Drills, exercises in homes, workplaces, classrooms, etc.	2	School District		O		
	EO-c. Ongoing -- Distribution of severe weather guides, preparedness handbooks, brochures homeowner's retrofit guide, etc.	2	WCDEM		O		
	EO-d. Ongoing -- Newsletters and utility bill inserts.	2	City Public Works Dept		O		
Hazard Specific (Reference: Whatcom County Mitigation Ideas)	Actions communities should consider to identify and evaluate a range of potential mitigation actions for reducing risk to natural hazards and disasters.						
Dam/Levee							

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF SUMAS IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Failures (See: Flooding)							
Droughts/Heat Waves	***D-a. Ongoing -- Assess Vulnerability to Drought Risk.***	1,2	City Planning Department		O		
	D-b. Ongoing -- Monitor Drought Conditions.	1,2	City Public Works Department		O		
	D-c. Ongoing -- Monitor Water Supply.	1,2,5	City Public Works Department		O		
	D-e. Ongoing -- Plan for Drought.	1			O		
	D-f. Ongoing -- Require Water Conservation During Drought Conditions	1	City Public Works Department		O		
	D-g. Ongoing -- Educate Residents on Water Saving Techniques.	2	City Administration		O		
Earthquakes	***EQ-a. Ongoing -- Incorporate Earthquake Mitigation into Local Planning.***	1.4	City Planning Dept		O		
	EQ-b. Ongoing -- Map and Assess Community Vulnerability to Seismic	1,2	City Planning Dept		O		

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF SUMAS IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	Hazards.						
	EQ-c. Ongoing -- Conduct Inspections of Building Safety.	1	City Building Dept		O		
	EQ-d. Ongoing -- Protect Critical Facilities and Infrastructure	1,5	City Building, Planning and Public Works		O		
Volcano	**VOL-1 Lahar Early Warning Trigger System** The US Geological Survey has designed a number of systems that automatically detect lahars as they descend neighboring valleys. These systems automatically trigger various types of early warning systems, such as sirens or telephone-based warning systems.	1, 2, 5	Lynden Fire Department	L	M	Local sources, and state and federal grants	UNKNOWN
Extreme Temperatures	No actions are currently being considered/All mitigation actions are discontinued, or complete.						
Flooding	***FL-a. Ongoing -- Incorporate Flood Mitigation in Local Planning.***	1, 5	City Planning Dept.	M	O	Local	
	FL-b. Ongoing -- Form Partnerships to Support Floodplain Management.	1	City Planning and Public Works Depts.	M	O	Local	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF SUMAS IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	FL-c. Ongoing -- Limit or Restrict Development in Floodplain Areas.	1, 3	City Planning, Building and Public Works Depts.	M	O	Local	
	FL-d. Ongoing -- Improve Stormwater Management Planning.	1, 3	City Planning Dept	M	O	Local	
	FL-e. Ongoing -- Improve Flood Risk Assessment.	1	City Public Works Dept	M	O	Local	
	FL-f. Ongoing -- Join or Improve Compliance with NFIP.	1	City Planning, Building and Public Works Depts.	M	O	Local	
	FL-g. Ongoing -- Manage the Floodplain Beyond Minimum Requirements.	1, 3	City Planning and Building Depts.	M	O	Local	
	FL-h. Ongoing -- Establish Local Funding Mechanisms for Flood Mitigation.	1, 3	County Flood Control Zone District	M	O	Local, County Flood Fund	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF SUMAS IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	FL-i. Ongoing -- Improve Stormwater Drainage System Capacity.	1	City Public Works Dept	M	O	Local	
	FL-j. Ongoing -- Conduct Regular Maintenance for Drainage Systems and Flood Control Structures	1	City Public Works Dept	M	O	Local	
	FL-k. Ongoing -- Preserve Floodplains as Open Space.	1, 3	City Planning Dept	M	O	Local	
	FL-1 Protect City Hall/Police Station This building is subject to flooding and is also prone to major damage in an earthquake, given that the building pre-dates modern building codes. A new facility should be constructed outside the floodplain.	1, 5	Sumas Public Works Department	M	M	State or Federal grants	$4.5 Million
	FL-2 Protect the Fire Station This building is subject to flooding. A new facility should be constructed outside the floodplain.	1, 5	Whatcom County Fire District # 14	M	M	State or federal grants	2.5 Million
	FL-3 Flood Corridor Residential Buy-Out In a large flood, the Cherry Street bridge over Johnson Creek is a major impediment to flow. Water is forced out of the Johnson	1, 2, 3	City of Sumas	M	L	State or federal grants	$1 Million

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF SUMAS IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	Creek channel, leading to worse inundation in the commercial and residential areas to the north and northeast. The bridge should be replaced at a higher elevation and with less supporting pilings.						
	FL-4 Cherry Street Bridge Replacement In a large flood, the Cherry Street bridge over Johnson Creek is a major impediment to flow. Water is forced out of the Johnson Creek channel, leading to worse inundation in the commercial and residential areas to the north and northeast. The bridge should be replaced at a higher elevation and with less supporting pilings.	1, 2, 3	WA State Department of Transportation	M	L	State or federal grants	$10 Million
Landslide/ Erosion	No actions are currently being considered/All mitigation actions are discontinued, or complete.						
Land Subsidence	***SU-a. Ongoing -- Map and Assess Vulnerability to Subsidence.***	1,2	City Planning Dept.		O		
	SU-b. Ongoing -- Manage Development in High-Risk Areas.	1	City Building Dept.		O		

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF SUMAS IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Lightning	No actions are currently being considered/All mitigation actions are discontinued, or complete.						
Severe Storms	No actions are currently being considered/All mitigation actions are discontinued, or complete.						
Severe Wind	***SW-a. Ongoing -- Protect Power Lines and Infrastructure.***	1,5	City Public Works		O		
	SW-b. Ongoing -- Retrofit Public Buildings and Critical Facilities.	1,5	City Public Works		O		
Tornadoes	No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						
Tsunami	No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						
Wildfires	No actions are currently being considered/All mitigation actions are ongoing, discontinued, or complete.						
Winter Storms/	***WW-a. Ongoing -- Protect Buildings and Infrastructure.***	1	City Public Works Dept		O		

Priority:	**Timeline:**	**Funding Source:**	**Estimated Cost:**
H (High); M (Medium); L (Low)	**Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing**	**Local; State; FEMA; Private; Other**	**Actual; Estimated**

CITY OF SUMAS IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
Freezes (Severe Winter Weather)	***WW-b. Ongoing -- Protect Power Lines.***	1,5	City Public Works Dept		O		
	WW-c. Ongoing -- Reduce Impacts to Roadways	1,5	City Public Works Dept		O		
Multiple Hazards	***MU-a. Ongoing -- Assess Community Risk.***	1,2	City Planning and Public Works Depts		O		
	MU-b. Ongoing -- Map Community Risk.	2	City Planning Dept.		O		
	MU-c. Ongoing -- Prevent Development in Hazard Areas.	1	City Building and Planning Depts		O		
	MU-d. Ongoing -- Adopt Development Regulations in Hazard Areas.	1	City Building and Planning Depts.		O		
	MU-e. Ongoing -- Limit Density in Hazard Areas.	1	City Planning Dept.		O		
	MU-f. Ongoing -- Integrate Mitigation into Local Planning.	1,4	City Planning Dept.		O		
	MU-g. Ongoing -- Strengthen Land Use Regulations.	1	City Planning Dept.		O		

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF SUMAS IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	MU-h. Ongoing -- Monitor Mitigation Plan Implementation.	1	City Planning and Public Works Depts		O		
	MU-i. Ongoing -- Protect Structures.	1	City Planning and Public Works Depts		O		
	MU-j. Ongoing -- Protect Infrastructure and Critical Facilities.	1,5	City Public Works Dept.		O		
	MU-k. Ongoing --Increase Hazard Education and Risk Awareness.	2	City Public Works Dept.		O		
Advanced Mitigation Projects (Dream List)	Natural Hazard Early Warning Systems	1,5					
	Cell Phone-Based Early Warning System. A computerized early warning system that automatically dials each landline telephone number within a specified area, and play a recorded message when the phone is answered is currently provided to the City by the Whatcom County Sheriff's Office Division of Emergency Management. A larger capacity system that can also contact cell phones through the use of a federally	2, 5	WCDEM/LFD			Local sources, and state and federal grants	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

CITY OF SUMAS IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	licensed COG would help to address a variety of natural and manmade problems.						

Sumas Annual Review and Progress for Hazard-Specific Mitigation Actions 2021-2025

Progress monitoring means tracking the implementation of the hazard specific mitigation actions over time. Each jurisdiction must identify how, when, and by whom action items will be monitored. The responsible agency assigned to each mitigation action is responsible for tracking and reporting on each of their actions.

Annual review and progress reporting includes the following:

Step One: Identify mitigation actions that your planning team has identified for the annual review. The planning team has the option to address ALL action items, or only those that should be acted on during each review cycle.

Step Two: Use the table below to track annual progress. For each action item selected for annual review insert the appropriate letter that indicates the status of that action item.

Step Three: Complete a progress report form as illustrated in Appendix G for each mitigation action item selected for annual review

Step Four: Submit the completed form(s) to the Whatcom County DEM.

City of Sumas Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & Enter Letter)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
GENERAL: ALL HAZARDS						
G-a. Ongoing -- Emergency preparedness education programs for schools.						
G-b. Ongoing -- Drills, exercises in homes, workplaces, classrooms, etc.						
G-c. Ongoing -- Distribution of severe weather guides, preparedness handbooks, brochures homeowner's retrofit guide, etc.						
G-d. Ongoing -- Newsletters and utility bill inserts. .						
G-e. Ongoing -- Adopt and Enforce Building Codes.						
Add New Action Items if Applicable						
DAM/LEVEE FAILURES						
Add New Action Items if Applicable						
DROUGHTS/HEAT WAVES						
D-a. Ongoing -- Assess Vulnerability to Drought Risk.						
D-b. Ongoing -- Monitor Drought Conditions.						
D-c. Ongoing -- Monitor Water Supply.						
D-e. Ongoing -- Plan for Drought.						
D-f. Ongoing -- Require Water Conservation During Drought Conditions.						
D-g. Ongoing -- Educate Residents on Water Saving Techniques.						
EARTHQUAKES						

City of Sumas Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
EQ-a. Ongoing -- Incorporate Earthquake Mitigation into Local Planning.						
EQ-b. Ongoing -- Map and Assess Community Vulnerability to Seismic Hazards.						
EQ-c. Ongoing -- Conduct Inspections of Building Safety.						
EQ-d. Ongoing -- Protect Critical Facilities and Infrastructure.						
EQ-e Ongoing -- Protect Wellfield Backup Power						Discontinued
Add New Action Items if Applicable						
VOLCANO						
VOL-a. Ongoing -- Lahar Early Warning System.						
VOL-1 Lahar Early Warning Trigger System						
Add New Action Items if Applicable						
FLOODING						
FL-a. Ongoing -- Incorporate Flood Mitigation in Local Planning.						
FL-b. Ongoing -- Form Partnerships to Support Floodplain Management.						
FL-c. Ongoing -- Limit or Restrict Development in Floodplain Areas.						
FL-d. Ongoing -- Improve Stormwater Management Planning.						
FL-e. Ongoing -- Improve Flood Risk Assessment.						
FL-f. Ongoing -- Join or Improve Compliance with NFIP.						

City of Sumas Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
FL-g. Ongoing -- Manage the Floodplain Beyond Minimum Requirements.						
FL-h. Ongoing -- Establish Local Funding Mechanisms for Flood Mitigation.						
FL-i Ongoing --. Improve Stormwater Drainage System Capacity.						
FL-j. Ongoing -- Conduct Regular Maintenance for Drainage Systems and Flood Control Structures.						
FL-k. Ongoing -- Preserve Floodplains as Open Space.						
FL-1 Protect City Hall/Police Station						
FL-2 Protect the Fire Station						
FL-3 Flood Corridor Residential Buy-Out						
FL-4 Cherry Street Bridge Replacement						
Add New Action Items if Applicable						
LANDSLIDES/EROSION						
Add New Action Items if Applicable						
LAND SUBSIDENCE						
SU-a. Ongoing -- Map and Assess Vulnerability to Subsidence.						
SU-b. Ongoing -- Manage Development in High-Risk Areas.						
Add New Action Items if Applicable						
TORNADOES						
Add New Action Items if Applicable						
TSUNAMI						

City of Sumas Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Add New Action Items if Applicable						
WILDFIRES						
Add New Action Items if Applicable						
WINTER STORMS/FREEZES (SEVERE WINTER WEATHER)						
WW-a. Ongoing -- Protect Buildings and Infrastructure.						
WW-b. Ongoing -- Protect Power Lines.						
WW-c. Ongoing -- Reduce Impacts to Roadways.						
Add New Action Items if Applicable						
EXTREME TEMPERATURES						
Add New Action Items if Applicable						
LANDSLIDE						
Add New Action Items if Applicable						
LIGHTNING						
Add New Action Items if Applicable						
SEVERE WIND						
SW-a. Ongoing -- Protect Power Lines and Infrastructure.						
SW-b. Ongoing -- Retrofit Public Buildings and Critical Facilities.						
Add New Action Items if Applicable						
MULTIPLE HAZARDS						

City of Sumas Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
MU-a. Ongoing -- Assess Community Risk.						
MU-b. Ongoing -- Map Community Risk.						
MU-c. Ongoing -- Prevent Development in Hazard Areas.						
MU-d. Ongoing -- Adopt Development Regulations in Hazard Areas.						
MU-e. Ongoing -- Limit Density in Hazard Areas.						
MU-f. Ongoing -- Integrate Mitigation into Local Planning.						
MU-g. Ongoing -- Strengthen Land Use Regulations.						
MU-h. Ongoing -- Monitor Mitigation Plan Implementation						
MU-i. Ongoing -- Protect Structures.						
MU-j. Ongoing -- Protect Infrastructure and Critical Facilities.						
MU-k. Ongoing -- Increase Hazard Education and Risk Awareness.						
Add New Action Items if Applicable						

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WHATCOM COUNTY

Contact Information	**John Gargett, Deputy Director** Whatcom County Sheriff's Office Division of Emergency Management 3888 Sound Way, Bellingham, WA 98226 (360) 778-7160
Approving Authority	**County Executive Satpal Singh Sidhu & County Council Members** 311 Grand Avenue, Suite 108 Bellingham, WA 98225 (360) 778-5200

Planning Process

Whatcom County began the process reviewing, updating, and adopting the 2021 Natural Hazards Mitigation Plan (NHMP or Plan) in the winter of 2020. Biweekly county wide meetings took place to guide Whatcom County through updating the plan. The planning process involved all local political subdivisions in Whatcom County as well as several special districts. The wider Whatcom County community was invited to participate through multiple webinars and outreach efforts.

Key Contributor List

- Wally Kost, Program Specialist, Whatcom County Sheriff's Office, Div. of Emergency Management
- John Gargett, Deputy Director, Whatcom County Sheriff's Office, Div. of Emergency Management
- Frances Burkhart, Program Specialist, Whatcom County Sheriff's Office, Div. of Emergency Management
- Roland Middleton, Whatcom County Public Works
- Paula Harris, River and Flood Manager, Whatcom County Public Works
- Andy Wiser, Geohazard Specialists/Planner, Whatcom County Planning and Development Services

The information contained in the Natural Hazards Mitigation Plan update regarding hazards, risks, vulnerability and potential mitigation is based on the available science, historical

occurrence, known hazards and technology available. This information is used as a planning tool and source document when the County updates other plans and programs, such as the following:

- Whatcom County Comprehensive Emergency Management Plan
- Shoreline Management Program (part of comprehensive plan)
- Transportation Plan (part of comprehensive plan)
- Urban Growth Areas SubArea Plans
- Zoning Code
- Capital Improvement Program for Whatcom County Facilities
- Whatcom County Comprehensive Emergency Management Plan
- Whatcom County Disaster Debris Management Plan
- Whatcom County Severe Storm Action Plan
- Whatcom County Tsunami Action Plan
- Whatcom County Mount Baker Action Plan

As information becomes available from other planning sources, actual incidents and events, or emerging threats that can enhance this Plan, that information will be incorporated through the periodic update process.

Plan Maintenance for Whatcom County

Each year, beginning in August, an annual review will be conducted by each community. Each community will update the status of their 2021-2025 mitigation actions using the annual review and progress table.

The Whatcom County Sheriff's Office Division of Emergency Management will initiate the action. Updates or changes to the plan will be annotated and submitted to the Whatcom County Sheriff's Office Division of Emergency Management. Should the plan require a major change(s) due to legislative or other action, a virtual public meeting will be coordinated by the Whatcom County Sheriff's Office Division of Emergency Management. The update process will be completed when a letter or amendment, as required, is sent to the Washington Military Department, Emergency Management Division Hazard Mitigation Officer stating completion of the review.

Public Outreach and Education

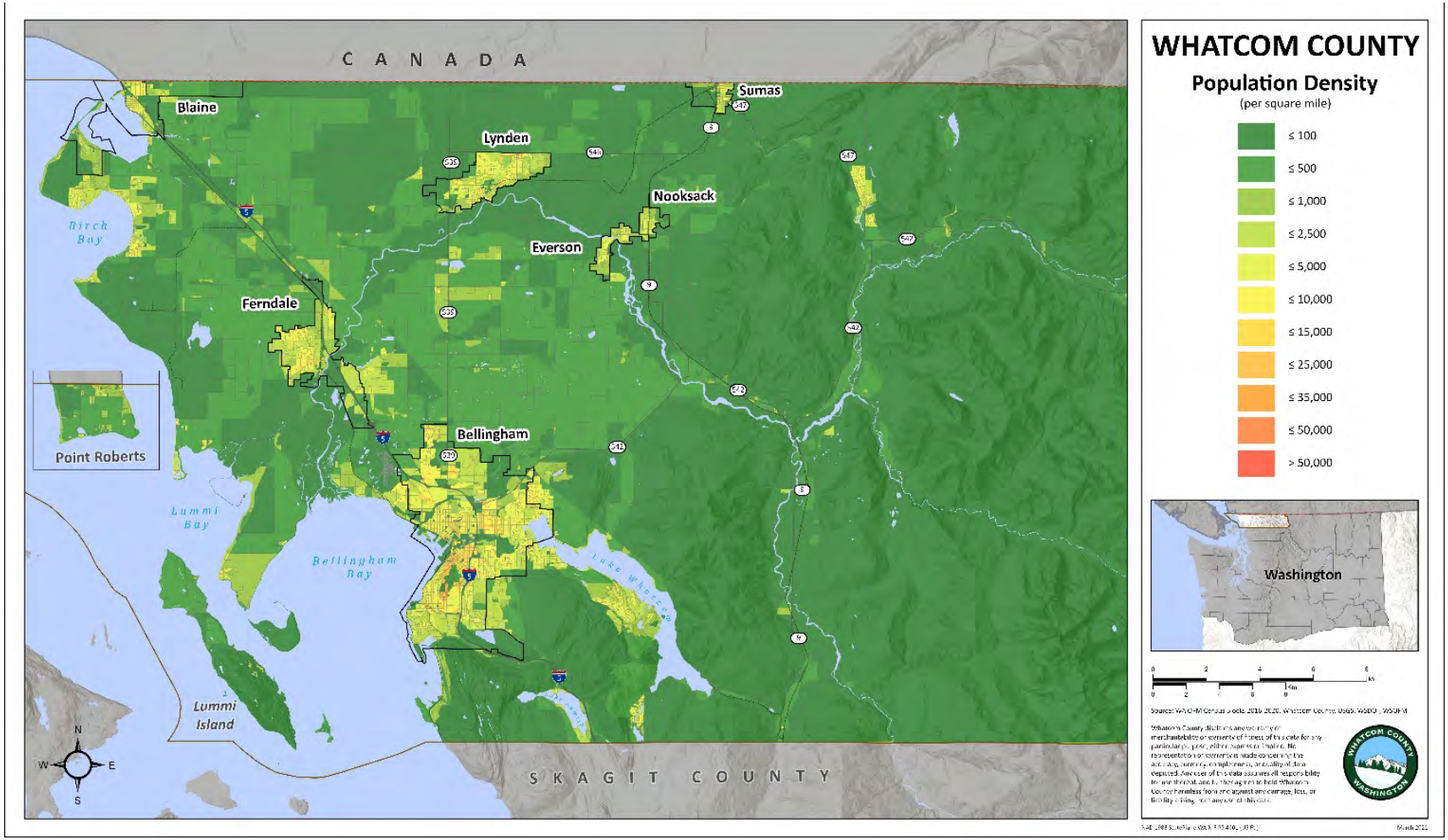
Program	Yes/No, Year Adopted	Description
Nonprofit organizations or local residents' groups focused on hazard mitigation, emergency preparedness, vulnerable populations, etc.	Yes	**Map Your Neighborhood**: prepares residents for the span of time when emergency services are unavailable during a disaster. **CERT:** Community Emergency Response Training prepares residents to safely and efficiently assist others in their neighborhood or workplace following an event when professional responders are not immediately available to help. **Volunteer Mobilization Center:** The VMC is dedicated to being ready after a disaster to sign up spontaneous volunteers as temporary State emergency workers and matching their skills with emergency responders' needs.
School-related programs for natural hazard safety	Yes, 2015-2021	Emergency preparedness education programs for school staff in multiple Whatcom County School Districts.
Public education or information program	Yes, Continuous	**Public Engagement:** Drills, exercises in homes, workplaces, classrooms, etc.; Regular PSA and social media posts; Hazard "safety fairs"; hazard conferences, seminars; Distribution of severe weather guides, preparedness handbooks, brochures homeowner's retrofit guide, etc.; Direct Mailings; Regular newspaper articles Whatcom County Sheriff's Office Division of Emergency Management **Annual correspondence:** Notify residents reminding them of the need to be hazard prepared.

StormReady certification	Yes, first adopted in 2003, and has been renewed every five years since with the most recent renewal being 2021.	Whatcom County is one of 14 counties in Washington State to be certified StormReady. StormReady uses a grassroots approach to help communities develop plans to handle all types of extreme weather.
Firewise Community certification	Yes, initially started in 2015.	There are six FireWise sites in Whatcom County: Clark's Point, The Town of Diablo, Lummi Island Scenic Estates, The Town of Newhalen, North Cascades Environmental Learning Center, and Paradise Lakes Country Club. The national Firewise USA® recognition program provides a collaborative framework to help neighbors in a geographic area get organized, find direction, and take action to increase the ignition resistance of their homes and community and to reduce wildfire risks at the local level. Any community that meets a set of voluntary criteria on an annual basis and retains an "In Good Standing Status" may identify itself as being a Firewise® Site.
Public-Private Partnership initiatives addressing disaster-related issues	Yes, 2015	The Whatcom County Sheriff's Office Division of Emergency Management has undertaken multiple disaster planning and response support with industries in Whatcom County, including response support and planning in 2020 for COVID-19 and the Custer Train Derailment.
Other		

Overview of Whatcom County, Hazards, and Assets

Geography of Whatcom County

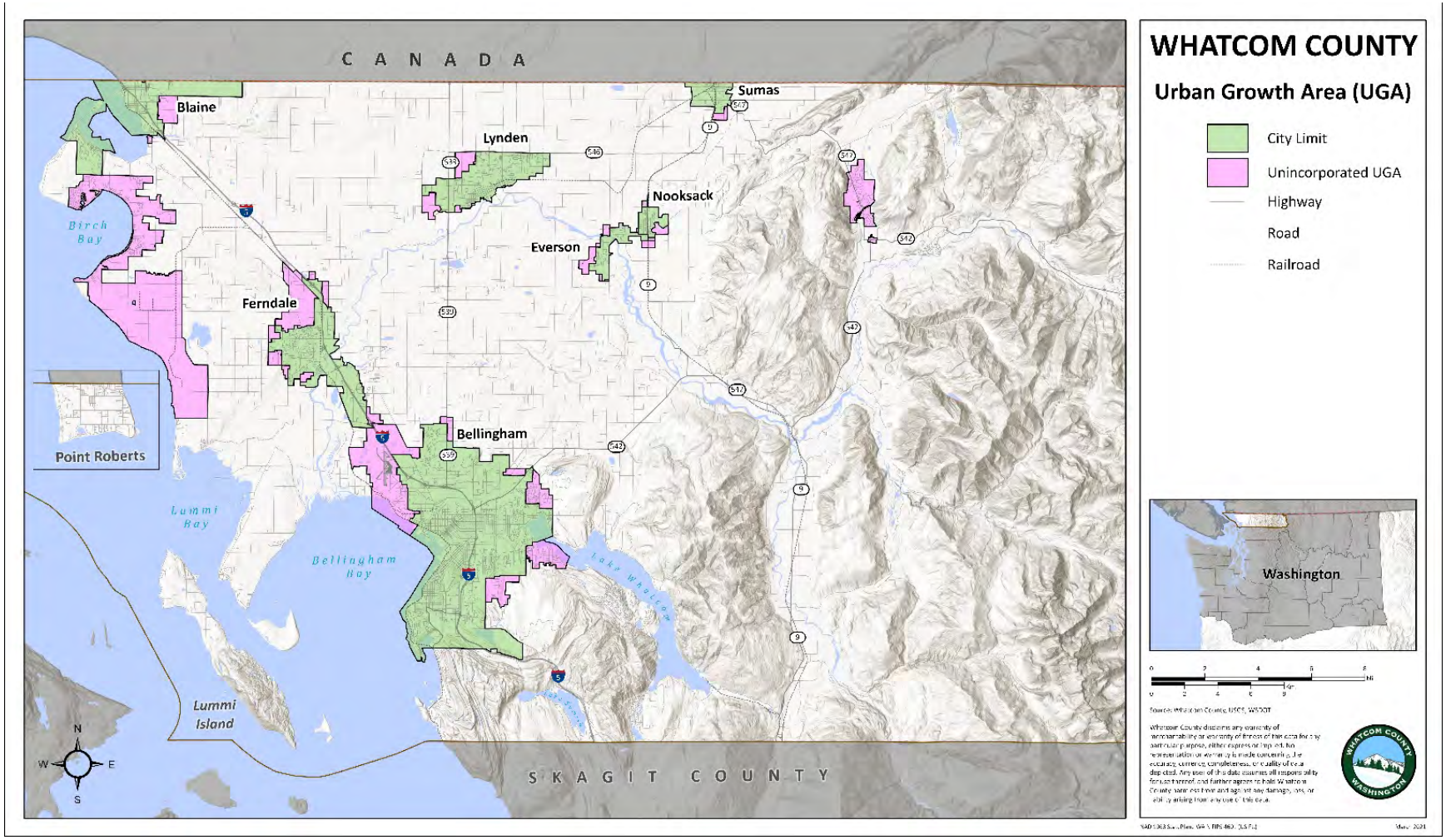
Whatcom County Total Population	228,000 (2020 Census estimate)
Unincorporated Area Population	95,300 (2020 Census estimate)
Whatcom County Total Area	2,120 mi
Whatcom County Incorporated Area	95.4 mi
Whatcom County Unincorporated Area	2,024.6 mi



Washington State Office of Financial Management (OFM) 2020 population and housing estimates for 2010-2020 census block data. This map uses the 2016-2020 average population to show population density per square mile.

Growth Trends

This map displays the UGA for the Whatcom County, as designated by the Whatcom County Comprehensive Plan.


C A N A D A
Blaine
Sumas
Lynden
Nooksack
Everson
Ferndale
Birch Bay
Point Roberts
Bellingham
Lummi Bay
Bellingham Bay
Lake Whatcom
Lummi Island
S K A G I T C O U N T Y
N
W
E
S
WHATCOM COUNTY
Urban Growth Area (UGA)
City Limit
Unincorporated UGA
Highway
Road
Railroad
Washington

Presence of Hazards and their Impacts in Whatcom County

Since its establishment in 1854, Whatcom County has experienced many of the hazards in this Plan. As recently as January of 2020, Whatcom County faced flooding costing millions of dollars in damages, across the County, with specific impact in the Sumas drainage. There have been four FEMA disaster declarations by Whatcom County from January 2016 to June 2021, including:

Declaration Year	Incident Date	Designation	Title	Individual Assistance	Public Assistance[2]
2017	30-Jan-2017 thru 22-Feb-2017	DR-4309-WA	Severe Winter Storms, Flooding, Landslides, and Mudslides in 2017	x	✓ Types A, B, C, D, E, F, and G
2019	10-Dec-2018 thru 24-Dec-2018	DR-4418-WA	Straight-Line Winds, Flooding, Landslides, and Tornado	x	✓ Types A, B, C, D, E, F, and G
2020	20-Jan-2020 thru 10-Feb-2020	DR-4539-WA	Severe Storms, Flooding, Landslides, and Mudslides	x	✓ Types A, B, C, D, E, F, and G
2020	22-Mar-2020[1] thru unknown	DR-4481-WA	Covid-19 Pandemic	✓ (crisis counseling; funeral assistance)	✓ Type B

[1]Emergency declaration on 13-Mar-2020, superseded by disaster declaration on 22-Mar-2020.
[2]Public Assistance Types: A-debris removal, B-emergency protective measures, C-permanent work (roads and bridges), D-permanent work (water control facilities), E-permanent work (buildings and equipment), F-permanent work (utilities), G- permanent works (other) , H-fire management.

Since 2016, Whatcom County Unincorporated has grown by roughly 5,000 residents. This growth has increased the threat of natural hazards, particularly wildfires in the wildland urban interface.

In the table below is a list of the major hazards that effect Whatcom County. The second column provides the percentage of Whatcom County's total area that is exposed to each hazard. The third column indicates the severity of anticipated impacts to community function, considering the credible worst-case hazard scenario. Severity of anticipated impacts considers

effects on basic community function such as shelter, transportation, utilities, commerce, industry, agriculture, education, health, recreation, and cultural identity. Severity ranges from none to extreme, as shown in the key below the table. Finally, the last column of the table describes where the hazard impacts the community and which services the hazard would most significantly impact.

	Hazard	% area Exposed	Severity of Anticipated Impacts	Hazard Descriptions
Geological	**Earthquake**	86.4%	Moderate to High	The risk of earthquakes to the county is moderate to high. Shorelines, wetlands and river/stream beds are especially subject to damage through liquefaction. There are also potential threats from landslides impacting transportation routes. Structural damage could be moderate to high for many older structures in Whatcom County.
	Liquefaction	25.5%	Moderate to High	The loss of intergranular strength in saturated, loosely-packed sediment due to elevated pore pressures typically generated by seismic shaking during large magnitude earthquakes. Liquefaction can result in a loss of foundation bearing support and significant building damage, as well as lateral spreading, sand boils, and excessive ground settlement with associated disruption of utilities, roadway systems, and infrastructure.
	Landslide	5.8%	Moderate	Landslides can affect many places throughout the county, caused destruction to infrastructure, property, and interrupting transportation. Landslides could be caused by earthquakes or erosion, including excess rainfall. Mount Baker, the Chuckanut Mountains, and the Nooksack are just some of the areas susceptible to landslides.
	Volcano	33.9%	High	The principal threat from Mount Baker are lahar flows. Lahar flows to the west will impact the Nooksack drainages, with the potential for the greatest impact in the Sumas Plain north to British Columbia. Lahar flows to the east will, and have (1975), threatened the Baker River project

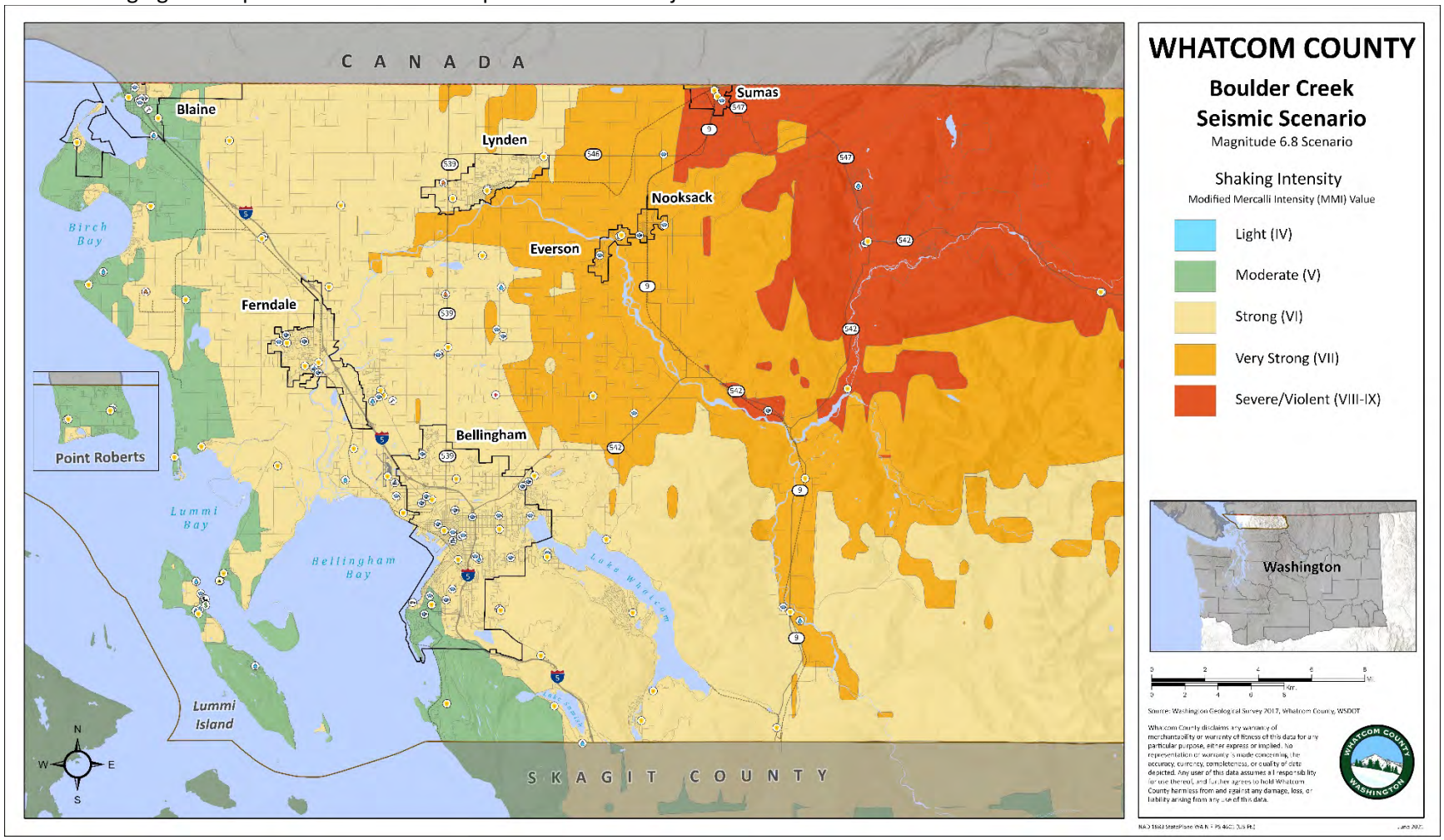
				dams. In 2019 it was estimated that the damage from an eruption of Mount Baker could reach 12-15 billion dollars in damage and long-term impact.
	Tsunami	1.2%	Low	All Whatcom County shorelines are at risk of tsunami damage based on current modeling, however the only area in unincorporated Whatcom County where evidence of a tsunami has been found is in Birch Bay at Birch Bay State Park.
	Mine Hazards	0.1%	Low	Mine hazards are minimal in Whatcom County and generally the mines are deep enough that even a collapse of the shafts would have minimal impact on the surface. Coal mining occurred in Whatcom County over 100 years ago, but there are no active coal mines since then.
Hydrological	**Flooding**	4.8%	Moderate	The Nooksack River is the primary river basin subject to flooding in Whatcom County that causes significant impacts, however there are other rivers and creeks that cause flooding, including Johnson Creek, Sumas River, and Jones Creek. All Whatcom County shorelines are at risk of coastal flooding based on actual events over the last 100 years. The communities in unincorporated Whatcom County impacted by coastal flooding are Sandy Point, Birch Bay, Blaine, Point Roberts, and Lummi Peninsula and Lummi Island. Damages have included structural damage to residences, seawalls and transportation as large debris is carried by waves hitting the shoreline, inundation damage to structures, and debris accumulation and flooding of roadways. In December of 2018 over 3.5 million dollars in damage occurred in Birch Bay and Blaine from coastal flooding.

Meteorological	**Wildfire**	12.3%	Moderate	Certain communities at risk have been identified, as well as levels of fire risk. Smaller communities on the Mt Baker Highway, as well as residents around the North and South shore of Lake Whatcom, along Highway 2 and 542, Pt. Roberts, and Lummi Island are some of the the WUI intermix and interface areas and at the highest risk.

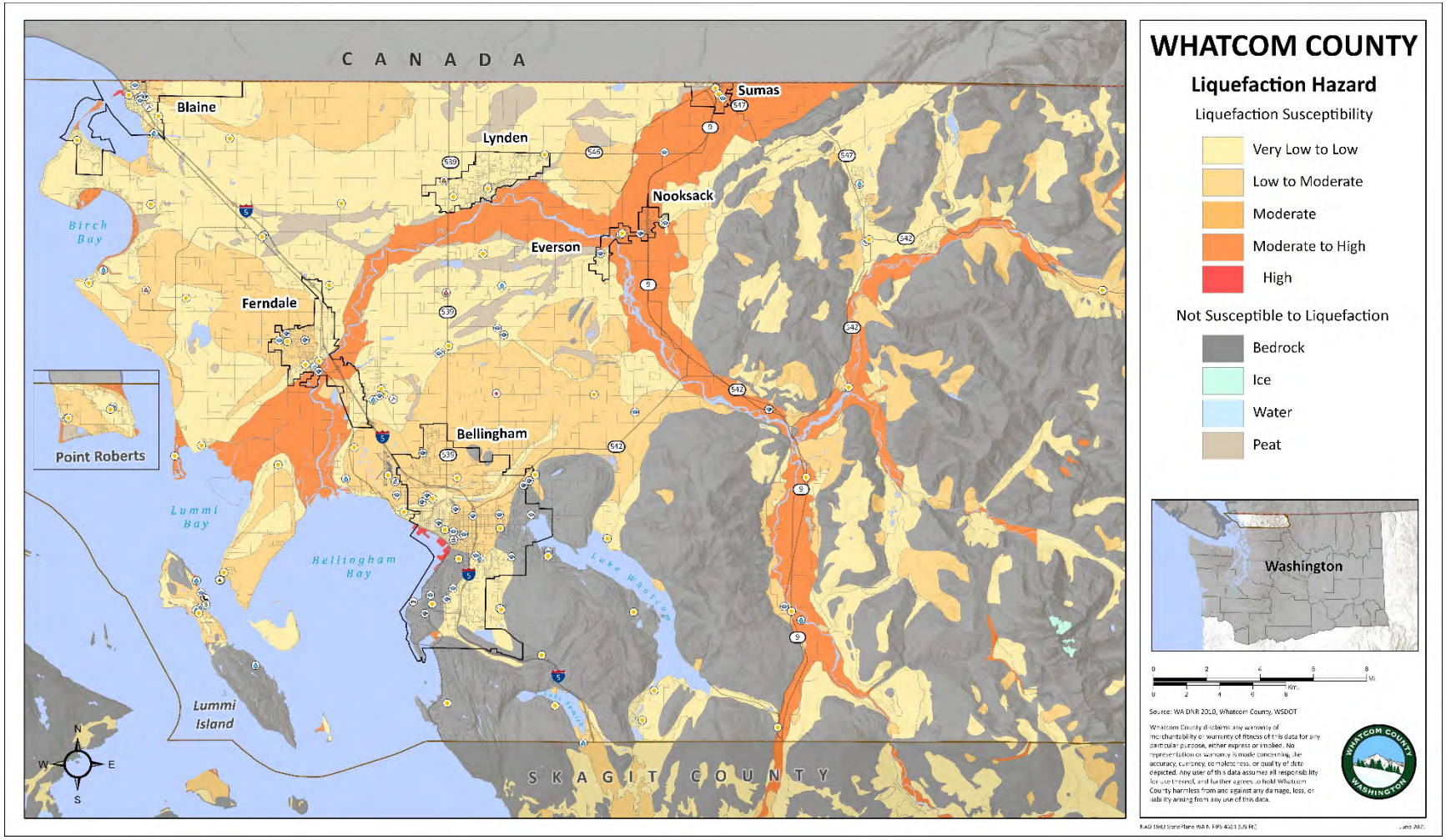
Severity Scale: **None** = no impact to community function
Low = minor degradation of community functions, not widespread
Moderate = moderate degradation over multiple weeks or widespread
High =degradation or loss over many weeks, widespread

Natural Hazard Maps

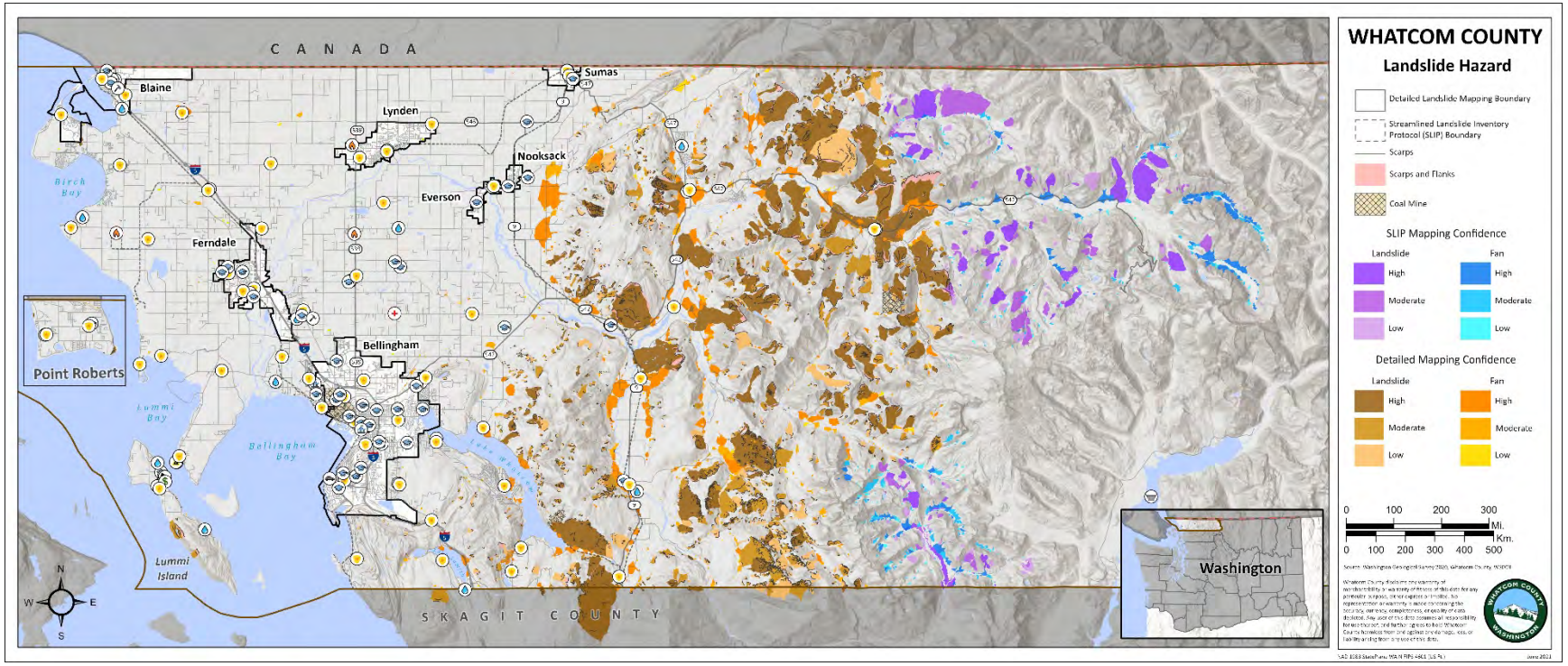
The following figures depict the natural hazards present within the jurisdiction.



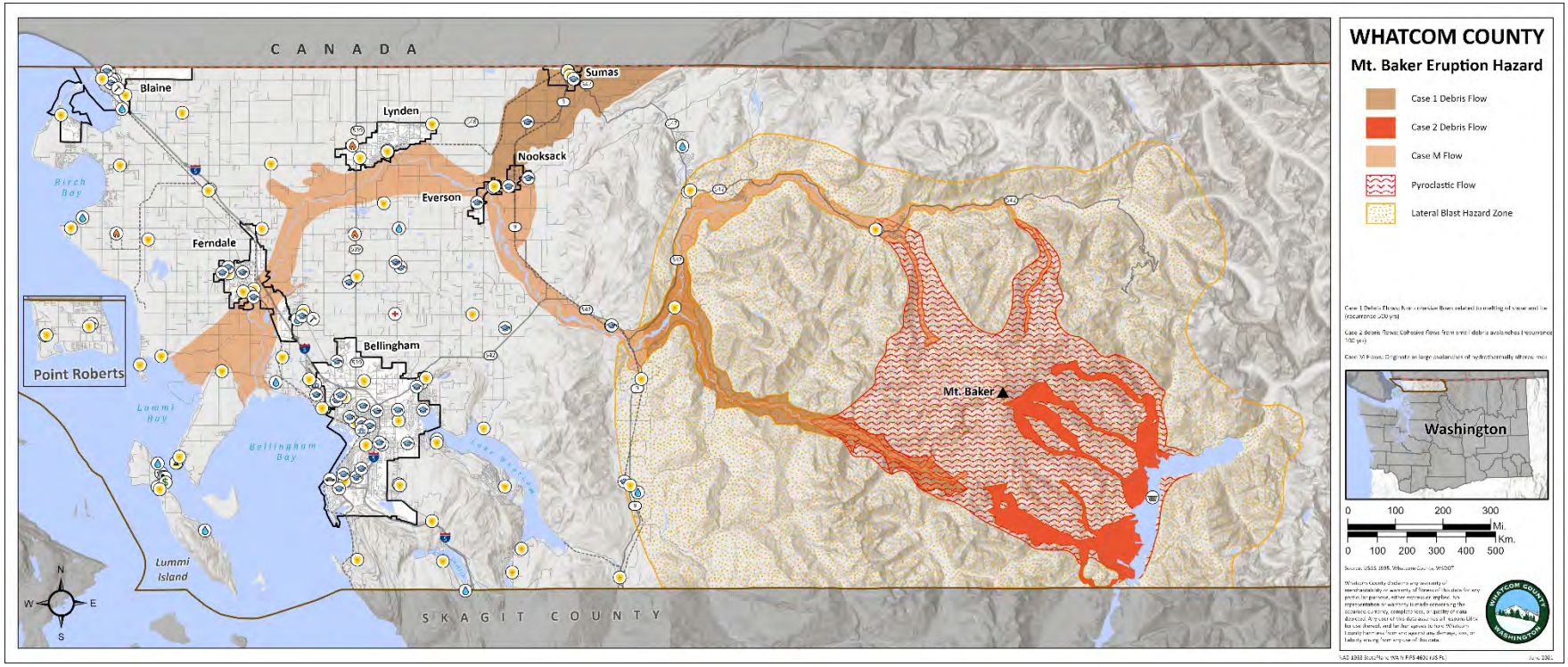
Washington Department of Natural Resources (WA DNR) 2017 Boulder Creek Fault Zone seismic scenario of magnitude 6.8 data. Displays extent and severity of the modeled earthquake in the Modified Mercalli Intensity (MMI) scale.



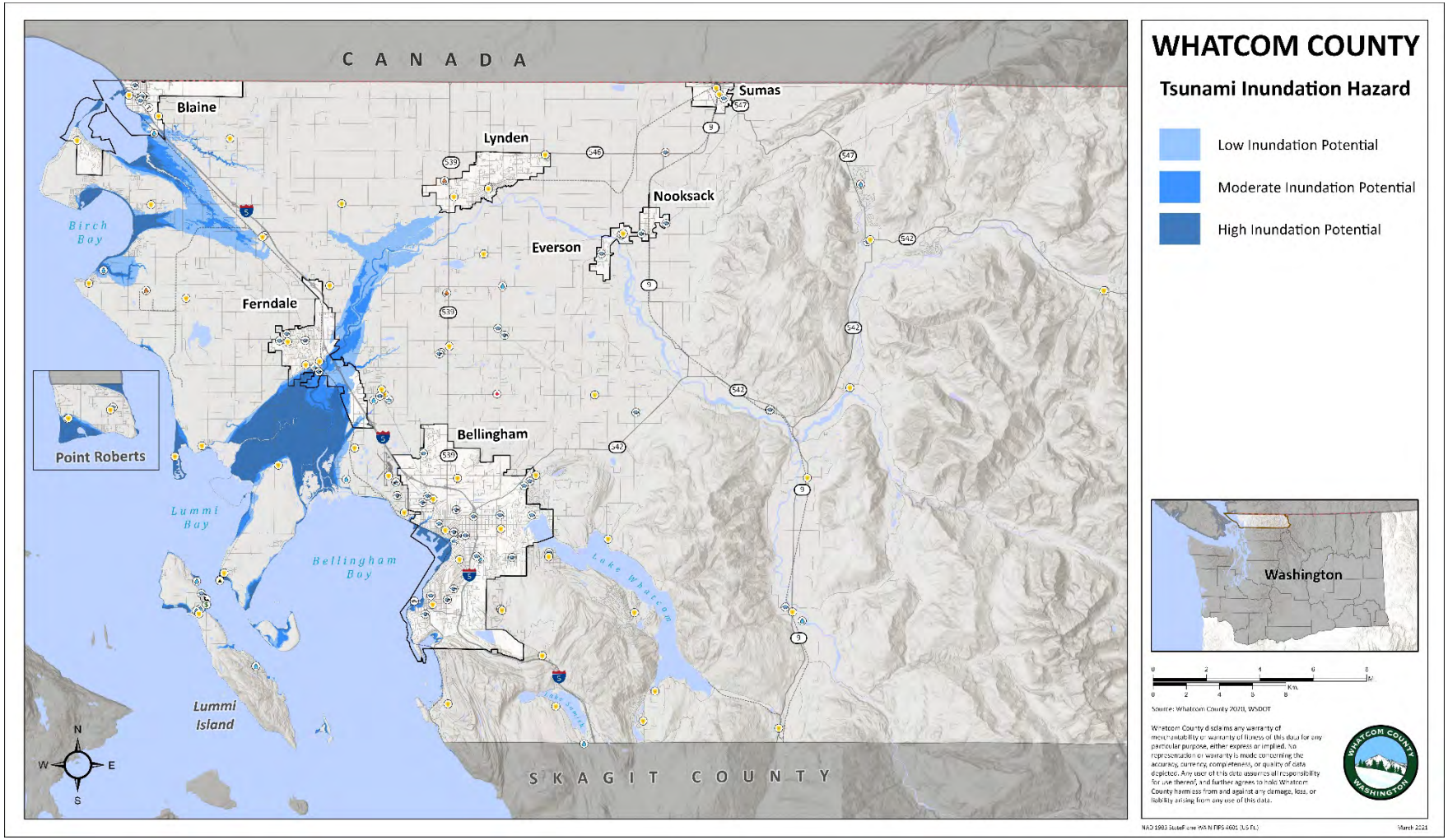
Washington Department of Natural Resources (WA DNR) 2010 liquefaction susceptibility data. This feature class is part of a geodatabase that contains statewide ground response data for Washington State.



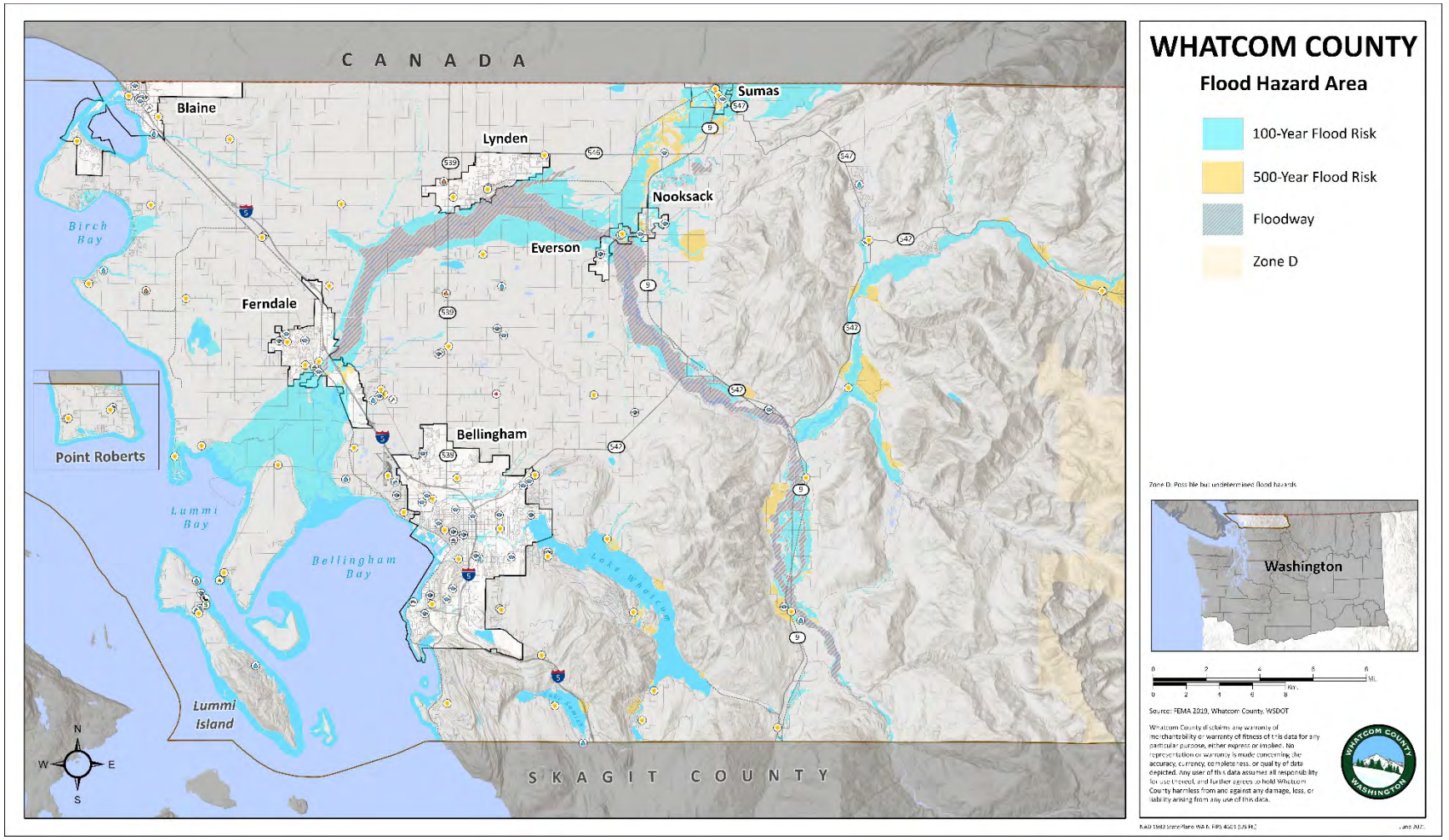
Washington Geological Survey (WGS) 2020 Washington landslide inventory data compiled following streamline landslide mapping protocol (SLIP). SLIP was developed by the WGS's Landslide Hazards Program to help geologists rapidly map landslide landforms from lidar. This data shows both detailed mapping and SLIP landslide data.



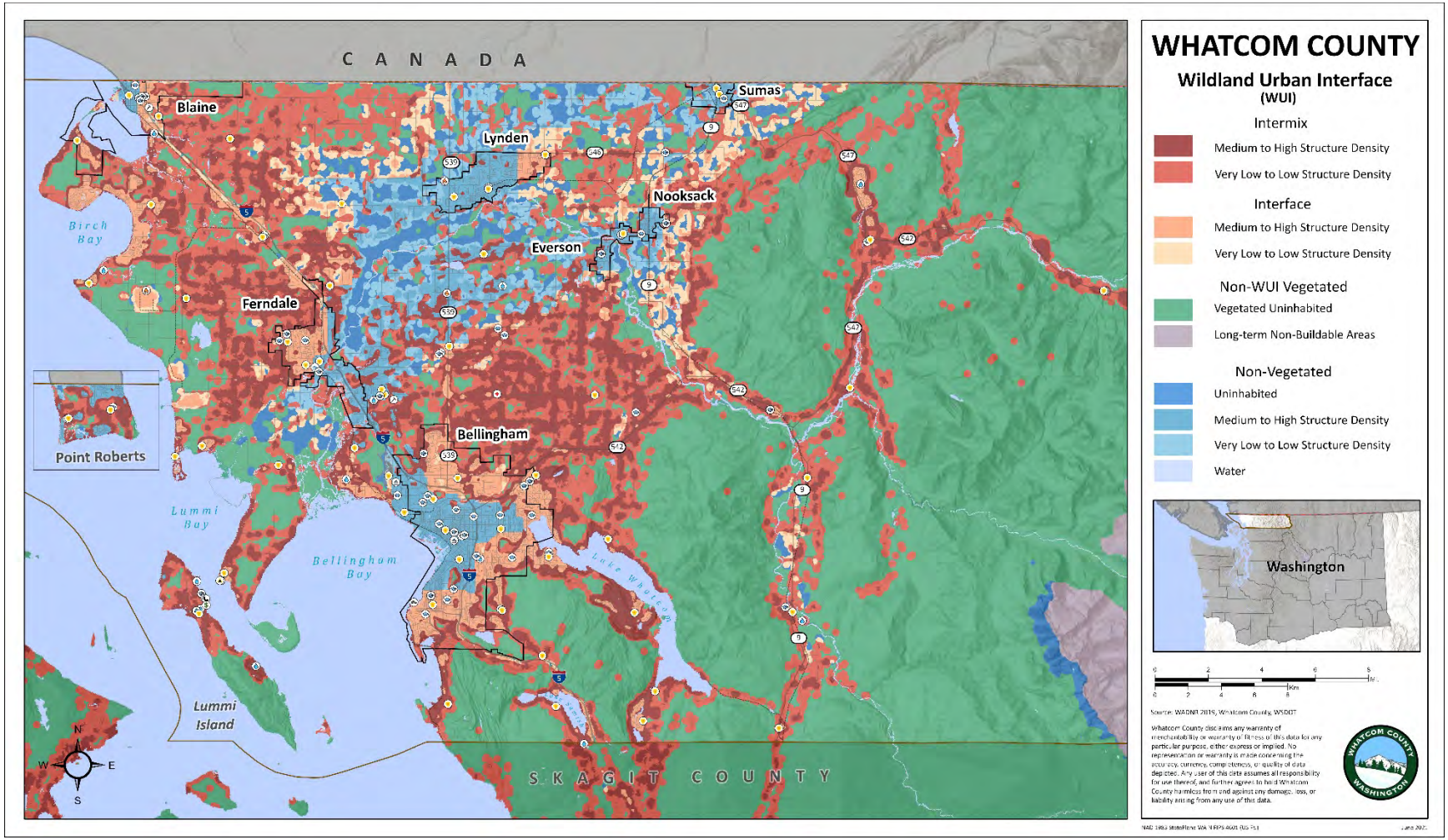
USGS Hazards from Future Activity of Mount Baker, WA (1995) data shows different volcanic flows. Case M flows originate as large avalanches of hydrothermally altered rock. Case 1 debris flows are non-cohesive flows related to melting of snow and ice, with a recurrence of 500 years. Case 2 debris flows are cohesive flows from small debris avalanches, with a recurrence of 100 years.



Whatcom County 2020 tsunami inundation data. Assumes, magnitude 9.0 Cascadia Subduction Zone earthquake-induced tsunami scenario. This scenario predicts a maximum wave height of about 9.6 feet, which could come on top of a 10 ft high tide. Additionally, tsunami inundation can be "funneled" into bays, river and stream deltas, pushing water well inland of the coast and past 20 ft elevation.



FEMA 2019 flood hazard data showing 100-year flooding, 500-year flooding, floodways, and flood zones. FEMA flood data includes both riverine and coastal flooding.



Washington Department of Natural Resources (WA DNR) 2019 mapped data of Washington's Wildland Urban Interface (WUI). The WUI displays areas of WA where structures and wildland overlap with specific structure densities.

Whatcom County Critical Facility List

While this section of the Whatcom County Natural Hazards Mitigation Plan focuses on unincorporated Whatcom County, the list of critical facilities includes all critical facilities in the county, whether located in the unincorporated section of the county or within a city limit. First response critical facilities, in particular, engage in mutual aid; fire and police stations in a city also support response in unincorporated county. Water and sewage pumping stations and treatment sites are often located in unincorporated county while servicing cities and vis-versa. School district boundaries do always follow city boundaries; during a disaster, schools may serve as educational site and/or mass care sites and serve residents beyond their traditional school catchment area.

Facility Name	Facility Type	Signi-ficance	Location	Assessed Dollar Value	Notes
Columbia Valley Water District	LUS	3	6229 Azure Way, Maple Falls, WA 98266		Water District
Beach School Elementary School	EF	1	3786 Centerview Road		Shelter for Lummi Island Residents
Fairhaven Alaskan Ferry Terminal	EF	3	355 Harris Ave, Bellingham, WA 98225		Southern terminus of Alaska Marine Highway system.
Gooseberry Point Ferry Dock	EF	3	Lummi View Drive		Ferry dock for Lummi Island
Isle Aire Beach Association	LUS	2	P.O. Box 211		Water District on Lummi Island
LISECC	LUS	2	1211 Island Drive		Water District on Lummi Island
Lummi Island Dock	EF	3	N Nugent Road		Ferry dock for Lummi Island
Lummi Island Grange	EF	1	2210 N. Nugent Road		Shelter for Lummi Island Residents
Lummi Island Post Office	EF	1	2211 N Nugent Road		Post Office for Lummi Island
Lummi Point Water	LUS	3	3766 Blizard Rd.		Water District on Lummi Island
Owners Association	LUS	3	2174 Granger Way		Utility: Water

Beach Club Condos					
Puget Sound Energy Switch	LUS	3	Gooseberry Point		Utility: Power for Lummi Island
Sunset Water and Maintenance Association	LUS	3	2040 Granger Way		Utility: Water
					Private contractor, not essential
The Islander	EF	1	2130 S. Nugent Road		Lummi Island Store
Vander Yacht Propane	LUS	3	6811 WA-539, Lynden, WA 98264		Largest propane distributor in Whatcom County with thousands of customers and serves the San Juan Islands
Whatcom Farmers Co-op	LUS	3	2041 Agronomy Way, Lynden, WA 98264		propane distributor in Whatcom County with thousands of customers
Lummi Law & Order	EF	3	Lummi Reservation		Lummi Police
Nooksack Police Department	EF	3	111 W Main St, Everson, WA 98247		Nooksack Police
Northwest Water Association	LUS	3	5207 Graveline Rd, Bellingham, WA 98226		Utility: Water
Pole Road Water Association	LUS	3	6912 Hannegan Rd #105, Lynden, WA 98264		Utility: Water
Alderwood Elementary School	EF	1	3400 Hollywood Avenue, Bellingham, WA 98225-1134		School, possible shelter, distribution site or staging area.
Birchwood Elementary School	EF	1	3200 Pinewood Avenue, Bellingham, WA 98225-1436		School, possible shelter, distribution site or staging area.
Carl Cozier Elementary School	EF	1	1330 Lincoln Street, Bellingham WA 98229-6238		School, possible shelter, distribution site or staging area.

Columbia Elementary School	EF	1	2508 Utter Street, Bellingham WA 98225-2708		School, possible shelter, distribution site or staging area.
Cordata Elementary School	EF	1	4420 Aldrich Road, Bellingham, WA 98226-9680		School, possible shelter, distribution site or staging area.
Geneva Elementary School	EF	1	1401 Geneva Street, Bellingham WA 98229-5218		School, possible shelter, distribution site or staging area.
Happy Valley Elementary School	EF	1	1041 24th Street, Bellingham WA 98225-8603		School, possible shelter, distribution site or staging area.
Lowell Elementary School	EF	1	935 14th Street, Bellingham WA 98225-6305		School, possible shelter, distribution site or staging area.
Northern Heights Elementary School	EF	1	4000 Magrath Road, Bellingham WA 98226-1729		School, possible shelter, distribution site or staging area.
Parkview Elementary School	EF	1	3033 Coolidge Drive, Bellingham WA 98225-1803		School, possible shelter, distribution site or staging area.
Roosevelt Elementary School	EF	1	2900 Yew Street, Bellingham WA 98226-6127		School, possible shelter, distribution site or staging area.
Silver Beach Elementary School	EF	1	4101 Academy Street, Bellingham WA 98226-4443		School, possible shelter, distribution site or staging area.
Sunnyland Elementary School	EF	1	2800 James Street, Bellingham WA 98225-2639		School, possible shelter, distribution site or staging area.
Wade King Elementary School	EF	1	2155 Yew Street Road, Bellingham, WA 98229-8812		School, possible shelter, distribution site or staging area.
Fairhaven Middle School	EF	1	110 Parkridge Road, Bellingham WA 98225-7907		School, possible shelter, distribution site or staging area.
Kulshan Middle School	EF	1	1250 Kenoyer Drive, Bellingham WA 98229-2346		School, possible shelter, distribution site or staging area.

Shuksan Middle School	EF	1	2717 Alderwood Avenue, Bellingham WA 98225-1222		School, possible shelter, distribution site or staging area.
Whatcom Middle School	EF	1	810 Halleck Street, Bellingham WA 98225-3243		School, possible shelter, distribution site or staging area.
Bellingham High School	EF	1	2020 Cornwall Avenue, Bellingham WA 98225-3648		School, possible shelter, distribution site or staging area.
Options High School	EF	1	2015 Franklin Street, Bellingham WA 98225-4220		School, possible shelter, distribution site or staging area.
Sehome High School	EF	1	2700 Bill McDonald Parkway, Bellingham WA 98225-5909		School, possible shelter, distribution site or staging area.
Squalicum High School	EF	1	3773 E McLeod Road, Bellingham WA 98226-7728		School, possible shelter, distribution site or staging area.
Blaine High School	EF	1	1055 H Street Blaine, WA 98230		School, possible shelter, distribution site or staging area.
Blaine Middle School	EF	1	975 H Street Blaine, WA 98230		School, possible shelter, distribution site or staging area.
Blaine Elementary School	EF	1	836 Mitchell Avenue Blaine, Washington 98230		School, possible shelter, distribution site or staging area.
Blaine Primary School	EF	1	820 Boblett Street Blaine, WA 98230		School, possible shelter, distribution site or staging area.
Point Roberts Primary School	EF	1	2050 Benson Road Pt. Roberts, WA 98281		School, possible shelter, distribution site or staging area.
Irene Reither Elementary School	EF	1	954 East Hemmi Road Everson, WA 98247		School, possible shelter, distribution site or staging area.

Meridian Middle School	EF	1	861 Ten Mile Road Lynden, WA 98264		School, possible shelter, distribution site or staging area.
Meridian High School	EF	1	194 West Laurel Road Bellingham, WA 98226		School, possible shelter, distribution site or staging area.
Acme Elementary School	EF	1	5200 Turkington Rd, Acme, WA 98220		School, possible shelter, distribution site or staging area.
Harmony Elementary School	EF	1	5060 Sand Rd, Bellingham, WA 98226		School, possible shelter, distribution site or staging area.
Kendall Elementary School	EF	1	7547 Kendall Rd, Maple Falls, WA 98266		School, possible shelter, distribution site or staging area.
Mt. Baker Junior/Senior High School	EF	1	4936 Deming Rd Deming, WA 98244		School, possible shelter, distribution site or staging area.
Ferndale High School	EF	1	5830 Golden Eagle Drive PO Box 428 Ferndale WA 98248		School, possible shelter, distribution site or staging area.
Horizon Middle School	EF	1	2671 Thornton Road PO Box 1769 Ferndale WA 98248		School, possible shelter, distribution site or staging area.
Vista Middle School	EF	1	6051 Vista Drive PO Box 1328 Ferndale WA 98248		School, possible shelter, distribution site or staging area.
Beach Elementary School	EF	1	3786 Centerview Road Ferndale WA 98262		School, possible shelter, distribution site or staging area.
Cascadia Elementary School	EF	1	6175 Church Road PO Box 2009 Ferndale WA 98248		School, possible shelter, distribution site or staging area.
Central Elementary School	EF	1	5610 Second Avenue PO Box 187 Ferndale WA 98248		School, possible shelter, distribution site or staging area.
Custer Elementary School	EF	1	7660 Custer School Road Custer WA 98240		School, possible shelter, distribution site or staging area.

Eagleridge Elementary School	EF	1	2651 Thornton Road PO Box 1127 Ferndale WA 98248		School, possible shelter, distribution site or staging area.
Skyline Elementary School	EF	1	2225 Thornton Road PO Box 905 Ferndale WA 98248		School, possible shelter, distribution site or staging area.
North Bellingham Learning Center (Ferndale Schools)	EF	1	5275 Northwest Drive Bellingham, WA 98226		School, possible shelter, distribution site or staging area.
Nooksack Valley High School	EF	1	3326 E. Badger Rd. Everson, WA 98247		School, possible shelter, distribution site or staging area.
Nooksack Valley Middle School	EF	1	404 W. Columbia Everson, WA 98247		School, possible shelter, distribution site or staging area.
Everson Elementary School	EF	1	216 Everson Goshen Rd Everson, WA 98247		School, possible shelter, distribution site or staging area.
Nooksack Elementary School	EF	1	3333 Breckenridge Rd Everson, WA 98247		School, possible shelter, distribution site or staging area.
Sumas Elementary School	EF	1	1024 Lawson St Sumas, WA 98295		School, possible shelter, distribution site or staging area.
Whatcom County Search & Rescue	EF	3	1041 W Smith Rd, Bellingham, WA 98226		
Seattle City Light Ross Dam	LUS	3	Newhalem		Utility: Power
Seattle City Light Diablo Dam	LUS	3	Newhalem		Utility: Power
Seattle City Light Gorge Dam	LUS	3	Newhalem		Utility: Power
Puget Sound Energy Upper Baker Dam	LUS	3	Baker Lake		Utility: Power
Water District #2 – Bellingham	LUS	3	Bellingham		Utility: Water

Water District #7 – Bellingham	LUS	3	Bellingham		Utility: Water
Water District # 4 – Point Roberts	LUS	3	Point Roberts		Utility: Water
Water District #10 – Geneva/Sudden Valley	LUS	3	Bellingham		Utility: Water
Water District #12 – Lake Samish	LUS	3	Bellingham		Utility: Water
Water District #13 – Maple Falls	LUS	3	Maple Falls		Utility: Water
Water District #14 – Glacier	LUS	3	Bellingham		Utility: Water
Water District #18 – Acme	LUS	3	Acme		Utility: Water
BP-Cherry Point Refinery	Fuel	2	4519 Grandview Road		
Birch Bay Water and Sewer (District 8)	LUS	3	7096 Pt. Whitehorn Road		Utility: Water
Birch Bay Water Connection	LUS	3	2701 Bell Road		Utility: Water
Whatcom County Sheriff's Office Emergency Coordination Center	EF	3	3888 Sound Way Bellingham, WA 98226		Critical Government Facility
Whatcom County Sheriff's Office	EF	3	311 Grand Avenue Public Safety Office Bellingham, WA 98225		Critical Government Facility
Fire Station 01 – Bellingham Fire Station	EF	3	1800 Broadway St, Bellingham, Wa 98225		Critical Government Facility

Fire Station 02 – Bellingham Fire Station	EF	3	1590 Harris Ave, Bellingham, Wa 98225		Critical Government Facility
Fire Station 03 – Bellingham Fire Station	EF	3	1111 Billy Frank Jr St, Bellingham, Wa 98225		Critical Government Facility
Fire Station 04 – Bellingham Fire Station	EF	3	2306 Yew St, Bellingham, Wa 98229		Critical Government Facility
Fire Station 05 – Bellingham Fire Station	EF	3	3314 Northwest Ave, Bellingham, Wa 98225		Critical Government Facility
Fire Station 06 – Bellingham Fire Station	EF	3	4060 Deemer Rd, Bellingham, Wa 98226		Critical Government Facility
Fire Station 10 – Bellingham Fire Station	EF	3	858 E Smith Rd, Bellingham, Wa 98226		Critical Government Facility
Fire Station 31 – Bellingham Fire / WCFD 08 Station	EF	3	752 Marine Dr, Bellingham, Wa 98225		Critical Government Facility
Fire Station 34 – Bellingham Fire / WCFD 08 Station	EF	3	2600 Mackenzie Rd, Bellingham, Wa 98226		Critical Government Facility
Fire Station 33 – Bellingham Fire / WCFD 08 Station	EF	3	4504 Curtis Rd, Bellingham, Wa 98229		Critical Government Facility
Fire Station 32 - Bellingham International Airport ARFF	EF	3	2005 West Bakerview Road, Bellingham, WA 98226		Critical Government Facility
Fire Station 96 – WCFD 19	EF	3	9953 Mt Baker Hwy Deming Wa 98244		Critical Government Facility
Fire Station 71 – Lynden Fire Department	EF	3	203 19th St Lynden Wa 98264		Critical Government Facility
Fire Station 75 – Lynden Fire Department	EF	3	215 4th St Lynden Wa 98264		Critical Government Facility

Fire Station 72 – Lynden Fire Department	EF	3	1507 E Badger Rd Lynden Wa 98247		Critical Government Facility
Fire Station 13 – North Whatcom Fire Rescue	EF	3	2308 E Smith Rd, Bellingham, Wa 98226		Critical Government Facility
Fire Station 11 – North Whatcom Fire Rescue	EF	3	3131 Y Road Bellingham Wa 98226		Critical Government Facility
Fire Station 12 – North Whatcom Fire Rescue	EF	3	4142 Britton Loop Bellingham Wa 98226		Critical Government Facility
Fire Station 36 – North Whatcom Fire Rescue	EF	3	633 E Wiser Lake Rd Lynden Wa 98264		Critical Government Facility
Fire Station 61 – North Whatcom Fire Rescue	EF	3	9408 Odell Rd Blaine Wa 98230		Critical Government Facility
Fire Station 62 – North Whatcom Fire Rescue	EF	3	9001 Semiahmoo Pkwy Blaine Wa 98230		Critical Government Facility
Fire Station 63 – North Whatcom Fire Rescue	EF	3	4581 Birch Bay Lynden Rd Blaine Wa 98230		Critical Government Facility
Fire Station 64 – North Whatcom Fire Rescue	EF	3	7625 Custer School Rd Custer Wa 98240		Critical Government Facility
Fire Station 65 – North Whatcom Fire Rescue	EF	3	3401 Haymie Rd Blaine Wa 98230		Critical Government Facility
Fire Station 68 – North Whatcom Fire Rescue	EF	3	8118 N Enterprise Rd Custer Wa 98240		Critical Government Facility

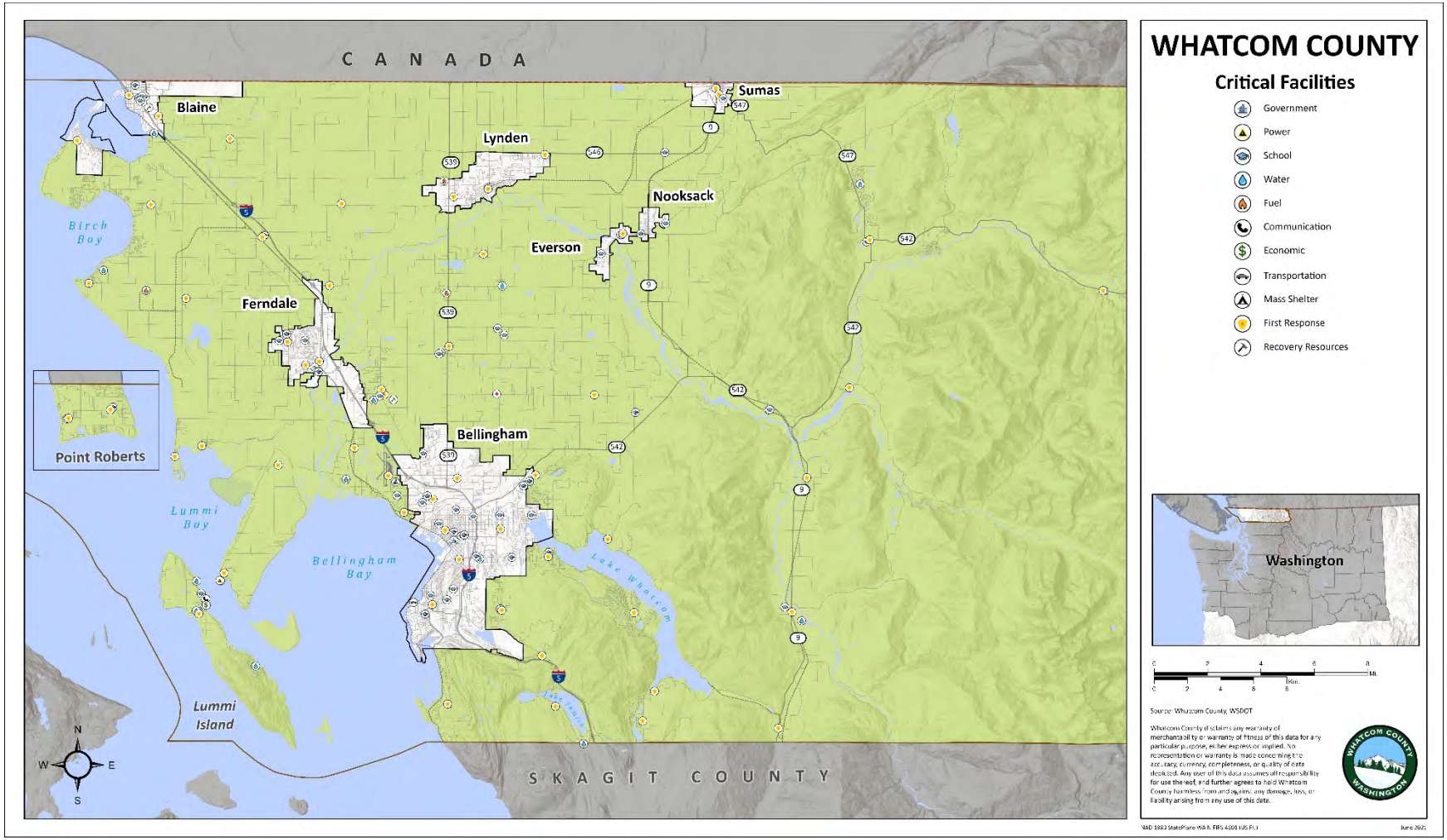
Fire Station 69 – North Whatcom Fire Rescue	EF	3	6028 Guide Meridian Bellingham Wa 98226		Critical Government Facility
Fire Station 56 – Sandy Point Fire	EF	3	4332 Sucia Dr Ferndale Wa 98248		Critical Government Facility
Fire Station 57 – Sandy Point Fire	EF	3	3685 Prevost Way Ferndale Wa 98248		Critical Government Facility
Fire Station 16 – South Whatcom Fire Authority	EF	3	2095 Yew St Rd Bellingham Wa 98229		Critical Government Facility
Fire Station 18 – South Whatcom Fire Authority	EF	3	686 Chuckanut Dr Bellingham Wa 98229		Critical Government Facility
Fire Station 21 – South Whatcom Fire Authority	EF	3	4518 Cable St Bellingham Wa 98229		Critical Government Facility
Fire Station 22 – South Whatcom Fire Authority	EF	3	2050 Lake Whatcom Blvd Bellingham Wa 98229		Critical Government Facility
Fire Station 28 – South Whatcom Fire Authority	EF	3	5170 Samish Way Bellingham Wa 98229		Critical Government Facility
Fire Station 29 – South Whatcom Fire Authority	EF	3	705 W Lake Samish Dr Bellingham Wa 98229		Critical Government Facility
Fire Station 80 – WCFD 01	EF	3	101 E Main St Everson Wa 98247		Critical Government Facility
Fire Station 81 – WCFD 01	EF	3	3740 Mt Baker Hwy Everson Wa 98247		Critical Government Facility
Fire Station 58 – WCFD 05	EF	3	2030 Benson Rd Point Roberts Wa 98281		Critical Government Facility
Fire Station 59 – WCFD 05	EF	3	1431 Gulf Rd Point Roberts Wa 98281		Critical Government Facility

Fire Station 41 – WCFD 07	EF	3	2020 Washington St Ferndale Wa 98248		Critical Government Facility
Fire Station 42 – WCFD 07	EF	3	4047 Brown Rd Ferndale Wa 98248		Critical Government Facility
Fire Station 43 – WCFD 07	EF	3	5368 Northwest Dr Bellingham Wa 98226		Critical Government Facility
Fire Station 44 – WCFD 07	EF	3	5491 Grandview Rd Blaine Wa 98230		Critical Government Facility
Fire Station 45 – WCFD 07	EF	3	1886 Grandview Rd Ferndale Wa 8248		Critical Government Facility
Fire Station 46 – WCFD 07	EF	3	6081 Church Rd Ferndale Wa 98248		Critical Government Facility
Fire Station 38 – Lummi Island	EF	3	3809 Legoe Bay Rd Lummi Island Wa 98262		Critical Government Facility
Fire Station 91 – WCFD 14	EF	3	841 Sumas Ave Sumas Wa 98295		Critical Government Facility
Fire Station 92 – WCFD 14	EF	3	7528 Kendall Rd Maple Falls Wa 98266		Critical Government Facility
Fire Station 93 – WCFD 14	EF	3	5640 Mosquito Lake Rd Deming Wa 98244		Critical Government Facility
Fire Station 86 – WCFD 16	EF	3	5491 Potter Rd Acme Wa 98220		Critical Government Facility
Fire Station 87 – WCFD 16	EF	3	2036 Valley Hwy Acme Wa 98220		Critical Government Facility
Fire Station 88 – WCFD 16	EF	3	319 Valley Hwy Acme Wa 98220		Critical Government Facility
Fire Station 25 – WCFD 18	EF	3	3250 South Bay Dr Sedro Woolley Wa		Critical Government Facility
Fire Station 26 – WCFD 18	EF	3	431 Cain Lake Rd Sedro Woolley Wa 98284		Critical Government Facility
Ferndale Police Department	EF	3	2220 Main St, Ferndale, WA 98248		Critical Government Facility
Blaine Police Department	EF	3	322 H St, Blaine, WA 98230		Critical Government Facility
Lynden Police Department	EF	3	203 19th St, Lynden, WA 98264		Critical Government Facility
Sumas Police Department	EF	3	433 Cherry Street, Sumas, WA 98295		Critical Government Facility

Everson Police Department	EF	3	111 W Main St, Everson, WA 98247		Critical Government Facility
Whatcom County Public Works	EF	3	901 East Smith Road, Bellingham, WA 98226		Critical Government Facility
Sumas Public Works Department	EF	3	433 Cherry Street, Sumas, WA 98295		Critical Government Facility
Ferndale Public Works Department	EF	3	2095 Main St, Ferndale, WA 98248		Critical Government Facility
Blaine Public Works Department	EF	3	1200 Yew Ave, Blaine, WA 98230		Critical Government Facility
Lynden Public Works Department	EF	3	300 4th St, Lynden, WA 98264		Critical Government Facility
Everson Public Works Department	EF	3	111 West Main Street, Everson, WA 98247		Critical Government Facility

Facility Type: **EF** = Essential Facility; **HMF** = Hazardous Materials Facility; **HPL** = High Potential Loss; **LUS** = Lifeline Utility System

Significance to community function: **1**=Moderate; **2**= High; **3** =Very High



Map of critical facilities identified by Unincorporated Whatcom County. Across Whatcom County, critical facilities fell into 15 categories. Unique categories developed for this plan update include mass shelter, assisted living, and recovery resources. Mass shelter includes facilities such as fairgrounds and community centers. Recovery resources are facilities that are required post-hazard event, for example public works and private construction companies. Not all judications identified or included critical facilities in each category.

Critical Facility Rankings for the Whatcom County

The table below indicates whether each critical facility falls within known hazard zones for earthquake, liquefaction, landslide, tsunami, volcano, riverine flooding, coastal flooding and wildfire zones. A rank assessment in the last column indicates how the relative risk of community impact. This ranking considers the significance of the facility to the community and the number of hazard zones the facility is within. The frequency of each hazard is also considered, such that being in a low frequency hazard zone would receive a lower ranking than that same facility being in a high frequency hazard zone. Ranking is on a scale of 1 to 10, with 1 being the facility with the highest-ranking score, and 10 being a facility with the lowest ranking score in the jurisdiction.

$$\text{Rank} = \text{Significance} * \left[\frac{\text{EQ\_Zone}}{\text{EQ\_Freq}} + \frac{\text{LQ\_Zone}}{\text{LQ\_Freq}} + \frac{\text{LS\_Zone}}{\text{LS\_Freq}} + \ldots \frac{\text{WF\_Zone}}{\text{WF\_Freq}} \right]$$

Ranking value will be from 0.0 to 1.0, scaled to the highest ranking in the jurisdiction.

Significance: 1=moderate; 2=high; 3=very high, as assessed in the critical facilities list in the previous section
Zone: 0=facility not in hazard zone; 1 = facility in the hazard zone
Frequency (e.g. EQ_Freq, LQ_Freq) is the most difficult variable to which to assign a value. Frequency varies based upon the magnitude of a hazard event and varies from one place to another. It was not possible within the time constraints to assess frequency of hazard at each critical facility location. Instead, a qualitative assessment of the hazard frequency across the entire county was made, as shown in the chart below.

Description	Freq Value used in formula	Hazards
Frequent, occurring on the order of decades	3	Riverine flooding (FL); Coastal flooding (COA)
Rare, occurring on the order of centuries	2	Earthquake (EQ); Liquefaction (LQ); Landslide (LS); Wildfire (WF)
Very rare, occurring on the order of millennia	1	Tsunami (TSU); Volcano (VOL)

Note: Severe storm, a very frequent hazard, was omitted because it is ubiquitous and because no hazard map of storm severity was available.

Critical Facilities Ranking Table

Facility Name	Facility Type	Signi-ficance	EQ	LQ	LS	TSU	VOL	FL	COA	WF	Rank Assessment
Columbia Valley Water District	LUS	3	1	1	0	0	0	0	0	1	0.45
Beach School Elementary School	EF	1	1	1	0	0	0	1	1	1	0.22
Fairhaven Alaskan Ferry Terminal	EF	3	1	0	0	1	0	0	1	0	0.55
Gooseberry Point Ferry Dock	EF	3	1	1	0	1	0	0	1	1	0.85
Isle Aire Beach Association	LUS	2	1	1	0	0	0	0	0	0	0.2
LISECC	LUS	2	1	0	0	0	0	0	0	1	0.2
Lummi Island Dock	EF	3	1	1	0	0	0	0	0	0	0.3
Lummi Island Grange	EF	1	1	1	0	0	0	0	0	1	0.15
Lummi Island Post Office	EF	1	1	0	0	1	0	0	0	1	0.2
Lummi Point Water	LUS	3	1	0	0	1	0	0	1	1	0.7
Owners Association Beach Club Condos	LUS	3	1	1	0	0	0	0	0	1	0.45
Puget Sound Energy Switch	LUS	3	1	1	0	1	0	0	1	1	0.85
Sunset Water and Maintenance Association	LUS	3	1	1	0	0	0	0	0	1	0.45
The Islander	EF	1	1	1	0	1	0	0	0	1	0.25
Vander Yacht Propane	LUS	3	1	1	0	0	0	0	0	0	0.3
Whatcom Farmers Co-op	LUS	3	1	1	0	0	0	0	0	0	0.3

Lummi Law & Order	EF	3	1	1	0	0	0	0	0	1	0.45
Nooksack Police Department	EF	3	1	1	0	0	0	0	0	0	0.3
Northwest Water Association	LUS	3	1	1	0	0	0	0	0	0	0.3
Pole Road Water Association	LUS	3	1	1	0	0	0	0	0	0	0.3
Alderwood Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
Birchwood Elementary School	EF	1	1	1	1	0	0	0	0	0	0.15
Carl Cozier Elementary School	EF	1	1	1	0	0	0	0	0	1	0.15
Columbia Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
Cordata Elementary School	EF	1	1	1	0	0	0	0	0	1	0.15
Geneva Elementary School	EF	1	1	0	0	0	0	0	0	1	0.1
Happy Valley Elementary School	EF	1	1	1	0	0	0	0	0	1	0.15
Lowell Elementary School	EF	1	1	0	0	0	0	0	0	1	0.1
Northern Heights Elementary School	EF	1	1	1	0	0	0	0	0	1	0.15
Parkview Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
Roosevelt Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1

Silver Beach Elementary School	EF	1	1	0	0	0	0	0	0	1	0.1
Sunnyland Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
Wade King Elementary School	EF	1	1	1	0	0	0	0	0	1	0.15
Fairhaven Middle School	EF	1	1	0	0	0	0	0	0	1	0.1
Kulshan Middle School	EF	1	1	0	0	0	0	0	0	1	0.1
Shuksan Middle School	EF	1	1	1	1	0	0	0	0	0	0.15
Whatcom Middle School	EF	1	1	1	0	0	0	0	0	0	0.1
Bellingham High School	EF	1	1	1	0	0	0	0	0	0	0.1
Options High School	EF	1	1	1	0	0	0	0	0	0	0.1
Sehome High School	EF	1	1	0	0	0	0	0	0	0	0.05
Squalicum High School	EF	1	1	0	0	0	0	0	0	1	0.1
Blaine High School	EF	1	1	1	0	0	0	0	0	1	0.15
Blaine Middle School	EF	1	1	1	0	0	0	0	0	1	0.15
Blaine Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
Blaine Primary School	EF	1	1	1	0	0	0	0	0	1	0.15
Point Roberts Primary School	EF	1	1	1	0	0	0	0	0	1	0.15
Irene Reither Elementary School	EF	1	1	1	0	0	0	0	0	1	0.15
Meridian Middle School	EF	1	1	1	0	0	0	0	0	1	0.15
Meridian High School	EF	1	1	1	0	0	0	0	0	1	0.15

Acme Elementary School	EF	1	1	1	1	0	1	1	0	1	0.33
Harmony Elementary School	EF	1	1	1	0	0	1	0	0	1	0.25
Kendall Elementary School	EF	1	1	1	0	0	0	0	0	1	0.15
Mt. Baker Junior/Senior High School	EF	1	1	1	0	0	1	0	0	1	0.25
Ferndale High School	EF	1	1	1	0	0	0	0	0	0	0.1
Horizon Middle School	EF	1	1	1	0	0	0	0	0	0	0.1
Vista Middle School	EF	1	1	1	0	0	0	0	0	0	0.1
Beach Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
Cascadia Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
Central Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
Custer Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
Eagleridge Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
Skyline Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
North Bellingham Learning Center (Ferndale Schools)	EF	1	1	1	0	0	0	0	0	0	0.1
Nooksack Valley High School	EF	1	1	1	0	0	0	0	0	0	0.1

Nooksack Valley Middle School	EF	1	1	1	0	0	0	0	0	0	0.1
Everson Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
Nooksack Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
Sumas Elementary School	EF	1	1	1	0	0	0	0	0	0	0.1
Whatcom County Search & Rescue	EF	3	1	1	0	0	0	0	0	0	0.3
Seattle City Light Ross Dam	LUS	3	1	0	0	0	0	1	0	0	0.25
Seattle City Light Diablo Dam	LUS	3	1	0	0	0	0	1	0	0	0.25
Seattle City Light Gorge Dam	LUS	3	1	0	0	0	0	1	0	0	0.25
Puget Sound Energy Upper Baker Dam	LUS	3	1	1	0	0	0	0	0	0	0.3
Water District #2 – Bellingham	LUS	3	1	1	0	0	0	0	0	1	0.45
Water District #7 – Bellingham	LUS	3	1	1	0	0	0	0	0	1	0.45
Water District # 4 – Point Roberts	LUS	3	1	1	0	1	0	0	0	1	0.75
Water District #10 – Geneva/Sudden Valley	LUS	3	1	1	0	0	0	0	0	1	0.45
Water District #12 – Lake Samish	LUS	3	1	1	0	0	0	0	0	1	0.45
Water District #13 – Maple Falls	LUS	3	1	1	0	0	0	0	0	1	0.45
Water District #14 – Glacier	LUS	3	1	1	1	0	1	1	0	1	1

Water District #18 – Acme	LUS	3	1	1	0	0	1	1	0	1	0.85
BP-Cherry Point Refinery	Fuel	2	1	1	0	0	0	0	0	1	0.3
Birch Bay Water and Sewer (District 8)	LUS	3		1	0	1	0	0	0	1	0.75
Birch Bay Water Connection	LUS	3	1	1	0	1	0	0	0	1	0.75
Whatcom County Sheriff's Office Emergency Coordination Center	EF	3	1	1	0	0	0	0	0	0	0.3
Whatcom County Sheriff's Office	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 01 – Bellingham Fire Station	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 02 – Bellingham Fire Station	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 03 – Bellingham Fire Station	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 04 – Bellingham Fire Station	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 05 – Bellingham Fire Station	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 06 – Bellingham Fire Station	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 10 – Bellingham Fire Station	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 31 – Bellingham Fire / WCFD 08 Station	EF	3	1	1	0	0	0	0	0	0	0.3

Fire Station 34 – Bellingham Fire / WCFD 08 Station	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 33 – Bellingham Fire / WCFD 08 Station	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 32 - Bellingham International Airport ARFF	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 96 – WCFD 19	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 71 – Lynden Fire Department	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 75 – Lynden Fire Department	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 72 – Lynden Fire Department	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 13 – North Whatcom Fire Rescue	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 11 – North Whatcom Fire Rescue	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 12 – North Whatcom Fire Rescue	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 36 – North Whatcom Fire Rescue	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 61 – North Whatcom Fire Rescue	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 62 – North Whatcom Fire Rescue	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 63 – North Whatcom Fire Rescue	EF	3	1	1	0	0	0	0	0	1	0.45

Fire Station 64 – North Whatcom Fire Rescue	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 65 – North Whatcom Fire Rescue	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 68 – North Whatcom Fire Rescue	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 69 – North Whatcom Fire Rescue	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 56 – Sandy Point Fire	EF	3	1	1	0	1	0	0	1	1	0.85
Fire Station 57 – Sandy Point Fire	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 16 – South Whatcom Fire Authority	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 18 – South Whatcom Fire Authority	EF	3	1	0	0	0	0	0	0	1	0.3
Fire Station 21 – South Whatcom Fire Authority	EF	3	1	0	0	0	0	0	0	1	0.3
Fire Station 22 – South Whatcom Fire Authority	EF	3	1	0	0	0	0	0	0	1	0.3
Fire Station 28 – South Whatcom Fire Authority	EF	3	1	0	0	0	0	0	0	1	0.3
Fire Station 29 – South Whatcom Fire Authority	EF	3	1	0	0	0	0	0	0	1	0.3
Fire Station 80 – WCFD 01	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 81 – WCFD 01	EF	3	1	1	0	0	1	1	0	0	0.7
Fire Station 58 – WCFD 05	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 59 – WCFD 05	EF	3	1	1	0	0	0	0	0	1	0.45

Fire Station 41 – WCFD 07	EF	3	1	1	0	0	1	0	0	0	0.6
Fire Station 42 – WCFD 07	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 43 – WCFD 07	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 44 – WCFD 07	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 45 – WCFD 07	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 46 – WCFD 07	EF	3	1	1	0	0	0	0	0	1	0.45
Fire Station 38 – Lummi Island	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 91 – WCFD 14	EF	3	1	1	0	0	1	0	0	0	0.6
Fire Station 92 – WCFD 14	EF	3	1	1	0	0	1	0	0	1	0.75
Fire Station 93 – WCFD 14	EF	3	1	0	0	0	1	0	0	1	0.6
Fire Station 86 – WCFD 16	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 87 – WCFD 16	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 88 – WCFD 16	EF	3	1	1	0	0	0	0	0	0	0.3
Fire Station 25 – WCFD 18	EF	3	1	0	1	0	0	0	0	0	0.3
Fire Station 26 – WCFD 18	EF	3	1	1	0	0	0	0	0	1	0.45
Ferndale Police Department	EF	3	1	1	0	0	0	0	0	0	0.3
Blaine Police Department	EF	3	1	1	0	0	0	0	0	0	0.3
Lynden Police Department	EF	3	1	1	0	0	0	0	0	0	0.3
Sumas Police Department	EF	3	1	1	0	0	0	0	0	0	0.3
Everson Police Department	EF	3	1	1	0	0	1	1	0	0	0.7
Whatcom County Public Works	EF	3	1	1	0	0	0	0	0	0	0.3

Sumas Public Works Department	EF	3	1	1	0	0	0	0	0	0	0.3
Ferndale Public Works Department	EF	3	1	1	0	0	0	0	0	0	0.3
Blaine Public Works Department	EF	3	1	1	0	0	0	0	0	0	0.3
Lynden Public Works Department	EF	3	1	1	0	0	0	0	0	0	0.3
Everson Public Works Department	EF	3	1	1	0	0	0	0	0	0	0.3

Notes: **EQ** = Earthquake; **LQ** =Liquefaction; **LS** = Landslide; **TSUN** = Tsunami; **VOL** = Volcano; **FL** = Riverine Flooding; **COA** = Coastal Flooding; **WF** = Wildland Fire

Areas and Assets Exposed, Per Hazard

	Unincorporated Whatcom County Exposure to Natural Hazards					
	Hazard Susceptibility	**Area (sq.mi.)**	**Population**	**Parcels**	**Critical Facilities**	**Critical Facilities Appraised Value (Million)**
Geological						
	MMI IV	7.7%	-	0.03%	-	-
	MMI V	31.7%	15.3%	15.7%	23.8%	$161 [1]
	MMI VI	29.6%	63.5%	66.8%	47.6%	$1396 [1]
	MMI VII	11.7%	13.8%	8.4%	9.8%	$37
	MMI VIII - IX	5.7%	7.3%	7.4%	9.1%	$44
	TOTAL	86.4%	99.9%	98.3%	90.3%	$1,638
	Very Low to Low	14.6%	45.4%	41.8%	45.5%	$283 [1]
	Low to Moderate	6.5%	24.4%	27.5%	28%	$1189 [1]
	Moderate	-	-	-	-	-
	Moderate to High	4.4%	7.5%	8.5%	11.2%	$59
	High	0.02%	-	0.04%	-	-
	TOTAL	25.5%	77.3%	77.84%	84.7%	$1,531
	Landslide Low	0.7%	0.2%	0.25	-	-
	Landslide Moderate	1%	0.2%	0.1%	-	-
	Landslide High	2.9%	1.2%	1.9%	1.4%	$0.3

	Fan Low	0.1%	0.1%	0.06%	-	-
	Fan Moderate	0.3%	0.2%	0.2%	-	-
	Fan High	0.8%	2.4%	1.9%	2.8%	$3
	Mine Hazard	0.1%	0.4%	2.1%	1.4%	19% [1]
	TOTAL	5.9%	4.7%	6.51%	5.6%	$22.3
	Case 1 Debris Flows	1.6%	1.9%	2.1%	4.9% [2]	$19 [2]
	Case 2 Debris Flows	0.9%	1.2%	-	-	-
	Case M Flows	2.9%	5.6%	6.3%	7.7% [2]	$43 [2]
	Pyroclastic Flows, Lava Flows, and Ballistic Debris	5.8%	0.2%	0.6%	2.1% [2]	$0.3 [2]
	Lateral Blast Hazard Zone	22.7%	3.8%	5.5%	7% [2]	$11 [2]
	TOTAL	33.9%	12.7%	14.5%	21.7%	$73.3
	Low to Moderate Inundation Potential	0.3%	3%	0.6%	3.5%	$7
	Moderate to High Inundation Potential	0.3%	1.5%	0.5%	-	-
	High Inundation Potential	0.6%	3.8%	5.6%	4.2%	$18
	TOTAL	1.6%	8.3%	6.7%	7.7%	$25
Hydrol						
	100-year Flood	3.5%	6.7%	8%	9.1%	$66

	500-year Flood	0.4%	1.9%	3.4%	4.9%	$129
	Floodway	0.9%	1.4%	-	-	-
	Undetermined (Zone D)	52.1%	0.1%	0.05%	1.4%	$9
	TOTAL	4.8%	10.1%	11.45%	15.4%	$204
Meteorological	**Wildfire Zones**					
	Interface Very Low-Low Structure Density	0.9%	1.9%	7.7%	0.7%	$0.4
	Interface Medium-High Structure Density	1.4%	23.2%	26.9%	39.2%	$1,331 [1]
	Intermix Very Low-Low Structure Density	5.9%	17.2%	1.6%	19.6%	$112
	Intermix Medium-High Structure Density	4.1%	32.1%	30.4%	23.1%	$39
	TOTAL	12.3%	74.4%	66.6%	82.6%	$1,482.4

[1]This value shows the total of 2020 Whatcom County parcel data appraised total value and community's critical facility assessed dollar value (found in the community's critical facilities list). The critical facility's assessed dollar value was used instead of the appraised total value when available.

[2]Some critical facilities located in multiple hazard zones.

Status of Unincorporated Whatcom County's 2016-2020 and Ongoing Hazard Mitigation Actions

This section describes the status of mitigation actions that were proposed in the 2016 Mitigation Plan and are now 1) currently being implemented and are ongoing, 2) are now completed, or 3) are now discontinued because they are no longer needed. The actions are organized by hazard and indicate the lead agency, funding source, and status.

Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
Funding Source	Local; State; FEMA; Private; Other
Current Status	Action Discontinued / Action Completed / Action ongoing and expected completion date

Education and Outreach

EO-a. Emergency preparedness education programs for schools. Emergency preparedness and emergency management is delegated to school districts by Washington State RCW's. The Whatcom County Sheriff's Office Division of Emergency Management does support all the school districts in Whatcom County with emergency planning.

Lead Agency	School Districts 501, 502, 503, 504, 506, 507
Funding Source	Local, Homeland Security Grant Funding
Current Status	Action Ongoing and continuous

EO-b. Drills, exercises in homes, workplaces, classrooms, etc. Emergency drills and exercises are delegated to school districts by Washington State RCW's. The Whatcom County Sheriff's Office Division of Emergency Management does support all the school districts in Whatcom County with emergency drills and exercises.

Lead Agency	School Districts 501, 502, 503, 504, 506, 507
Funding Source	Local
Current Status	Action Ongoing and continuous

EO-c. Hazard "safety fairs." Hazard "safety fairs" are conducted at the local level within jurisdictions or special districts. While COVID-19 did disrupt these fairs in 2020, the Whatcom County Sheriff's Office Division of Emergency Management did participate in a number of these (Night Out, Lummi Island Safety Fair, Sudden Valley Safety Fair, Northwest Washington Fair,

etc.).

Lead Agency	Local jurisdictions and special districts
Funding Source	Local, other
Current Status	Action Ongoing and continuous

EO-d. Hazard conferences, seminars. The Whatcom County Sheriff's Office Division of Emergency Management has sponsored, participated in, or attended numerous hazard specific conferences and seminars over the last 5 years on all natural hazards listed in this plan.

Lead Agency	Whatcom County Sheriff's Office Division of Emergency Management
Funding Source	Local, state, FEMA, Private, Other
Current Status	Action Ongoing and continuous

EO-e. Distribution of severe weather guides, preparedness handbooks, brochures homeowner's retrofit guide, etc. The Whatcom County Sheriff's Office Division of Emergency Management is the county focal point for the distribution of brochures, handbooks and guides for emergency and disaster management.

Lead Agency	Whatcom County Sheriff's Office Division of Emergency Management
Funding Source	Local, state, FEMA, Private, Other
Current Status	Action Ongoing and continuous

EO-f. Newspaper articles - There has been no articles regularly published on disaster preparedness in the last 5 years as the local media does not support regular submissions or have a section for disaster planning. They have reported on disasters and did do a fictional (internal) account of what would happen after a major earthquake, with input from local experts and emergency managers.

Lead Agency	None
Funding Source	Other
Current Status	Ad hoc

EO-g. Annual correspondence with residents. Whatcom County Public Works does distribute an annual flood and emergency preparedness outreach paper.

Lead Agency	Whatcom county Public Works
Funding Source	Local
Current Status	Action Ongoing and continuous

Drought/heat wave

Action initiating with initial goals of identifying, documenting and determining applicability of Droughts and Heat Waves.

Earthquake

EQ-a. Incorporate Earthquake Mitigation into Local Planning. Whatcom County has incorporated building mitigation strategies for earthquakes into the Comprehensive Plan.

Lead Agency	Whatcom County Planning and Development Services
Funding Source	Local
Current Status	Action Ongoing and continuous

EQ-b. Conduct Inspections of Building Safety. Building safety inspections are carried out on a continual and regular basis.

Lead Agency	Whatcom County Planning and Development Services
Funding Source	Local
Current Status	Action Ongoing and continuous

EQ-c. Increase Earthquake Risk Awareness. The Whatcom County Sheriff's Office Division of Emergency Management promotes earthquake awareness on a continual and ongoing basis.

Lead Agency	Whatcom County Sheriff's Office Division of Emergency Management
Funding Source	Local, State and Federal
Current Status	Action Ongoing and continuous

Debris Slides

LS-a. Manage Development in Landslide Hazard Areas. Whatcom County Planning and Development Services does manage development in Landslide Hazard Areas on a continual and ongoing basis.

Lead Agency	Whatcom County Planning and Development Services
Funding Source	Local
Current Status	Action Ongoing and continuous

Flooding

FL-a. Establish Local Funding Mechanisms for Flood Mitigation

Lead Agency	Lead responsibility lies Flood Zone & Surface Water/ Public Works
Funding Source	Local, state, FEMA, Private, Other
Current Status	Action ongoing and continuous

FL-b. Remove Existing Structures from Flood Hazard Areas

Lead Agency	Lead responsibility lies Flood Zone & Surface Water/ Public Works
Funding Source	Local, state, FEMA, Private, Other
Current Status	Action ongoing and expected to be completed in 2025

FL-c. Improve Stormwater Drainage System Capacity

Lead Agency	Lead responsibility lies Flood Zone & Surface Water/ Public Works
Funding Source	Local, state, FEMA, Private, Other
Current Status	Action ongoing and continuous

FL-d. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures

Lead Agency	Lead responsibility lies Flood Zone & Surface Water/ Public Works
Funding Source	Local, state, FEMA, Private, Other
Current Status	Action ongoing and continuous

FL-e. Protect Infrastructure

Lead Agency	Lead responsibility lies Flood Zone & Surface Water/ Public Works for any infrastructure that is County property
Funding Source	Local, state, FEMA, Private, Other
Current Status	Action ongoing and continuous

FL-f. Construct Flood Control Measures

Lead Agency	Lead responsibility lies Flood Zone & Surface Water/ Public Works for any infrastructure that is County property
Funding Source	Local, state, FEMA, Private, Other
Current Status	Action ongoing and continuous

FL-g. Protect and Restore Natural Flood Mitigation Features

Lead Agency	Lead responsibility lies Flood Zone & Surface Water/ Public Works in repetitive problem areas
Funding Source	Local, state, FEMA, Private, Other
Current Status	Action ongoing and continuous

Landslide/erosion

No actions ongoing, discontinued, or completed for this hazard.

Severe Storm

No actions ongoing, discontinued, or completed for this hazard.

Severe Wind

SW-a. Protect Power Lines and Infrastructure

Lead Agency	Puget Sound Energy, Blaine Electric, Bonneville Power Administration, Western States Power Grid
Funding Source	Private Investment
Current Status	Action ongoing and continuous

Tsunami

TSU-a. Map and Assess Vulnerability to Tsunami

Lead Agency	Lead responsibility lies with the DNR. They have completed all mapping in Whatcom County in 2013.
Funding Source	State, other
Current Status	Action ongoing and expected to be completed in 2025

TSU-b. Manage Development in Tsunami Hazard Areas

Lead Agency	Lead responsibility lies with Whatcom County Planning Department
Funding Source	Local
Current Status	Action ongoing and continuous

Wildfire

WF-a. Incorporate Wildfire Mitigation in the Comprehensive Plan. The Whatcom County Sheriff's Office Division of Emergency Management has been working with the fire community to write a Wildland Fire plan for Whatcom County.

Lead Agency	Whatcom County Sheriff's Office Division of Emergency Management
Funding Source	Local
Current Status	Action ongoing and continuous

WF-b. Participate in Firewise Program. Firewise is managed by the Whatcom Conservation District and is a continual improvement process.

Lead Agency	Whatcom Conservation District
Funding Source	State & Local
Current Status	Action ongoing and continuous

Winter storms/Freezes

WW-a. Reduce Impacts to Roadways

Lead Agency	Whatcom County Public Works.
Funding Source	Local
Current Status	Action ongoing and continuous

WW-b. Conduct Winter Weather Risk Awareness Activities

Lead Agency	Whatcom County Sheriff's Office Division of Emergency Management
Funding Source	Local
Current Status	Action ongoing and continuous

Multiple Hazards

MU-a. Adopt and Enforce Building Codes. Whatcom County adopts the International Building Code Suit, including the Residential and Building Codes, which include standards for seismic, wind, and snow loads, among others; it also adopts the suite's Fire Code. It currently follows the 2018 editions of those codes per Ordinance 2021-016, passed March 23, 2021. The Whatcom County Planning Department supports enforcement through its permitting and inspection processes.

Lead Agency	Whatcom County Planning and Development Services
Funding Source	Local
Current Status	Action Ongoing and continuous

MU-b. Improve Household Disaster Preparedness. The shortage in staff for the task is leveraged through social media outreach. In 2019, the Division of Emergency Management partnered with CERT and Western Washington University to pilot a door-to-door and online survey on resident hazard awareness and disaster preparedness. Residents surveyed were given information about natural hazards in Whatcom County, expected impacts, and simple ways they could be better prepare. Future iterations of the survey are planned for post-pandemic conditions.

Lead Agency	Whatcom County Sheriff's Office Division of Emergency Management.
Funding Source	Local
Current Status	Action Ongoing and continuous

Unincorporated Whatcom County 2021-2025 Hazard Mitigation Strategy

Whatcom County Hazard Mitigation Goals

Whatcom County has identified five overarching hazard mitigation goals, which represent what a community seeks to achieve through mitigation actions.

Goal 1. Protect Life, Property and Public Welfare

Goal 2. Increase Public Awareness

Goal 3. Preserve and Enhance Natural Systems

Goal 4. Encourage Partnership for Implementation

Goal 5. Ensure Continuity of Emergency Services

These countywide goals help guide any prioritization and implementation of mitigation actions, ensuring that the actions contribute to a community's vision for the future.

Mitigation Action Options

Appendix E of the Whatcom County Natural Hazard Mitigation Plan provides a list of mitigation options. Unincorporated Whatcom County considered mitigation options related to geological, hydrological, and meteorological hazards, especially those related to earthquake, liquefaction and volcano because these hazards have the potential to cause the greatest loss and damage. Not all mitigation options in Appendix E were relevant or a strong priority for Unincorporated Whatcom County. Some options have already been implemented or are ongoing in Unincorporated Whatcom County, as documented in the section above on the status of 2016-2020 and ongoing hazard mitigation actions.

Mitigation Action Prioritization

The mitigation actions in this section are new actions that Unincorporated Whatcom County has prioritized for the 2021-2025 planning period and beyond. Mitigation options were prioritized based upon review of the following two criteria: 1) The action's Overall Feasibility based on engineering, environmental, financial and political considerations, 2) The Criticality of the action, based upon a consideration of which actions had the greatest potential to protect life, property and public welfare. Unincorporated Whatcom County is working with other participating communities and special districts to develop a systematic methodology that would use multiple evaluation criteria to determine mitigation action prioritization. This new methodology will be used in future updates of this Plan.

Unincorporated Whatcom County has, since the first Natural Hazards Mitigation Plan in 2005, consistently maintained the goals of the plans to be similar and addressed the natural hazards

in a maintenance format. Since 2005, many of the understandings of the natural hazards, along with the science supporting these hazards, has changed. In this 2021-2025 plan, Whatcom County will focus on mitigation actions that will help Unincorporated Whatcom County integrate the new science, assumptions and realities for each of the major natural hazards, coupled with an expansion of the use of GIS, both for documentation and geospatial analysis, as well as multiagency coordination. Finally, it will focus on enhanced education outreach. The goal is to establish a baseline that will be up-to-date, accurate and based on best available science, from which the most appropriate mitigation actions can be chosen.

In the following Identified Mitigation Actions 2021-2025 table, each priority action is listed by hazard. Each action is followed by planning goals, lead agency, the priority evaluation, timeline, funding source and estimated cost, where such information is available. This information can be used by local decision makers in pursuing strategies for implementation.

1	Goals	Indicates the hazard mitigation planning goal or goals this action addresses; countywide and/or community-specific
2	Lead Agency	May be more than one lead agency indicating shared responsibility and coordination
3	Priority	H (High); M (Medium); L (Low)
4	Timeline	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing
5	Funding Source	Local; State; FEMA; Private; Other
6	Estimated Cost	Actual; Estimated

Unincorporated Whatcom County Identified Mitigation Actions 2021-2025

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility for Carrying out Measure	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
MULTIPLE HAZARDS	These are actions that inform and educate citizens, elected officials, and property owners about hazards and ways to mitigate them.						
	MU-a Ongoing -- Adopt and Enforce Building Codes Whatcom County adopts the International Building Code Suit, including the Residential and Building Codes, which include standards for seismic, wind, and snow loads, among others; it also adopts the suite's Fire Code. It currently follows the 2018 editions of those codes per Ordinance 2021-016, passed March 23, 2021. The Whatcom County Planning Department supports enforcement through its permitting and inspection processes.	1	Whatcom County Planning and Development Services	H	O	Local	
	MU-b Ongoing -- Improve Household Disaster Preparedness The shortage in staff for the task is leveraged through social media outreach. In 2019, the Division of Emergency Management partnered with CERT and Western Washington University to pilot a door-to-door	1	Whatcom County Sheriff's Office Division of Emergency Management.	H	O	Local	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	and online survey on resident hazard awareness and disaster preparedness. Residents surveyed were given information about natural hazards in Whatcom County, expected impacts, and simple ways they could be better prepare. Future iterations of the survey are planned for post-pandemic conditions.						
	MU-1 Assess Community Risk Task: 1. Obtain local data including tax parcels, building footprints, critical facility locations, and other information for use in risk analysis. 2. Develop and maintain a database to track community exposure in known hazard areas. 3. Establish a process to coordinate with state and Federal agencies to maintain up-to-date hazard data, maps, and assessments.	1,2, 3	Whatcom County Sheriff's Office Division of Emergency	H	MR	Local, State, FEMA	$250,000

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	4. Update aerial photography current, especially in rapidly developing areas. 5. Identify the most at-risk critical facilities and evaluating potential mitigation techniques. 6. Perform a social vulnerability analysis to identify neighborhoods of high vulnerability to hazard impacts, considering income, age, insurance rates, education, length of time in community and other potential indicators.						
	MU-2 Integrate Mitigation into Local Planning Tasks: 1. Incorporate risk assessment and hazard mitigation principles into comprehensive planning efforts. 2. Incorporate a stand-alone element for hazard mitigation into the local comprehensive (land use) plan.	1, 4	Whatcom County Planning and Development Services	M	LR	Local, State, FEMA	$250,000

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility for Carrying out Measure	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	3. Incorporate hazard mitigation into broader growth management (i.e., Smart Growth) initiatives. 4. Incorporate a hazard risk assessment into the local development and subdivision review process.						
	MU-3 Monitor Mitigation Plan Implementation Tasks: 1. Form a plan implementation steering committee to monitor progress on local mitigation actions. Include a mix of representatives from neighborhoods, local businesses, and local government. 2. Prepare a plan implementation monitoring schedule and outlining roles for those responsible for monitoring (i.e., local departments, agencies, and committees). 3. Prepare and submit an annual plan implementation progress report to the local elected body.	1,4	Whatcom County Sheriff's Office Division of Emergency	H	MR	Local, State, FEMA	$125,000
	MU-4 Protect Structures	1,5	Task 1:	H	MR	Local,	$5,000,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	Tasks: 1. Acquire or relocating structures located in hazard areas. 2. Assess the need to retrofit fire and police stations to become hazard resistant.		Whatcom County Public Works Task 2: Whatcom County Sheriff's Office Division of Emergency			State, FEMA	
	MU-5 Increase Hazard Education and Risk Awareness Tasks: 1. Develop and implement a multi-hazard public awareness program. 2. Establish a "hazard awareness week" in coordination with the media to promote hazard awareness (seasonal). 3. Create a speaker's bureau for disaster-related topics that focus on mitigation and preparedness measures.	2	Whatcom County Sheriff's Office Division of Emergency	H	MR	Local, State, FEMA	$100,000
Education and OUtreach	***EO-a Ongoing -- Emergency preparedness education programs for schools*** Emergency preparedness and emergency	2	School Districts 501, 502, 503, 504, 506, 507	H	O	Local, Homeland Security	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	management is delegated to school districts by Washington State RCW's. The Whatcom County Sheriff's Office Division of Emergency Management does support all the school districts in Whatcom County with emergency planning.					Grant Funding	
	EO-b Ongoing -- Drills, exercises in homes, workplaces, classrooms, etc. Emergency drills and exercises are delegated to school districts by Washington State RCW's. The Whatcom County Sheriff's Office Division of Emergency Management does support all the school districts in Whatcom County with emergency drills and exercises.	1, 2	School Districts 501, 502, 503, 504, 506, 507	H	O	Local	
	EO-c Ongoing -- Hazard "safety fairs." Hazard "safety fairs" are conducted at the local level within jurisdictions or special districts. While COVID-19 did disrupt these fairs in 2020, the Whatcom County Sheriff's Office Division of Emergency Management did participate in a number of these (Night Out, Lummi Island Safety Fair, Sudden Valley Safety Fair, Northwest Washington Fair,	2	Local jurisdictions and special districts	H	O	Local, Other	

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility for Carrying out Measure	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	etc.).						
	EO-d Ongoing -- Hazard conferences, seminars The Whatcom County Sheriff's Office Division of Emergency Management has sponsored, participated in, or attended numerous hazard specific conferences and seminars over the last 5 years on all natural hazards listed in this plan.	2	Whatcom County Sheriff's Office Division of Emergency Management	M	O	Local, state, FEMA, Private, Other	
	EO-e Ongoing -- Distribution of severe weather guides, preparedness handbooks, brochures homeowner's retrofit guide, etc. The Whatcom County Sheriff's Office Division of Emergency Management is the county focal point for the distribution of brochures, handbooks and guides for emergency and disaster management.	2	Whatcom County Sheriff's Office Division of Emergency Management	M	O	Local, state, FEMA, Private, Other	
	EO-f Ongoing -- Newspaper articles There has been no articles regularly published on disaster preparedness in the last 5 years as the local media does not support regular submissions or have a section	2	None	L	O	Other	

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	for disaster planning. They have reported on disasters and did do a fictional (internal) account of what would happen after a major earthquake, with input from local experts and emergency managers.						
	EO-g Ongoing -- Annual correspondence with residents Whatcom County Public Works does distribute an annual flood and emergency preparedness outreach paper.	2	Whatcom county Public Works	M	O	Local	
Hazard Specific (Reference: Whatcom County Mitigation Ideas)							
Droughts/Heat Waves	**D-1 Assess Vulnerability to Drought Risk** Tasks: 1. Gather and analyze existing water and climate data and projection modeling to gain a better understanding of local climate and changes in future precipitation and temperature patterns.	1, 5	Whatcom County Sheriff's Office Division of Emergency Management	L	M	State, FEMA, and Federal	$75,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	2. Identify factors that affect the severity of a drought, including water usage and population projections. 3. Identify available water supplies and projected shortages. 4. Identify appropriate water saving and use reduction strategies that may reduce impact of drought. 5. Integrate drought mitigation into public awareness actions.						
Earthquakes	***EQ-a Ongoing -- Incorporate Earthquake Mitigation into Local Planning.*** Whatcom County has incorporated building mitigation strategies for earthquakes into the Comprehensive Plan.	1	Whatcom County Planning and Development Services	M	O	Local	
	EQ-b Ongoing -- Conduct Inspections of Building Safety Building safety inspections are carried out on a continual and regular basis.	1	Whatcom County Planning and Development Services	M	O	Local	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	EQ-c Ongoing -- Increase Earthquake Risk Awareness. The Whatcom County Sheriff's Office Division of Emergency Management promotes earthquake awareness on a continual and ongoing basis.	1	Whatcom County Sheriff's Office Division of Emergency Management	M	O	Local, State, Federal	
	EQ-1 Increase Earthquake Risk Awareness Tasks: 1. Develop an outreach program about earthquake risk and mitigation activities in homes, schools, and businesses.	2	Whatcom County Sheriff's Office Division of Emergency Management	H	M	Local, state, FEMA, Private, Other	$100,000
	EQ-2 Conduct Outreach to Builders, Architects, Engineers, and Inspector Tasks: 1. Training building department staff and officials on Form ATC-20 for post-earthquake building evaluation. The ATC-20 report and addendum, prepared by the Applied Technology Council, provide procedures and guidelines for making on-the-spot evaluations and decisions regarding continued use and	2,3	Whatcom County Sheriff's Office Division of Emergency Management	M	M	Local, state, FEMA, Private, Other	$75,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	occupancy of earthquake-damaged buildings.						
Erosion	**ER-1 Map and Assess Vulnerability to Erosion** Tasks: 1. Use satellite and aerial photography to identify and map erosion hazard areas. 2. Develop and maintain a database to track community vulnerability to erosion. 3. Use GIS to identify concentrations of at-risk structures.	1	Whatcom County Sheriff's Office Division of Emergency Management	M	M	Local, State, FEMA, Private, Other	$150,000
Landslides	***LS-a Ongoing -- Manage Development in Landslide Hazard Areas.*** Whatcom County Planning and Development Services does manage development in Landslide Hazard Areas on a continual and ongoing basis.	1, 3	Whatcom County Planning and Development Services	M	O	Local	
	LS-1 Map and Assess Vulnerability to Landslides Tasks:	1, 2	Whatcom County Sheriff's Office Division of	H	M	Local, State, FEMA,	$150,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	1. Study areas where riparian landslides may occur. 2. Complete an inventory of locations where critical facilities, other buildings, and infrastructure are vulnerable to landslides. 3. Develop and maintaining a database to track community vulnerability to landslides.		Emergency Management			Private, Other	
Flooding	***FL-a Ongoing -- Establish Local Funding Mechanisms for Flood Mitigation***	1	Lead responsibility lies Flood Zone & Surface Water/ Public Works	M	O	Local, state, FEMA, Private, Other	
	FL-b Ongoing -- Remove Existing Structures from Flood Hazard Areas	1	Lead responsibility lies Flood Zone & Surface Water/ Public Works	M	O	Local, state, FEMA, Private, Other	
	FL-c Ongoing -- Improve Stormwater	1	Lead	M	O	Local,	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		(1) Goals	(2) Lead Responsibility for Carrying out Measure	(3) Priority	(4) Timeline	(5) Funding Source	(6) Estimated Cost
Hazard	Action Items						
	Drainage System Capacity		responsibility lies Flood Zone & Surface Water/ Public Works			state, FEMA, Private, Other	
	FL-d Ongoing -- Conduct Regular Maintenance for Drainage Systems and Flood Control Structures	1	Lead responsibility lies Flood Zone & Surface Water/ Public Works	M	O	Local, state, FEMA, Private, Other	
	FL-e Ongoing -- Protect Infrastructure	1	Lead responsibility lies Flood Zone & Surface Water/ Public Works for any infrastructure that is County property	M	O	Local, state, FEMA, Private, Other	
	FL-f Ongiong -- Construct Flood Control Measures	1	Lead responsibility	M	O	Local, state,	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
			lies Flood Zone & Surface Water/ Public Works for any infrastructure that is County property			FEMA, Private, Other	
	FL-g Ongoing -- Protect and Restore Natural Flood Mitigation Features	1	Lead responsibility lies Flood Zone & Surface Water/ Public Works in repetitive problem areas	M	O	Local, state, FEMA, Private, Other	
Coastal Flooding	**CF-1 Map and Assess Vulnerability to Coastal Flooding** Tasks: 1. Model various "what-if" scenarios to estimate potential vulnerabilities in order to develop coastal mitigation priorities. 2. Use GIS to map hazard areas, at-risk	1, 2, 5	Whatcom County Sheriff's Office Division of Emergency Management	M	M	Local, State, FEMA, Private, Other	$250,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	structures, and associated hazards (e.g., flood and storm surge) to assess high-risk areas. 3. Develop an inventory of public buildings and infrastructure that may be particularly vulnerable to coastal flooding.						
Winter Weather	***WW-a. Reduce Impacts to Roadways***	1	Whatcom County Public Works.	M	O	Local	
	WW-b. Conduct Winter Weather Risk Awareness Activities	1	Whatcom County Sheriff's Office Division of Emergency Management	M	O	Local	
	WW-1 Conduct Winter Weather Risk Awareness Activities Tasks: 1. Inform the public about severe winter weather impacts. 2. Distribute family and traveler emergency preparedness information	1, 2	Whatcom County Sheriff's Office Division of Emergency Management	M	M	Local, State, FEMA, Private, Other	$50,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	about severe winter weather hazards. 3. Encourage homeowners to install carbon monoxide monitors and alarms. 4. Educating citizens that all fuel-burning equipment should be vented to the outside.						
	WW-2 Assist Vulnerable Populations Tasks: 1. Identify specific at-risk populations that may be exceptionally vulnerable in the event of long-term power outages. 2. Organize outreach to vulnerable populations, including establishing and promoting accessible heating centers in the community.	1	Task 1: Whatcom County Sheriff's Office Division of Emergency Management Task 2: Whatcom County Health Department	M	M	Local, State, FEMA, Private, Other	$100,000
Subsidence	**SU-1 Map and Assess Vulnerability to Subsidence** Tasks: 1. Using GIS to map areas that are susceptible to subsidence. 2. Identify and map old mining areas or		Whatcom County Sheriff's Office Division of Emergency Management	M	M	Local, State, FEMA, Private, Other	$75,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	geologically unstable terrain so that development can be prevented or eliminated. 3. Improve accuracy of hazard area maps to educate residents about unanticipated risks.						
Tsunami	***TSU-a Ongoing -- Map and Assess Vulnerability to Tsunami***	1	Lead responsibility lies with the DNR. They have completed all mapping in Whatcom County in 2013.	M	O	State, Other	
	TSU-b Ongoing -- Manage Development in Tsunami Hazard Areas	1, 3	Lead responsibility lies with Whatcom County Planning Department	M	O	Local	
	TSU-1 Map and Assess Vulnerability to		Whatcom	H	S	Local,	$250,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	Tsunami Tasks: 1. Using updated tsunami indentation modeling from DNR, develop and maintain a database to track community vulnerability to tsunamis. 2. Offer tsunami hazard mapping online for residents and design professionals. 3. Educate map users on the appropriate uses and limitations of maps. 4. More accurately map problem areas to educate residents about unanticipated risks.		County Sheriff's Office Division of Emergency Management			State, FEMA, Private, Other	
	TSU-2 Manage Development in Tsunami Hazard Areas Tasks: 1. Encourage awareness of and compliance with the IBC's non-mandatory appendix on tsunami-generated flood hazard. 2. Where modeled wave height is low, encourage new development that is configured to minimize tsunami losses	1,3,5	Whatcom County Planning and Development Services	H	S	Local, State, FEMA, Private, Other	$25,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	by using site planning strategies that slow water currents, steer water forces, and block water forces.						
	TSU-3 Increase Public Awareness of Tsunami Hazard Tasks: 1. Educate citizens regarding the dangers of tsunami and inform them of emergency procedures and routes to use should a tsunami warning be issued. 2. Designate tsunami inundation zones and evacuation routes. 3. Conduct tsunami evacuation drills. 4. Develop maps showing possible tsunami inundation areas. 5. Participating in NOAA's TsunamiReady Community program.	2	Whatcom County Sherriff's Office Division of Emergency Management	H	S	Local, State, FEMA, Private, Other	$150,
	WF-a Ongoing -- Incorporate Wildfire Mitigation in the Comprehensive Plan The Whatcom County Sheriff's Office Division of Emergency Management has been	1	Whatcom County Sheriff's Office Division of Emergency	M	O	Local	

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	working with the fire community to write a Wildland Fire plan for Whatcom County.		Management				
	WF-b Ongoing -- Participate in Firewise Program. Firewise is managed by the Whatcom Conservation District and is a continual improvement process.	1	Whatcom Conservation District	M	O	State, Local	
Wildfire	**WF-1 Map and Assess Vulnerability to Wildfire** Tasks: 1. Use GIS mapping of wildfire hazard areas to facilitate analysis and planning decisions through comparison with zoning, development, infrastructure, etc. 2. Develop and maintain a database to track community vulnerability to wildfire. 3. Create a wildfire scenario to estimate potential loss of life and injuries, the types of potential damage, and existing	1,2	Whatcom County Sheriff's Office Division of Emergency Management	H	S	Local, state, FEMA, Private, Other	$250,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	vulnerabilities within a community to develop wildfire mitigation priorities.						
	WF-2 Require or Encourage Fire-Resistant Construction Techniques Tasks: 1. Encourage the use of non-combustible materials for new construction in wildfire hazard areas. 2. Using fire resistant roofing and building materials in remodels, upgrades, and new construction. 3. Encourage enclosing the foundations of homes and other buildings in wildfire-prone areas, rather than leaving them open and potentially exposing undersides to blown embers or other materials.		Whatcom County Planning and Development Services	H	S	Local, state, FEMA, Private, Other	$125,000
	WF-3 Create Defensible Space Around Structures and Infrastructure Tasks: 1. Encourage creating buffers around residential and non-residential structures through the removal or reduction of flammable vegetation,		Whatcom County Sheriff's Office Division of Emergency Management	H	S	Local, state, FEMA, Private, Other	$125,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	including vertical clearance of tree branches. 2. Encourage replacing flammable vegetation with less flammable species. 3. Encourage creating defensible zones around power lines, oil and gas lines, and other infrastructure systems.						
	WF-4 Participate in Firewise Program Tasks: 1. Expand the "Firewise Communities/USA" recognition program sponsored by the National Wildlife Coordinating Group (firewise.org). 2. Sponsor Firewise workshops for local officials, developers, civic groups, and neighborhood/homeowners' associations. 3. Publicize Firewise guidance and encourage best practices in Whatcom County.		Whatcom County Conservation District	H	S	Local, state, FEMA, Private, Other	$125,000
	WF-5 Increase Wildfire Risk Awareness Tasks:		Whatcom County Sheriff's Office Division of	H	S	Local, state, FEMA,	$75,000

Priority:	Timeline:	Funding Source:	Estimated Cost:
H (High); M (Medium); L (Low)	Short-Range (less than 2 years); Mid-Range (2-5 years); Long-Range (more than 5 years); Ongoing	Local; State; FEMA; Private; Other	Actual; Estimated

UNINCORPORATED WHATCOM COUNTY IDENTIFIED MITIGATION ACTIONS 2021-2025							
MITIGATION ACTIONS		**(1) Goals**	**(2) Lead Responsibility for Carrying out Measure**	**(3) Priority**	**(4) Timeline**	**(5) Funding Source**	**(6) Estimated Cost**
Hazard	**Action Items**						
	1. Offer GIS hazard mapping online for residents, developers, and design professionals. 2. Organize Fire District tours to show elected officials and planners the most vulnerable areas of the community's wildland-urban interface and increase their understanding of risks. 3. Develop partnerships with neighborhood groups, homeowners' associations, and others to conduct outreach activities. 4. Conduct education programs in schools. 5. Educate the public about evacuation procedures. 6. Form a citizen plan implementation steering committee to monitor progress of local mitigation actions. Include a mix of representatives from neighborhoods, local businesses, and local government.		Emergency Management			Private, Other	

Unincorporated Whatcom County Annual Review and Progress for Hazard-Specific Mitigation Actions 2021-2025

Progress monitoring means tracking the implementation of the hazard specific mitigation actions over time. Each jurisdiction must identify how, when, and by whom action items will be monitored. The responsible agency assigned to each mitigation action is responsible for tracking and reporting on each of their actions.

Annual review and progress reporting includes the following:

Step One: Identify mitigation actions that your planning team has identified for the annual review. The planning team has the option to address ALL action items, or only those that should be acted on during each review cycle.

Step Two: Use the table below to track annual progress. For each action item selected for annual review insert the appropriate letter that indicates the status of that action item.

Step Three: Complete a progress report form as illustrated in Appendix G for each mitigation action item selected for annual review

Step Four: Submit the completed form(s) to the Whatcom County DEM.

Unincorporated Whatcom County Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
MULTIPLE HAZARDS						
MU-a Ongoing -- Adopt and Enforce Building Codes						
MU-b Ongoing -- Improve Household Disaster Preparedness						
MU-1 Assess Community Risk - Obtain local data including tax parcels, building footprints, critical facility locations, and other information for use in risk analysis						
MU-1 Assess Community Risk - Develop and maintain a database to track community vulnerability (i.e., exposure in known hazard areas)						
MU-1 Assess Community Risk - Establish a process to coordinate with state and Federal agencies to maintain up-to-date hazard data, maps, and assessments						
MU-1 Assess Community Risk - Update aerial photography current, especially in rapidly developing areas						
MU-1 Assess Community Risk - Identify the most at-risk critical facilities and evaluating potential mitigation techniques						
MU-2 Integrate Mitigation into Local Planning - Incorporate risk assessment and hazard mitigation principles into comprehensive planning efforts						
MU-2 Integrate Mitigation into Local Planning - Incorporate a stand-alone element for hazard mitigation into the local comprehensive (land use) plan						
MU-2 Integrate Mitigation into Local Planning - Incorporate hazard mitigation into broader growth management (i.e.,						

Unincorporated Whatcom County Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**)*: **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Smart Growth) initiatives.						
MU-2 Integrate Mitigation into Local Planning - Incorporate a hazard risk assessment into the local development and subdivision review process.						
MU-3 Monitor Mitigation Plan Implementation - Form a plan implementation steering committee to monitor progress on local mitigation actions. Include a mix of representatives from neighborhoods, local businesses, and local government						
MU-3 Monitor Mitigation Plan Implementation - Prepare a plan implementation monitoring schedule and outlining roles for those responsible for monitoring (i.e., local departments, agencies, and committees)						
MU-3 Monitor Mitigation Plan Implementation - Prepare and submit an annual plan implementation progress report to the local elected body						
MU-4 Protect Structures - Acquire or relocating structures located in hazard areas						
MU-4 Protect Structures - Assess the need to retrofit fire and police stations to become hazard resistant						
MU-5 Increase Hazard Education and Risk Awareness - Develop and implement a multi-hazard public awareness program						
MU-5 Increase Hazard Education and Risk Awareness - Establish a "hazard awareness week" in coordination with the media to promote hazard awareness (seasonal)						

Unincorporated Whatcom County Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
MU-5 Increase Hazard Education and Risk Awareness - Create a speaker's bureau for disaster-related topics that focus on mitigation and preparedness measures						
Add New Action Items if Applicable						
DROUGHTS/HEAT WAVES						
D-1 Assess Vulnerability to Drought Risk - Gather and analyze water and climate data to gain a better understanding of local climate and drought history						
D-1 Assess Vulnerability to Drought Risk - Identify factors that affect the severity of a drought						
D-1 Assess Vulnerability to Drought Risk - Identify available water supplies						
D-1 Assess Vulnerability to Drought Risk - Determine how the community and its water sources have been impacted by droughts in the past						
EARTHQUAKES						
EQ-a Ongoing -- Incorporate Earthquake Mitigation into Local Planning. Whatcom County has incorporated building mitigation strategies for earthquakes into the Comprehensive Plan.						
EQ-b Ongoing -- Conduct Inspections of Building Safety Building safety inspections are carried out on a continual and regular basis.						
EQ-c Ongoing -- Increase Earthquake Risk Awareness. The Whatcom County Sheriff's Office Division of Emergency Management promotes earthquake awareness on a continual and ongoing basis.						

Unincorporated Whatcom County Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
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	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
EQ-1 Increase Earthquake Risk Awareness - Develop an outreach program about earthquake risk and mitigation activities in homes, schools, and businesses						
EQ-2 Conduct Outreach to Builders, Architects, Engineers, and Inspectors - Training building department staff and officials on Form ATC-20 for post-earthquake building evaluation. The ATC-20 report and addendum, prepared by the Applied Technology Council, provide procedures and guidelines for making on-the-spot evaluations and decisions regarding continued use and occupancy of earthquake-damaged buildings						
Add New Action Items if Applicable						
EROSION						
ER-1 Map and Assess Vulnerability to Erosion - Use GIS to identify and map erosion hazard areas						
ER-1 Map and Assess Vulnerability to Erosion - Develop and maintain a database to track community vulnerability to erosion						
ER-1 Map and Assess Vulnerability to Erosion - Use GIS to identify concentrations of at-risk structures						
Add New Action Items if Applicable						
LANDSLIDES						
LS-a Ongoing -- Manage Development in Landslide Hazard Areas. Whatcom County Planning and Development Services does manage development in Landslide Hazard Areas on a continual and ongoing basis.						
LS-1 Map and Assess Vulnerability to Landslides – Study areas where						

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	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
riparian landslides may occur						
LS-1 Map and Assess Vulnerability to Landslides - Complete an inventory of locations where critical facilities, other buildings, and infrastructure are vulnerable to landslides						
LS-1 Map and Assess Vulnerability to Landslides - Use GIS to identify and map landslide hazard areas						
LS-1 Map and Assess Vulnerability to Landslides - Develop and maintaining a database to track community vulnerability to landslides						
Add New Action Items if Applicable						
FLOODING						
FL-a. Comprehensive Flood Hazard Management Plan						
FL-b. Adopt and Enforce Building Codes and Development Standards						
FL-c. Improve Flood Risk Assessment						
FL-d. Join or Improve Compliance with NFIP						
FL-e. Manage the Floodplain Beyond Minimum Requirements						
FL-f. Participate in the CRS						
FL-g. Remove Existing Structures from Flood Hazard Areas						
FL-h. Improve Stormwater Drainage System Capacity						
FL-i. Conduct Regular Maintenance for Drainage Systems and Flood Control Structures						
FL-j. Protect Infrastructure						
FL-k. Protect Critical Facilities						

Unincorporated Whatcom County Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
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	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
FL-l. Construct Flood Control Measures						
FL-m. Protect and Restore Natural Flood Mitigation Features						
FL-1 Incorporate Flood Mitigation in Local Planning						
FL-2 Form Partnerships to Support Floodplain Management						
FL-3 Limit or Restrict Development in Floodplain Areas						
FL-4 Improve Stormwater Management Planning						
FL-5 Adopt Polices to Reduce Stormwater Runoff						
FL-6 Establish Local Funding Mechanisms for Flood Mitigation						
FL-7 Elevate or Retrofit Structures and Utilities						
FL-8 Flood proof Residential and Non-Residential Structures						
FL-9 Preserve Floodplains as Open Space						
FL-10 Increase Awareness of Flood Risk and Safety						
FL-11 Educate Property Owners about Flood Mitigation Techniques						
Add New Action Items if Applicable						
ALLUEVIAL FANS						
AF-a. Map and Assess Alluvial Fans Hazards						
AF-b. Manage Development in Alluvial Fan Hazard Areas						

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	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
AF-c. Promote or Require Site and Building Design Standards to Minimize Risk on Alluvial Fans						
AF-d. Remove Existing Buildings and Infrastructure from Erosion/Alluvial Fan Hazard Areas						
AF-e. Develop Basin-Specific Plans for Alluvial Fan Hazard Areas						
AF-f. Construct Mitigation Measures on Alluvial Fan Hazard Areas						
AF-g. Increase Awareness of Alluvial Fan Hazards						
Add New Action Items if Applicable						
COASTAL FLOODING (including STORM SURGE)						
CF-1 Map and Assess Vulnerability to Coastal Flooding - Model various "what-if" scenarios to estimate potential vulnerabilities in order to develop coastal mitigation priorities						
CF-1 Map and Assess Vulnerability to Coastal Flooding - Use GIS to map hazard areas, at-risk structures, and associated hazards (e.g., flood and storm surge) to assess high-risk areas						
CF-1 Map and Assess Vulnerability to Coastal Flooding - Develop an inventory of public buildings and infrastructure that may be particularly vulnerable to coastal flooding						
Add New Action Items if Applicable						
WINTER WEATHER						
WW-1 Conduct Winter Weather Risk Awareness Activities - Inform the public about severe winter weather impacts						
WW-1 Conduct Winter Weather Risk						

Unincorporated Whatcom County Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Awareness Activities - Distribute family and traveler emergency preparedness information about severe winter weather hazards						
WW-1 Conduct Winter Weather Risk Awareness Activities - Encourage homeowners to install carbon monoxide monitors and alarms						
WW-1 Conduct Winter Weather Risk Awareness Activities - Educating citizens that all fuel-burning equipment should be vented to the outside						
WW-2 Assist Vulnerable Populations - Organize outreach to vulnerable populations, including establishing and promoting accessible heating centers in the community						
Add New Action Items if Applicable						
SUBSIDENCE						
SU-1 Map and Assess Vulnerability to Subsidence - Use GIS to map areas that are susceptible to subsidence						
SU-1 Map and Assess Vulnerability to Subsidence - Identify and map old mining areas or geologically unstable terrain so that development can be prevented or eliminated						
SU-1 Map and Assess Vulnerability to Subsidence - Improve accuracy of hazard area maps to educate residents about unanticipated risks						
Add New Action Items if Applicable						
TSUNAMI						
TSU-1 Map and Assess Vulnerability to Tsunami - Using GIS to map areas that are vulnerable to inundation by tsunamis						
TSU-1 Map and Assess Vulnerability to						

Unincorporated Whatcom County Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
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	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Tsunami - Develop and maintain a database to track community vulnerability to tsunamis						
TSU-1 Map and Assess Vulnerability to Tsunami - Offer GIS hazard mapping online for residents and design professionals						
TSU-1 Map and Assess Vulnerability to Tsunami - Educate map users on the appropriate uses and limitations of maps						
TSU-1 Map and Assess Vulnerability to Tsunami - More accurately map problem areas to educate residents about unanticipated risks						
TSU-2 Manage Development in Tsunami Hazard Areas - Adopt and enforce building codes and design standards that contain requirements for tsunami-resistant design						
TSU-2 Manage Development in Tsunami Hazard Areas - Encourage new development that is configured to minimize tsunami losses by using site planning strategies that slow water currents, steer water forces, and block water forces						
TSU-3 Increase Public Awareness of Tsunami Hazard - Educate citizens regarding the dangers of tsunami and inform them of emergency procedures and routes to use should a tsunami warning be issued						
TSU-3 Increase Public Awareness of Tsunami Hazard - Conduct tsunami drills						
TSU-3 Increase Public Awareness of Tsunami Hazard - Designate tsunami inundation zones and evacuation routes						
TSU-3 Increase Public Awareness of Tsunami Hazard - Develop maps showing possible tsunami inundation areas						
TSU-3 Increase Public Awareness of						

Unincorporated Whatcom County Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
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	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
Tsunami Hazard - Participating in NOAA's TsunamiReady Community program						
Add New Action Items if Applicable						
WILDFIRE						
WF-1 Map and Assess Vulnerability to Wildfire - Use GIS mapping of wildfire hazard areas to facilitate analysis and planning decisions through comparison with zoning, development, infrastructure, etc						
WF-1 Map and Assess Vulnerability to Wildfire - Develop and maintain a database to track community vulnerability to wildfire						
WF-1 Map and Assess Vulnerability to Wildfire - Create a wildfire scenario to estimate potential loss of life and injuries, the types of potential damage, and existing vulnerabilities within a community to develop wildfire mitigation priorities						
WF-2 Require or Encourage Fire-Resistant Construction Techniques - Encourage the use of non-combustible materials for new construction in wildfire hazard areas						
WF-2 Require or Encourage Fire-Resistant Construction Techniques - Using fire resistant roofing and building materials in remodels, upgrades, and new construction						
WF-2 Require or Encourage Fire-Resistant Construction Techniques - Encourage enclosing the foundations of homes and other buildings in wildfire-prone areas, rather than leaving them open and potentially exposing undersides to blown embers or other materials						
WF-3 Create Defensible Space Around Structures and Infrastructure - Encourage creating buffers around residential and						

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	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
non-residential structures through the removal or reduction of flammable vegetation, including vertical clearance of tree branches						
WF-3 Create Defensible Space Around Structures and Infrastructure - Encourage replacing flammable vegetation with less flammable species						
WF-3 Create Defensible Space Around Structures and Infrastructure - Encourage creating defensible zones around power lines, oil and gas lines, and other infrastructure systems						
WF-4 Participate in Firewise Program - Expand the "Firewise Communities/USA" recognition program sponsored by the National Wildlife Coordinating Group (firewise.org)						
WF-4 Participate in Firewise Program - Sponsor Firewise workshops for local officials, developers, civic groups, and neighborhood/homeowners' associations						
WF-4 Participate in Firewise Program - Publizie Firewise guidance and encourage best practices in Whatcom County						
WF-5 Increase Wildfire Risk Awareness - Offer GIS hazard mapping online for residents, developers, and design professionals						
WF-5 Increase Wildfire Risk Awareness - Organize Fire District tours to show elected officials and planners the most vulnerable areas of the community's wildland-urban interface and increase their understanding of risks						
WF-5 Increase Wildfire Risk Awareness - Develop partnerships with neighborhood groups, homeowners' associations, and others to conduct outreach activities						

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	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
WF-5 Increase Wildfire Risk Awareness - Conduct education programs in schools						
WF-5 Increase Wildfire Risk Awareness - Educate the public about evacuation procedures						
WF-5 Increase Wildfire Risk Awareness - Form a citizen plan implementation steering committee to monitor progress of local mitigation actions. Include a mix of representatives from neighborhoods, local businesses, and local government						
Add New Action Items if Applicable						
VOLCANIC						
VOL-1 – Update the 2019 Mount Baker Action Plan						
VOL-2 – Update the latest USGS geologic risks related to Mount Baker and publish in Whatcom County GIS						
VOL-3 – Conduct Whatcom County table top exercise on updated plans and risks.						
Add New Action Items if Applicable						

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SECTION 4. PLAN MAINTENANCE

Annual Review and Updates to the Plan

The Plan will be reviewed annually by each of the major jurisdictions that have adopted the Plan. It will be evaluated to determine the effectiveness of mitigation programs, projects, or other related activities and changed accordingly. As new hazard threats arise, or mitigation data becomes available, it will be incorporated into the Plan. Each adopting jurisdiction is responsible for the section of the Plan that refers to its jurisdiction and to provide written changes, if any, annually to Whatcom County DEM prior to each annual public meeting.

Note: Each participating jurisdiction is responsible for monitoring and performing an annual review of their proposed 2021 to 2025 hazard specific action items. Instructions are found in the Annual Review and Progress Report of their Community Profile.

By adopting the Plan, jurisdictions will notify the Whatcom County DEM of status updates regarding assets, mitigation planning, or general updates that occur during the 5-year cycle for the subsequent Plan update. If necessary, a public meeting will be held with representatives of the adopting jurisdictions present to answer any questions or concerns regarding their section of the Plan. Public notices will be posted to invite public participation in the process.

The County will use this plan as a resource in its planning efforts with other planning endeavors such as the Whatcom County Development Standards, and the Comprehensive Flood Hazard Management Plan, as well as the Comprehensive Emergency Management Plan. Local participating political jurisdictions will update Whatcom County DEM to any changes in how they integrated the plan into their capital improvement plans or comprehensive planning efforts during the 5-year cycle for the subsequent Plan update.

A written report containing a summary of any changes based on annual reviews will be produced by the DEM and sent to the WSHMO following each annual review. The annual reviews by each jurisdiction and the public meeting will conclude by November 30 each year. The DEM will facilitate the review process.

Major Plan Update and Plan Reviews

A major update to the Plan will be performed and published every 5 years. It will contain all changes in strategy, identified hazards, and project updates, and will incorporate new data as it relates to the Plan. The public will also be involved in this process through public meetings coordinated by the DEM. A copy of the updated Plan will be delivered to the WSHMO for approval and forwarding to FEMA, Region X. All the jurisdictions that have adopted the Plan within Whatcom County will receive a copy of the updated Plan once it is approved.

As changes are made to other plans, the plan will be used to review them for consistency, and changes will be incorporated into other plans as necessitated by review and update of this plan.

The next 5-year update will be delivered to the WSHMO within 30 days following December 31, 2025.

Date	Product
August 2021	First annual review/update
August 2022	Second annual review/update
August 2023	Third annual review/update
August 2024	Fourth annual review/update
January thru December 2025	Major Plan Update and resubmission

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SECTION 5: APPENDICES

Appendix A: Capabilities Identification

Appendix B: List of Acronyms and Abbreviations

Appendix C: Whatcom County Risk Assessment & Mitigation Strategies for Wildland Fire

Appendix D: National Flood Insurance Program Participation (NFIP)

Appendix E: Whatcom County Mitigation Ideas

Appendix F: Mitigation Action Progress Report Form

Appendix G: Whatcom County Contact List

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APPENDIX A: CAPABILITIES IDENTIFICATION

Types of Capabilities

The ability of a jurisdiction to develop an effective hazard mitigation plan depends upon its capability to implement policy and programs which is dependent on the type of jurisdiction. This ability comes from the different types of capabilities a jurisdiction maintains. The FEMA 386 publication describes a capability assessment and outlines the types of capabilities that should be considered:

- Legal and Regulatory
- Administrative and Technical
- Fiscal

Legal and regulatory capabilities refer to the laws, regulations, authorities, and policies that govern current and potential mitigation measures. This can be broken down into two basic areas, local and extra-local. Local are those generated by the local governing agency that the jurisdiction has control over. Extra-local laws, regulations, etc. are those from a different level of government. Administrative and technical capabilities refer to a jurisdiction's staff and technical resources, as well as completed plans and studies that have considered, directly or indirectly, the mitigation of natural hazards. Technical capabilities also include the existing electronic and systemic resources. Fiscal capabilities refer to the financial resources available to achieve the identified mitigation strategies.

For the organizational purposes of this plan, administrative capabilities are organizations, agencies or departments responsible for implementing or partnering to implement mitigation measures. The fiscal capabilities at the City level are thus correlated to the budgets and expenditures of these departments as well as the separate funds available for mitigation-related activities. For special purpose districts, fiscal capabilities center on levies, contracts, and grants.

For the purposes of this Plan the 10 jurisdictions have been placed into three categories or groups of jurisdictions: Cities/Towns, School Districts, and Special Purpose Districts.

Additionally, there are **State and Federal Capabilities.** These are the regulations that dictate what a specified jurisdiction in Washington can and cannot pursue with regards to mitigation, as well as what assistance may be available. They essentially cover the same 4 capability areas that are covered in local capabilities: **Legal and Regulatory, Administrative**, **Technical,** and **Fiscal.**

Extra-Local Fiscal Resources

One of the key issues in implementing mitigation measures is finding sufficient monetary resources to do it. Fiscal resources in the form of grants are available to jurisdictions in pursuing hazard reduction activities. Grants may be administered from the federal or state level, and in some instances may be administered by the private or non-profit sector. Each grant has specific requirements and uses varying elements to conduct benefit-cost analysis. The purpose of the benefit-cost analysis is to determine if the benefits of the project exceed the costs of the project. Jurisdictions should coordinate with the administering agency to understand the program-specific requirements and conduct the required analyses.

For example, if either Hazard Mitigation Grant Program (HMGP) or Pre-Disaster Mitigation (PDM) funding is involved in a hazard mitigation project, the jurisdiction involved will conduct a benefit-cost analysis based on guidelines provided by U.S. Department of Homeland Security, FEMA, and Washington Emergency Management Division on how to determine cost-effectiveness of mitigation projects and how to calculate the benefit-cost ratio. Both the HMGP and PDM require a benefit-cost ratio of at least 1.0 for a project to be considered for funding.

Contained on the following pages are some of the major federal resources that currently may be used to secure funding to pursue implementation of mitigation measures. In addition, there is a list of State agencies that have mitigation capabilities and, in some cases, have funds that can assist with mitigation projects. Because the funding source, available funding, requirements, and type and number of grants is constantly changing, this assessment will outline neither all potential grants nor the detailed requirements of those grants that are mentioned. The websites listed here were accessed and confirmed just prior to the finalization of this document.

Federal Capabilities

The Federal Emergency Management Agency's (FEMA) Mitigation Grant programs provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. Currently, FEMA administers the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance (FMA) program, and the Pre-Disaster Mitigation (PDM) program, the Repetitive Flood Claims (RFC) program, and the Severe Repetitive Loss (SRL) program.

FEMA's mitigation grants are provided to eligible Applicant States/Tribes/Territories that, in turn, provide sub-grants to local governments. The Applicant selects and prioritizes applications developed and submitted to them by local jurisdictions to submit to FEMA for grant funds.

Prospective Sub-applicants should consult the official designated point of contact for their Applicant State/Tribe/Territory for further information regarding specific program and application requirements.

For more information on the mitigation grant programs, see below:

Pre-Disaster Mitigation Grant Program (PDM)

http://www.fema.gov/pre-disaster-mitigation-grant-program

The PDM program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

Hazard Mitigation Grant Program (HMGP)

http://www.fema.gov/hazard-mitigation-grant-program-hmgp

The HMGP provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act.

Flood Mitigation Assistance (FMA) Program

http://www.fema.gov/flood-mitigation-assistance-program

The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). FEMA provides FMA funds to assist States and communities implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the National Flood Insurance Program.

Repetitive Flood Claims Program (RFC)

http://www.fema.gov/repetitive-flood-claims-program

The RFC grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (P.L. 108–264), which amended the National Flood Insurance Act (NFIA) of 1968 (42 U.S.C. 4001, et al). Up to $10 million is available annually for FEMA to provide RFC

funds to assist States and communities reduce flood damages to insured properties that have had one or more claims to the National Flood Insurance Program (NFIP).

Severe Repetitive Loss Program (SRL)

http://www.fema.gov/severe-repetitive-loss-program

The SRL grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, which amended the National Flood Insurance Act of 1968 to provide funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss (SRL) structures insured under the National Flood Insurance Program (NFIP).

The definition of severe repetitive loss as applied to this program was established in section 1361A of the National Flood Insurance Act, as amended (NFIA), 42 U.S.C. 4102a. An SRL property is defined as a **residential property** that is covered under an NFIP flood insurance policy and: (a) That has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or (b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building. For both (a) and (b) above, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart.

AFGP Fire Prevention & Safety Grants (DHS)

www.fema.gov/firegrants/fpsgrants/index.shtm

The Fire Prevention and Safety Grants (FP&S) are part of the Assistance to Firefighters Grants (AFG) and are under the purview of the Grant Programs Directorate in the Federal Emergency Management Agency. FP&S grants support projects that enhance the safety of the public and firefighters from fire and related hazards. The primary goal is to target high-risk populations and mitigate high incidences of death and injury. Examples of the types of projects supported by FP&S include fire prevention and public safety education campaigns, juvenile firesetter interventions, media campaigns, and arson prevention and awareness programs. In fiscal year 2005, Congress reauthorized funding for FP&S and expanded the eligible uses of funds to include Firefighter Safety Research and Development.

Fire Prevention and Safety Grants

http://www.firegrantshelp.com/search-grants/453560-fire-prevention-and-safety-fp-s- grants/

FP&S offers grants to support activities in two categories:

- activities designed to reach high-risk target groups and mitigate incidences of death and injuries caused by fire and fire-related hazards (“Fire Prevention and Safety Activity”);
- research and development activities aimed at improving firefighter safety (“Firefighter Safety Research and Development Activity”).

Buffer Zone Protection Program (BZPP)

http://www.dhs.gov/files/programs/gc_1265397547397.shtm

BZPP provides grants to build security and risk-management capabilities at the State and local level in order to secure pre-designated Tier I and Tier II critical infrastructure sites, including chemical facilities, financial institutions, nuclear and electric power plants, dams, stadiums, and other high-risk/high-consequence facilities.

Community Development Block Grants (CDBG)

http://www.hud.gov/offices/cpd/communitydevelopment/programs/

These grants are a source of funding for hazard mitigation initiatives. The objective of the CDBG program is to assist communities in rehabilitating substandard dwelling structures and to expand economic opportunities, primarily for low-to-moderate-income families. Following a Presidential declared disaster, CDBG funds may be used for long-term needs such as acquisition, reconstruction, and redevelopment of disaster-affected areas.

Disaster Preparedness and Response for Schools and Universities

http://www.edfacilities.org/rl/disaster.cfm

National Clearinghouse for Educational Facilities (NCEF's) resource list of links, books, and journal articles on building or retrofitting schools to withstand natural disasters and terrorism, developing emergency preparedness plans, and using school buildings to shelter community members during emergencies.

Emergency Management Program Grants (EMPG)

http://www.fema.gov/non-disaster-grant-management-system

The EMPG program provides resources to assist State and local governments to sustain and enhance all-hazards emergency management capabilities. States have the opportunity to use EMPG funds to further strengthen their ability to support emergency management activities while simultaneously addressing issues of national concern as identified in the National Priorities of the National Preparedness Guidelines. EMPG has a 50 percent Federal and 50 percent State cost-share cash or in-kind match requirement.

Environmental Protection Agency's National Estuary Program

http://www.epa.gov/nep/

The EPA's National Estuary Program was established by Congress in 1987 to improve the quality of estuaries of national importance. The Clean Water Act Section 320 directs EPA to develop plans for attaining or maintaining water quality in an estuary. This includes protection of public

water supplies and the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife, and allows recreational activities, in and on water, requires that control of point and nonpoint sources of pollution to supplement existing controls of pollution. In several cases, more than one State is participating in a National Estuary Program. Each program establishes a Comprehensive Conservation and Management Plan to meet the goals of Section 320.

Hazardous Materials Emergency Preparedness (HMEP) Grant Program

http://hazmat.dot.gov/training/state/hmep/hmep.htm

The Hazardous Materials Emergency Preparedness (HMEP) grant program is intended to provide financial and technical assistance as well as national direction and guidance to enhance State, Territorial, Tribal, and local hazardous materials emergency planning and training. The HMEP Grant Program distributes fees collected from shippers and carriers of hazardous materials to emergency responders for hazmat training and to Local Emergency Planning Committees (LEPCs) for hazmat planning.

Homeland Security Grant Program

http://www.fema.gov/government/grant/hsgp/index.shtm

This core assistance program provides funds to build capabilities at the State and local levels through planning, organization, equipment, training, and exercise activities. State Homeland Security Program (SHSP) also supports the implementation of State homeland security strategies and key elements of the national preparedness architecture, including the National Preparedness Guidelines, the National Incident Management System and the National Response Framework.

The Homeland Security Grant Program (HSGP) plays an important role in the implementation of Presidential Policy Directive – 8 (PPD-8) by supporting the development and sustainment of core capabilities to fulfill the National Preparedness Goal (NPG). HSGP is comprised of three interconnected grant programs:

- State Homeland Security Program (SHSP)
- Urban Areas Security Initiative (UASI)
- Operation Stonegarden (OPSG)

Together, these grant programs fund a range of preparedness activities, including planning, organization, equipment purchase, training, exercises, and management and administration.

National Earthquake Hazards Reduction Program

http://www.nehrp.gov/index.htm

The National Earthquake Hazards Reduction Program (NEHRP) was established by the U.S. Congress when it passed the Earthquake Hazards Reduction Act of 1977, Public Law (PL) 95–124. At the time of its creation, Congress' stated purpose for NEHRP was "to reduce the risks of life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards reduction program." In establishing NEHRP, Congress recognized that earthquake-related losses could be reduced through improved design and construction methods and practices, land use controls and redevelopment, prediction techniques and early-warning systems, coordinated emergency preparedness plans, and public education and involvement programs.

National Weather Service

http://www.weather.gov/

The National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community.

Port Security Grant Program (PSGP)

http://www.fema.gov/port-security-grant-program

The PSGP provides grant funding to port areas for the protection of critical port infrastructure from terrorism. PSGP funds help ports enhance their risk management capabilities, domain awareness, training and exercises, and capabilities to prevent, detect, respond to, and recover from attacks involving improvised explosive devices and other non-conventional weapons.

Urban Areas Security Initiative Nonprofit Security Grant Program

http://www.fema.gov/preparedness-non-disaster-grants/urban-areas-security-initiative-nonprofit-security-grant-program

Nonprofit Security Grants Program (NSGP) provides funding support for target hardening and other physical security enhancements and activities to nonprofit organizations that are at high risk of a terrorist attack and located within one of the specific FY 2012 UASI-eligible urban areas. The FY 2012 NSGP plays an important role in the implementation of the Presidential Policy Directive – 8 by supporting the development and sustainment of core capabilities to fulfill the National Preparedness Goal.

Problem Solving Partnerships Grant Program (COPS)

http://www.cops.usdoj.gov/

The COPS Office has distributed over $12 billion to advance community policing since it was created in 1994. This funding supports a wide range of activities. COPS funding helps local law

enforcement agencies hire, equip, and train new community policing professionals. COPS funding helps redeploy existing officers into their communities and studies ways to maximize the impact they have on the people who live there. COPS funds a wide variety of strategies to advance community policing through innovative techniques and technologies.

Transit Security Grant Program

http://www.fema.gov/transit-security-grant-program

TSGP provides funds to owners and operators of transit systems (which include intracity bus, commuter bus, ferries, and all forms of passenger rail) to protect critical surface transportation infrastructure and the traveling public from acts of terrorism and to increase the resilience of transit infrastructure. The TSGP plays an important role in the implementation of PPD-8 by supporting the development and sustainment of core capabilities to fulfill the National Preparedness Goal (NPG).

Rural Development-Housing & Community Facilities Programs

http://www.rurdev.usda.gov/rhs/cf/brief_cp_grant.htm

Community Programs provides grants to assist in the development of essential community facilities in rural areas and towns of up to 20,000 in population. Grants are authorized on a graduated scale. Applicants located in small communities with low populations and low incomes will receive a higher percentage of grants. Grants are available to public entities such as municipalities, counties, and special-purpose districts, as well as non-profit corporations and tribal governments.

Grant funds may be used to assist in the development of essential community facilities. Grant funds can be used to construct, enlarge, or improve community facilities for health care, public safety, and community and public services. This can include the purchase of equipment required for a facility's operation. A grant may be made in combination with other Community Facilities financial assistance such as a direct or guaranteed loan, applicant contributions, or loans and grants from other sources.

Volunteers in Police Service (VIPS) Program

http://www.policevolunteers.org/

The VIPS Program provides support and resources for agencies interested in developing or enhancing a volunteer program and for citizens who wish to volunteer their time and skills with a community law enforcement agency. The program's ultimate goal is to enhance the capacity of state and local law enforcement to utilize volunteers.

Western Regional Climate Action Initiative

http://www.westernclimateinitiative.org/

The Western Climate Initiative (WCI) is a collaboration which was launched in February 2007 by the Governors of Arizona, California, New Mexico, Oregon and Washington to develop regional strategies to address climate change. WCI is identifying, evaluating and implementing collective and cooperative ways to reduce greenhouse gases in the region.

State Capabilities

Various law and rules have been identified in Washington State as supporting hazard mitigation. These can be found in Revised Code of Washington (RCW) and Washington Administrative Code (WAC). Washington State Constitution further identifies who does what and the basic rights in the State.

Various State of Washington State Agencies/Departments have mitigation capabilities:

- Community, Trade, Economic Development http://www.cted.wa.gov/
- Department of Fish and Wildlife http://wdfw.wa.gov/
- Department of Ecology http://www.ecy.wa.gov/ Department of Labor and Industries http://www.lni.wa.gov/
- Department of Natural Resource http://www.dnr.wa.gov/
- Department of Transportation http://www.wsdot.wa.gov/
- Governor's Office http://www.governor.wa.gov/
- Military Department (Emergency Management Division) http://www.emd.wa.gov/
- Office of Superintendent of Public Instruction http://www.k12.wa.us/
- Washington State Patrol http://www.wsp.wa.gov/

Other various capabilities in Washington State:

- Association of Washington Cities http://www.awcnet.org/
- Association of Washington Counties http://www.wacounties.org/
- Cascade Land Conservancy http://www.cascadeland.org/
- Municipal Research of Washington http://www.mrsc.org/
- Structural Engineers Association of Washington http://www.seaw.org/
- WA Association of Building Officials http://wabo.org/
- WA Association of Fire Chiefs http://www.wsafc.org/

- WA Association of Maintenance & Operations Administrators http://www.wamoa.org/
- WA Association of Sheriffs & Police Chiefs http://www.waspc.org/
- WA Emergency Management Association http://www.wsema.com/
- WA Firefighter Association http://www.wsffa.org/
- WA Fire Commissioners Association http://www.wfca.wa.gov/default.asp
- Washington Public Ports Administration http://www.washingtonports.org/
- Washington Schools Risk Management Pool http://www.wsrmp.com/

Local Capabilities

Each of the 10 individual jurisdictions has extensive local capabilities in their individual documents. Any websites associated with these local capabilities will be found within the 10 jurisdictions' addenda.

Mitigation Tools	Yes/No	Comments
Jurisdictional Capabilities		
Comprehensive Plan	Yes	
Capital Facilities Element	Yes	
Environmental & Critical Areas Element	Yes	
Land Use Element	Yes	
County Code	Yes	
Building/Fire Code	Yes	
Critical Areas	Yes	
Shoreline Regulations	Yes	
Zoning	Yes	
Critical Areas Regulations	Yes	
Flood Hazards	Yes	
Administrative Tools		
County Executive (elected official)	Yes	
County Council (elected officials)	Yes	
Planning & Land Services	Yes	
Board of Adjustment/Hearing Examiner	Yes	
Commercial Fire Safety/Code Inspection	Yes	
Regional Capabilities		
Hazard Mitigation Planning Team	Yes	
Local Business Districts	Yes	
Local Emergency Management	Yes	
Local Fire Agencies	Yes	

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APPENDIX B: LIST OF ACRONYMS AND ABBREVIATIONS

ACS	Auxiliary Communications Service
AFG	Assistance to Firefighters Grants
AHAB	All Hazard Alert Broadcast Siren
APA	Approval Pending Adoption
AWIA	America's Water infrastructure Act of 2018
BBWARM	Birch Bay area of Whatcom County Stormwater Program
B.C.	British Columbia
BCT	Bellingham Cruise Terminal
BFD	Bellingham Fire Department
BLI	Bellingham International Airport
BMC	Bellingham Municipal Code
BMC	Blaine Municipal Code
BST	Bellingham Shipping Terminal
BZPP	Buffer Zone Protection Program
Cascades	The Cascade Range
CDBG	Community Development Block Grants
CDS	Community Development Services
CEMP	Comprehensive Emergency Management Plan
CERT	Community Emergency Response Team
CFHMP	Comprehensive Flood Hazard Management Plan
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
COSMOS	Coastal Storm Modeling Systems
CRS	Community Rating System
CSZ	Cascadia Subduction Zone
CTP	Cooperating Technical Partners
CWPP	Community Wildfire Protection Plan
DMA	Disaster Mitigation Act of 2000
DEM	Division of Emergency Management
EF	Essential Facility
EIS	Environmental Impact Statement
EMD	Emergency Management Division
EMPG	Emergency Management Program Grants
EOC	Emergency Operations Center
EPA	Environmental Protection Agency

E&PS	Environmental and Planning Services
FCZD	Flood Control Zone District
FEMA	Federal Emergency Management Agency
FERN	Ferndale Emergency Response Network
FIPS	Federal Information Processing Standards
FLIP	Floodplain Integrated Planning Process
FMA	Flood Mitigation Assistance
FMC	Ferndale Municipal Code
FP&S	Fire Prevention and Safety Grants
FR	Federal Regulation
GIS	Geographic Information Systems
GMA	Growth Management Act
HIVA	Hazard Identification and Vulnerability Analysis
HMF	Hazardous Materials Facility
HMF	Hazard Mitigation Forum
HMEP	Hazardous Materials Emergency Preparedness Grants Program
HMGP	Hazard Mitigation Grant Program
HPL	High Potential Loss
HSGP	Homeland Security Grant Program
I-5	Interstate 5
IBC	International Building Code
ICC	International Code Council
ICT	Interagency Coordination Team
IFPL	Industrial Fire Precaution Level
IPAWS	Integrated Public Alert and Warning System
IRC	International Residential Code
KGMI	Emergency Alert System Station 790 AM
LAMIRD	Limited Area of More Intense Rural Development
LF	Linear Feet
LFD	Lynden Fire Department
LiDAR	Light Detection and Ranging
LUS	Lifeline Utility System
MAR	Managed Aquifer Recharge
MLLW	Mean Lower Low Water
MMI	Modified Mercalli Intensity Scale
MOST	Method of Splitting Tsunami
mph	miles per hour

MU	Multiple Hazards
NAD	North American Datum of 1983
NEHRP	National Earthquake Hazard Reduction Program
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NHMP	Natural Hazards Mitigation Plan
NOA	Naturally Occurring Asbestos
NOAA	National Oceanic and Atmospheric Association
NPDES	National Pollutant Discharge Elimination System
NPG	National Preparedness Goal
NTHMP	National Tsunami Hazard Mitigation Program
NW	Northwest
NWAC	Northwest Avalanche Center
NWS	National Weather Service
OEM	Office of Emergency Management
OFM	Office of Financial Management
OHV	Off Highway Vehicle
OPSG	Operation Stonegarden
PDM	Pre-Disaster Mitigation
PL	Public Law
Plan	Whatcom County Natural Hazards Mitigation Plan
PSE	Puget Sound Energy
PSGP	Port Security Grant Program
PUD	Public Utility District
PW	Public Works
RAMS	Risk Assessment and Mitigation Strategy
RCW	Revised Code of Washington
RFL	Repetitive Flood Loss Property
SCSMAP	Swift Creek Sediment Management Action Plan
SHMO	State Hazard Mitigation Officer
SHSP	State Homeland Security Program
SLIP	Streamline Landslide Mapping Protocol
SRL	Severe Repetative Loss Program
SR	State Route
SWIF	System-Wide Improvement Framework
TIME	Tsunami Inundation Mapping Effort
TSGP	Transit Security Grant Program

UASI	Urban Areas Security Initiative
UGA	Urban Growth Area
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USGS	U.S. Geological Society
VMC	Volunteer Mobilization Center
WABO	Washington Association Building Officials
WAC	Washington Administrative Code
WCI	Western Climate Initiative
WCNHMP	Whatcom County Natural Hazard Mitigation Plan
WCSO	Whatcom County Sheriff's Office
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WGS	Washington Geological Survey
WPSAPS	Wildfire Prevention Spatial Assessment and Planning Strategies
WSCP	Water Shortage Contingency Plan
WSDOT	Washington State Department of Transportation
WTA	Whatcom Transportation Authority
WSHMO	Washington State Hazard Mitigation Officer
WUI	Wildland/Urban Interface

APPENDIX C: WHATCOM COUNTY RISK ASSESSMENT & MITIGATION STRATEGIES FOR WILDLAND FIRE

This Assessment has been prepared for the Whatcom County using the Risk Assessment and Mitigation Strategies (RAMS) planning process. RAMS was developed for fire managers to be a holistic approach to analyzing wildland FUELS, HAZARD, RISK, VALUE, and SUPPRESSION CAPABILITY. It considers the effects of fire on unit ecosystems by taking a coordinated approach to planning at a landscape level and allows users to develop fire prevention and/or fuels treatments programs.

The steps involved in this process include:

- Identification of spatial Compartments for study
- Fire Management Zone 37 = Whatcom County
- Assessment of significant issues within each Compartment

Compartment 13: 37653 Part 1

Compartment 13 contains 295,228 acres in Fire Management Zone 37. The Compartment experiences 4.00 fires per year, totaling 5 acres. The characteristics of the compartment indicate that: Catastrophic Fire Likely.

Fuels Hazard characteristics are rated:

- Fuels (flame length produced): 8 + Feet (High)
- Crowning Potential: 0 - 2 (Low)
- Slope Percent: 0 - 20 (Low)
- Aspect: North (Low)
- Elevation: 0 - 3500 (High)

Protection Capability ratings are:

- Initial Attack: 21 - 30 minutes (Moderate)
- Suppression Complexity: Average (Moderate)

Ignition Risk factors include:

- Population Density - Wildland Urban Interface
  - 1001+ Dwellings/structures

- Power Lines In Unit
  - Sub-station
  - Distribution Lines
  - Transmission Lines

- Industrial Operations
  - Active timber sale
  - Maintenance/service contracts
  - Mining
  - Debris/slash burning
  - Construction project

- Recreation
  - Dispersed camping areas, party areas, hunters, water based, hiking
  - Off highway vehicle use
  - Developed camping areas

- Flammables Present
  - Powder magazine
  - Gas pumps or storage
  - Gas or oil wells/transmission

- Other
  - Woodcutting area, power equipment
  - Dump
  - Fireworks, children with matches
  - Electronic installations
  - Shooting/target
  - Government operations
  - Cultural Activities
  - Incendiary

- Railroads
  - Railroads are present

- Transportation System
  - Public Access Road(s)
  - County road(s)
  - State/Federal highway(s)

- Commercial Development
  - Camps, resorts, stables
  - Schools
  - Business, agricultural/ranching

Compartment 13: 37653 Part II

Compartment Values are characterized:

- Recreation: Developed recreation site within or adjacent to area **(High)**
- Administrative: High value or numerous administrative sites **(High)**
- Wildlife/Fisheries: Highly significant habitat **(High)**
- Range Use: Range allotment within area, normal/average use **(Moderate)**
- Watershed: Stream Class PI, I. Important water use/riparian area. Domestic water use **(High)**
- Forest/Woodland: Standing timber/woodland on 26 - 50% of area **(Moderate)**
- Plantations: 15% or less of area in or programmed for plantations **(Low)**
- Private Property: High loss and threat potential due to numbers and placement **(High)**
- Cultural Resources: Archaeological/historical findings of high significance **(High)**
- Special Interest Areas: Area is adjacent to a Special Interest area **(Moderate)**
- Visual Resources: Maximum modification dominates **(Low)**
- T&E Species: Species present **(High)**
- Soils (Erosion): Low significance (EHR < 4) **(Low)**
- Airshed: High receptor sensitivity **(High)**
- Vegetation: Potential for sensitive plants **(Moderate)**

Compartment 14: 37656 Part I

Compartment 14 contains 360,471 acres in Fire Management Zone 37. The Compartment experiences 8.00 fires per year, totaling 98 acres. The characteristics of the compartment indicate that: Catastrophic Fire Likely.

Fuels Hazard characteristics are rated:

- Fuels (flame length produced): 8 + Feet **(High)**
- Crowning Potential: 6 + **(High)**
- Slope Percent: 21 - 35 **(Moderate)**
- Aspect: North **(Low)**
- Elevation: 0 - 3500 **(High)**

Protection Capability ratings are:

- Initial Attack: 31+ minutes **(High)**
- Suppression Complexity: Complex **(High)**

Ignition Risk factors include:

- Population Density - Wildland Urban Interface
  - 1001+ Dwellings/structures
- Power Lines In Unit

  - Transmission Lines
  - Distribution Lines
  - Sub-station
- Industrial Operations
  - Active timber sale
  - Construction project
  - Debris/slash burning
  - Mining
  - Maintenance/service contracts
- Recreation
  - Dispersed camping areas, party areas, hunters, waterbased, hiking
  - Developed camping areas
  - Off highway vehicle use
- Flammables Present
  - Powder magazine
  - Gas or oil wells/transmission
  - Gas pumps or storage
- Other
  - Fireworks, children with matches
  - Electronic installations
  - Woodcutting area, power equipment
  - Shooting/target
  - Government operations
  - Incendiary
  - Cultural Activities
  - Dump
- Railroads
  - Railroads are present
- Transportation System
  - State/Federal highway(s)
  - County road(s)
  - Public Access Road(s)
- Commercial Development
  - Schools
  - Camps, resorts, stables
  - Business, agricultural/ranching

Compartment 14: 37656 Part II

Compartment Values are characterized:

- Recreation: Developed recreation site within or adjacent to area **(High)**
- Administrative: High value or numerous administrative sites **(High)**

- Wildlife/Fisheries: Highly significant habitat **(High)**
- Range Use: Range allotment within area, normal/average use **(Moderate)**
- Watershed: Stream Class PI, I. Important water use/riparian area. Domestic water use. **(High)**
- Forest/Woodland: Standing timber/woodland on 51+% of area **(High)**
- Plantations: 31+% or less of area in or programmed for plantations **(High)**
- Private Property: High loss and threat potential due to numbers and placement **(High)**
- Cultural Resources: Archaeological/historical findings of high significance **(High)**
- Special Interest Areas: Area is adjacent to a Special Interest area **(Moderate)**
- Visual Resources: Partially retain existing character **(Moderate)**
- T&E Species: Species present **(High)**
- Soils (Erosion): Moderately erodible (EHR 4-12) **(Moderate)**
- Airshed: High receptor sensitivity **(High)**
- Vegetation: Potential for sensitive plants **(Moderate)**

Compartment 15: 37658 Part I

Compartment 15 contains 948,133 acres in Fire Management Zone 37. The Compartment experiences 1.00 fires per year, totaling 6 acres. The characteristics of the compartment indicate that: Catastrophic Fire Possible.

Fuels Hazard characteristics are rated:

- Fuels (flame length produced): 8 + Feet (High)
- Crowning Potential: 3 - 5 (Moderate)
- Slope Percent: 36 + (High)
- Aspect: South (High)
- Elevation: 5001 + (Low)

Protection Capability ratings are:

- Initial Attack: 31+ minutes (High)
- Suppression Complexity: Simple (Low)

Ignition Risk factors include:

- Population Density - Wildland Urban Interface
  - 501-1000 Dwellings/structures
- Power Lines In Unit
  - Transmission Lines
  - Sub-station
  - Distribution Lines

- Industrial Operations
  - Debris/slash burning
  - Mining
  - Construction project
  - Active timber sale
  - Maintenance/service contracts
- Recreation
  - Dispersed camping areas, party areas, hunters, waterbased, hiking
  - Developed camping areas
  - Off highway vehicle use
- Flammables Present
  - Powder magazine
  - Gas or oil wells/transmission
  - Gas pumps or storage
- Other
  - Electronic installations
  - Fireworks, children with matches
  - Woodcutting area, power equipment
  - Shooting/target
  - Government operations
  - Incendiary
  - Cultural Activities
  - Dump
- Railroads
  - Railroads are present
- Transportation System
  - State/Federal highway(s)
  - Public Access Road(s)
  - County road(s)
- Commercial Development
  - Schools
  - Camps, resorts, stables
  - Business, agricultural/ranching

Compartment 15: 37658 Part II

Compartment Values are characterized:

- Recreation: Developed recreation site within or adjacent to area **(High)**
- Administrative:

Few or no administrative sites **(Low)**

- Wildlife/Fisheries: Highly significant habitat **(High)**
- Range Use: Little or no range use **(Low)**
- Watershed: Stream Class PI, I. Important water use/riparian area. Domestic water use **(High)**
- Forest/Woodland: Standing timber/woodland on 51+% of area **(High)**
- Plantations: 16 - 30% or less of area in or programmed for plantations **(Moderate)**
- Private Property: Little or no threat or loss potential **(Low)**
- Cultural Resources: Minimal archaeological/historical findings, potential for Native American use **(Moderate)**
- Special Interest Areas: Area is adjacent to a Special Interest area **(Moderate)**
- Visual Resources: Preserve and retain existing character **(High)**
- T&E Species: Species present. (High)
- Soils (Erosion): Moderately erodible (EHR 4-12) **(Moderate)**
- Airshed: Low receptor sensitivity (Low)
- Vegetation: Potential for sensitive plants **(Moderate)**

APPENDIX D: NATIONAL FLOOD INSURANCE PROGRAM PARTICIPATION (NFIP)

F1-WHATCOM COUNTY National Flood Insurance Program Participation

Topic	Considerations	Where to find Information	Answer
Insurance Summary	How many NFIP policies are in the community? What is the total premium and coverage?	CRS Floodplain Specialist ISO, Community Hazard Mitigation	994 policies in force $224,779,300.00 insurance in force 17 repetitive loss properties 7 mitigated properties. The Repetitive Loss Structures in Whatcom are residential. This is based off the 2018 Washington State Repetitive Loss Record from the State Mitigation Strategist at the Washington Emergency Management Division. There may currently be different Repetitive Loss structure types located in Whatcom, but the 2018 Repetitive Loss Record is the best available data.
	How many claims have been paid in the community? What is the total amount of paid claims?	CRS Floodplain Specialist ISO, Community Hazard Mitigation	307 paid losses $3,712,362.59 total losses paid

Topic	Considerations	Where to find Information	Answer
	How many of the claims were for substantial damage?		24 sub. damage claims since 1977
	Number of Structures exposed to flood risk within the community	Community Floodplain Administrator (FPA)	Approx. 5,043 Assessor parcels with improvement values (or structures) as of last map update (2019) plus new construction to date - we do not have the ability to do a precise structure count per parcel.
	Describe any areas of flood risk with limited NFIP policy coverage	Community FPA & FEMA Insurance Specialist	There is good coverage within the mapped floodplain areas. However, areas that could get damage due to flood events outside of the mapped floodplain (alluvial fan and channel migration zone areas)
Staff Resources	Does the community have a dedicated Floodplain Manager or NFIP Coordinator?	Community FPA	Yes
	Is floodplain management an auxiliary duty?		No
	Is there a Certified Floodplain Manager on Staff?		Yes there are 2 CFM's currently on staff
	Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections,		Education and outreach includes an annual flood newsletter, , annual repetitive

Topic	Considerations	Where to find Information	Answer
	engineering capability)		loss mailing, annual letter to Insurance/Local Realtors/Lenders regarding flood insurance. Administrative includes: Floodplain inquiries, permit review, GIS education, comprehensive flood planning, and flood hazard reduction.
	What are the barriers to running an effective NFIP program in the community, if any?		Limited resources due to budget constraints and competing priorities
Compliance History	Is the community in good standing with the NFIP?	• State NFIP Coordinator, FEMA NFIP Specialist, community records	Yes
	Are there any outstanding compliance issues (i.e., current violations)?		No
	When was the most recent Community Assistance Visit (VAC) or Community Assistance Contact (CAC)?		Last CAV was closed on 12/4/2017
Regulation	When did the community enter the NFIP?	• Community Status Book http://www.fema.gov/fema/cs b.shtm	09/30/1977 regular entry
	When did the community's Flood Insurance Rate Maps (FIRMS) become effective?		September 30, 1977
	Are the FIRMS digital or paper?	• Community FPA, State or FEMA NFIP Specialists	Paper and digital (DFIRM-GIS layers)

Topic	Considerations	Where to find Information	Answer
	Does the Floodplain Ordinance meet or exceed FEMA or State minimum requirements? If so, in what ways?	• Community FPA	Yes , was updated in 2019 to reflect new Countywide Flood Insurance Study (FIS) and exceeds minimum requirements.
	Provide an explanation of the permitting process and include a copy of floodplain permit.	• Community FPA	Applicant goes to Planning/ Development services for a permit. Permit is screened at the counter to determine if the project is located within the floodplain. If project is located within the floodplain it is routed to the Flood Division for a flood review and conditions are put on the applicable permit (see attached).
	Does the community participate in CRS?	• Community FPA, Sate, FEMA NFIP	Yes
	What is the community's CRS Class Ranking?	• Flood Insurance Manual Community status book report for state WA (fema.gov)	6
	What categories and activities provide CRS points and how can the class be improved?	• Community FPA, FEMA CRS Coordinator, ISO representative	CRS Activities: 310,320,330,360,430,502,510,520,450, 501,510,520,530,610
	Does the plan include CRS planning requirements?	• CRS manual https://www.fema.gov/sites/	Yes

Topic	Considerations	Where to find Information	Answer
		default/files/documents/fema_community-rating-system_coordinators-manual_2017.pdf	

NFIP CONTINUED COMPLIANCE ACTIONS

Topic	Considerations	Answer
Staff Resources	Identify need for additional staff. Identify training needs of existing staff.	We could use additional staff, but hiring is limited due to budget issues. We have 3 staff eligible to take the CFM.
Compliance	When is the next Community Assistance visit anticipated? If unknown, discuss any need for CAV, CAC, or other compliance assistance.	Unknown We have recently requested concurrence from FEMA regarding compliance with Ag. Structures.
Flood Risk Maps	Are there flood prone areas that need new flood studies? What areas are highest priority and why? Does the community have new data that can be included in future flood map updates?	Currently, Whatcom County is in the process of finalizing a Levee Analysis and Mapping Procedure (LAMP) project to update the Flood Maps and FIS for the Lower Nooksack River Reaches 1-5. Draft Work Maps have been submitted to the communities for comment. Preliminary FIRMS or Maps and FIS is scheduled to be released in the Winter of 2021 with a projected Effective date of Fall 2023.
Community Outreach	Consider outreach and education to provide in the community. Outreach can be targeted to increase NFIP policies, promote NFIP services, or increase knowledge of local flood risk, among other topics. Consider a variety of audiences, such as elected officials or builders.	We actively provide outreach and education as documented in CRS program. We have developed a "Building in a Floodplain" brochure and diagram for permit inquiries and applicants. We also provide outreach materials on our website accessible to variety of audiences.
Community Rating System (CRS)	Does the community want to participate in the CRS program? Does the community want to improve its current CRS class ranking? Identify activities the community is or will be pursuing to gain CRS points.	Whatcom County currently participates in the CRS program No, not at this time. Nothing at this time.

F2-CITY OF BELLINGHAM National Flood Insurance Program Participation

Topic	Considerations	Where to find Information	Answer
Insurance Summary	How many NFIP policies are in the community? What is the total premium and coverage?	• State NFIP Coordinator or FEMA NFIP Specialist	95 policies in force $33,986,900.00 insurance in force 2 repetitive loss properties. The Repetitive Loss Structures in Bellingham are non- residential. This is based off the 2018 Washington State Repetitive Loss Record from the State Mitigation Strategist at the Washington Emergency Management Division. There may currently be different Repetitive Loss structure types located in Bellingham, but the 2018 Repetitive Loss Record is the best available data.
	How many claims have been paid in the community? What is the total amount of	• FEMA NFIP or Insurance Specialist	29 paid claims $702,702.51 total losses paid

Topic	Considerations	Where to find Information	Answer
	paid claims? How many of the claims were for substantial damage?		1 sub. damage claim since 1978
	Number of Structures exposed to flood risk within the community	• Community Floodplain Administrator (FPA)	464
	Describe any areas of flood risk with limited NFIP policy coverage	• Community FPA & FEMA Insurance Specialist	A portion of the Baker Creek floodplain is not within a study area while it has had repeated flooding. Flooding is somewhat dependent on system capacity issues with Interstate 5 and other State conveyance systems.
Staff Resources	Does the community have a dedicated Floodplain Manager or NFIP Coordinator?	• Community FPA	Storm and Surface Water Utility Manager also acts as Floodplain Administrator
	Is floodplain management an auxiliary duty?		Yes
	Is there a Certified Floodplain Manager on Staff?		No
	Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)		Plan reviewers are trained to determine if projects or structures are within floodplain boundaries with required review for all permits. GIS system has FEMA coverage for

Topic	Considerations	Where to find Information	Answer
			permit review. Permits are conditioned for no occupancy until all certifications are complete and returned.
	What are the barriers to running an effective NFIP program in the community, if any?		Change to true digital mapping may ease process.
Compliance History	Is the community in good standing with the NFIP?	• State NFIP Coordinator, FEMA NFIP Specialist, community records	Yes
	Are there any outstanding compliance issues (i.e., current violations)?		No
	When was the most recent Community Assistance Visit (VAC) or Community Assistance Contact (CAC)?		11/28/2016 last CAV date
	Is a CAV or CAC scheduled or needed?		Changes to floodplains are forthcoming. A CAV would be appreciated.
Regulation	When did the community enter the NFIP?	• Community Status Book http://www.fema.gov/fema/csb.s htm	09/02/1982 regular entry.
	When did the community's Flood Insurance Rate Maps (FIRMS) become effective?		09/02/1982
	Are the FIRMS digital or paper?	• Community FPA, State or FEMA NFIP Specialists	Digital
	Does the Floodplain Ordinance meet or exceed FEMA or State minimum requirements? If so, in what ways?	• Community FPA	Ordinances and maps updated and revised January 16, 2004. Deemed in compliance at that time.

Topic	Considerations	Where to find Information	Answer
		NFIP Continued Compliance Actions	

NFIP CONTINUED COMPLIANCE ACTIONS

Topic	Considerations	Answer
Staff Resources	Identify need for additional staff. Identify training needs of existing staff.	For the amount of floodplain area within City existing staff level is sufficient. Ongoing training and/or refresher courses would be helpful.
Compliance	When is the next Community Assistance visit anticipated? If unknown, discuss any need for CAV, CAC, or other compliance assistance.	Unknown. Bellingham would welcome a CAV, however, the number of projects within flood areas has diminished. We are looking at a major stream rerouting project for Squalicum Creek that would be of interest.
Regulation	Are there potential ordinance changes to consider strengthening requirements? Are there potential improvements to permitting process or other administrative aspects of the community's NFIP program? Could the community enhance its floodplain services?	City still working on potential changes to comply with BiOp. Digital mapping. We should enter CRS program.
Flood Risk Maps	Are there flood prone areas that need new flood studies? What areas are highest priority and why? Does the community have new data that can be included in future flood map updates?	Yes, Bellingham has apprised FEMA of flood areas on Baker Creek outside of the area of study in the past. Bellingham will likely be providing a new study for Squalicum Creek as a part of the stream reroute. A new study for Padden Creek will be needed as a result of a proposed project to daylight 1/2 mile of this stream that was formerly culverted. Priority for the City would be Squalicum and Padden Creeks.

Topic	Considerations	Answer
		It is expected that the City will be submitting data for those two projects.
Community Outreach	Consider outreach and education to provide in the community. Outreach can be targeted to increase NFIP policies, promote NFIP services, or increase knowledge of local flood risk, among other topics. Consider a variety of audiences, such as elected officials or builders.	Community outreach has not been a significant part of our program due to the limited nature of the flooding. Discussion of that lacking at a CAV would be appreciated.
Community Rating System (CRS)	Does the community want to participate in the CRS program? Does the community want to improve its current CRS class ranking? Identify activities the community is or will be pursuing to gain CRS points.	Not Participating. Bellingham will consider entering CRS. It is likely that we need only to quantify some of the existing activities that we already do to receive a CRS class ranking.

F3-CITY OF BLAINE National Flood Insurance Program Participation

Topic	Considerations	Where to find Information	Answer
Insurance Summary	How many NFIP policies are in the community? What is the total premium and coverage?	• State NFIP Coordinator or FEMA NFIP Specialist	51 policies in force $13,963,900.00 insurance in force 0 repetitive losses
	How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	• FEMA NFIP or Insurance Specialist	3 paid losses $267,790.34 total paid losses 0 sub. damage claims since 1978
	Number of Structures exposed to flood risk within the community	• Community Floodplain Administrator (FPA)	8 (eight)
	Describe any areas of flood risk with limited NFIP policy coverage	• Community FPA & FEMA Insurance Specialist	Not aware of any
	Does the community have a	• Community FPA	No, covered by

Topic	Considerations	Where to find Information	Answer
Staff Resources	dedicated Floodplain Manager or NFIP Coordinator?		Community Development Director
	Is floodplain management an auxiliary duty?		Yes
	Is there a Certified Floodplain Manager on Staff?		No
	Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability		Permit review
	What are the barriers to running an effective NFIP program in the community, if any? Lack of staff, funds, and minimal impact/benefit		
Compliance History	Is the community in good standing with the NFIP?	• State NFIP Coordinator, FEMA NFIP Specialist, community records	Yes
	Are there any outstanding compliance issues (i.e., current violations)?		No
	When was the most recent Community Assistance Visit (VAC) or Community Assistance Contact (CAC)?		11/28/2016 last CAV date
	Is a CAV or CAC scheduled or needed?		Not scheduled, and not needed
Regulation	When did the community enter the NFIP?	• Community Status Book http://www.fema.gov/fema/csb.shtm	07/16/1979 regular entry
	When did the community's Flood Insurance Rate Maps (FIRMS) become effective?		7/16/1979
	Are the FIRMS digital or paper?	• Community FPA, State or FEMA NFIP Specialists	Digital
	Does the Floodplain Ordinance meet or exceed FEMA or State minimum requirements? If so, in what ways?	• Community FPA	Does not meet the recent ESA standards
	Provide an explanation of the	• Community FPA	Requests are

Topic	Considerations	Where to find Information	Answer
	permitting process and include a copy of floodplain permit.		reviewed for compliance in conjunction with Shoreline permits, and with building permits when Shoreline permit not required. It is a staff review for code compliance. We do not have a flood plain permit application.
	Does the community participate in CRS?	• Community FPA, Sate, FEMA NFIP	No
	What is the community's CRS Class Ranking?	• Flood Insurance Manual http://www.fema.gov/business/nfip/manual.shtm	
	What categories and activities provide CRS points and how can the class be improved?	• Community FPA, FEMA CRS Coordinator, ISO epresentative	
	Does the plan include CRS planning requirements?	• CRS manual http://www.fema.gov/library/viewRecord.do?id=2434	

NFIP CONTINUED COMPLIANCE ACTIONS

Topic	Considerations	Answer
Staff Resources	Identify need for additional staff. Identify training needs of existing staff.	
Compliance	When is the next Community Assistance visit anticipated? If unknown, discuss any need for CAV, CAC, or other compliance assistance.	
Regulation	Are there potential ordinance changes to consider strengthening requirements? Are there potential improvements to permitting process or other administrative aspects of the community's NFIP program? Could the community enhance its floodplain	Yes, the ordinance can be revised to comply with the ESA requirements.

Topic	Considerations	Answer
	services?	
Flood Risk Maps	Are there flood prone areas that need new flood studies? What areas are highest priority and why? Does the community have new data that can be included in future flood map updates?	
Community Outreach	Consider outreach and education to provide in the community. Outreach can be targeted to increase NFIP policies, promote NFIP services, or increase knowledge of local flood risk, among other topics. Consider a variety of audiences, such as elected officials or builders.	
Community Rating System (CRS)	Does the community want to participate in the CRS program? Does the community want to improve its current CRS class ranking? Identify activities the community is or will be pursuing to gain CRS points.	

F4-CITY OF EVERSON National Flood Insurance Program Participation

Topic	Considerations	Where to find Information	Answer
Insurance Summary	How many NFIP policies are in the community? What is the total premium and coverage?	• State NFIP Coordinator or FEMA NFIP Specialist	127 policies in force $31,819,000.00 insurance in force 9 repetitive loss properties. The Repetitive Loss Structures in Everson are residential. This is based off the 2018 Washington State Repetitive Loss Record from the State Mitigation

Topic	Considerations	Where to find Information	Answer
			Strategist at the Washington Emergency Management Division. There may currently be different Repetitive Loss structure types located in Whatcom, but the 2018 Repetitive Loss Record is the best available data.
	How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	• FEMA NFIP or Insurance Specialist	48 paid losses $464,029.21 total losses paid 2 Substantial Damage Claims
	Number of Structures exposed to flood risk within the community	• Community Floodplain Administrator (FPA)	Number of structures in the "Flood Plain": 453 Number of structures in the "Floodway": 14 Number of residential structures in the "Flood Plain": 254 Number of residential structures in the "Floodway": 5 (data compiled 10/2007)
	Describe any areas of flood risk with limited NFIP policy coverage	• Community FPA & FEMA Insurance Specialist	None
Staff Resources	Does the community have a dedicated Floodplain Manager or NFIP	• Community FPA	Yes

Topic	Considerations	Where to find Information	Answer
	Coordinator?		
	Is floodplain management an auxiliary duty?		Yes
	Is there a Certified Floodplain Manager on Staff?		No
	Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)		Permit review, community outreach, administration services, inspections.
	What are the barriers to running an effective NFIP program in the community, if any?		Loss of floodplain specialist at DOE regional level makes floodplain management more difficult to find answers to specific questions.
Compliance History	Is the community in good standing with the NFIP?	• State NFIP Coordinator, FEMA NFIP Specialist, community records	Yes
	Are there any outstanding compliance issues (i.e., current violations)?		No
	When was the most recent Community Assistance Visit (VAC) or Community Assistance Contact (CAC)?		12/11/2014 last CAV date
	Is a CAV or CAC scheduled or needed?		None scheduled
Regulation	When did the community enter the NFIP?	• Community Status Book http://www.fema.gov/fema/cs b.shtm	08/02/1982 regular entry
	When did the community's Flood Insurance Rate Maps (FIRMS) become effective?		08/02/1982
	When did the community's Flood Insurance Rate Maps (FIRMS) become effective?		08/02/1982
	Are the FIRMS digital or paper?	• Community FPA, State or FEMA NFIP Specialists	Digital
	Does the Floodplain Ordinance meet or exceed FEMA or State minimum	• Community FPA	Meets

Topic	Considerations	Where to find Information	Answer
	requirements? If so, in what ways?		
	Provide an explanation of the permitting process and include a copy of floodplain permit.	• Community FPA	We provide a City prepared Development Assessment Flow Chart and Floodplain Development Permit for applicants to complete as part of the normal Building Permit application process.
	Does the community participate in CRS?	• Community FPA, Sate, FEMA NFIP	Yes
	What is the community's CRS Class Ranking?	• Flood Insurance Manual Community status book report for state WA (fema.gov)	6
	What categories and activities provide CRS points and how can the class be improved?	• Community FPA, FEMA CRS Coordinator, ISO representative	Activities 310 -630 are applied and we continue to review policies and procedures to improve our rating.
	Does the plan include CRS planning requirements?	• CRS manual http://www.fema.gov/library/viewRecord.do?id=2434	Yes

NFIP CONTINUED COMPLIANCE ACTIONS

Topic	Considerations	Answer
Staff Resources	Identify need for additional staff. Identify training needs of existing staff.	Additional staff would be helpful to maximize the best possible rating for our community through application of all aspects of Activities 310-630.
Compliance	When is the next Community Assistance visit anticipated?	As scheduled by DOE.

	If unknown, discuss any need for CAV, CAC, or other compliance assistance.	
Regulation	Are there potential ordinance changes to consider strengthening requirements? Are there potential improvements to permitting process or other administrative aspects of the community's NFIP program? Could the community enhance its floodplain services?	Considering amendments to assess BAS ramifications. None at this time. Not at this time.
Flood Risk Maps	Are there flood prone areas that need new flood studies? What areas are highest priority and why? Does the community have new data that can be included in future flood map updates?	Johnson creek overflow corridor. No
Community Outreach	Consider outreach and education to provide in the community. Outreach can be targeted to increase NFIP policies, promote NFIP services, or increase knowledge of local flood risk, among other topics. Consider a variety of audiences, such as elected officials or builders.	
Community Rating System (CRS)	Does the community want to participate in the CRS program? Does the community want to improve its current CRS class ranking? Identify activities the community is or will be pursuing to gain CRS points.	We currently participate. Yes More community information assimilation. Policy review and revision

F5-CITY OF FERNDALE National Flood Insurance Program Participation

Topic	Considerations	Where to find Information	Answer
Insurance Summary	How many NFIP policies are in the community?	• State NFIP Coordinator or FEMA NFIP Specialist	98 policies in force $25,096,400.00

Topic	Considerations	Where to find Information	Answer
	What is the total premium and coverage?		insurance in force. 1 9 repetitive loss properties. The Repetitive Loss Structures in Ferndale are residential. This is based off the 2018 Washington State Repetitive Loss Record from the State Mitigation Strategist at the Washington Emergency Management Division. There may currently be different Repetitive Loss structure types located in Ferndale, but the 2018 Repetitive Loss Record is the best available data.
	How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	• FEMA NFIP or Insurance Specialist	40 paid losses $1,061,601.64 total losses paid 10 sub. damage claims since 1978
	Number of Structures exposed to flood risk within the community	• Community Floodplain Administrator (FPA)	Undetermined / Do not know
	Describe any areas of flood risk with limited NFIP policy coverage	• Community FPA & FEMA Insurance Specialist	Undetermined / Do not know
Staff	Does the community have a dedicated Floodplain	• Community FPA	No

Topic	Considerations	Where to find Information	Answer
Resources	Manager or NFIP Coordinator?		
	Is floodplain management an auxiliary duty?		Yes – managed by Community Development Director or designee
	Is there a Certified Floodplain Manager on Staff?		No
	Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)		City of Ferndale reviews development proposals for compliance with Floodplain Management requirements as defined by the Ferndale Municipal Code. Review may include modifications to development submittals.
	What are the barriers to running an effective NFIP program in the community, if any?		Public perception that FIRM's in certain portions of the City are inaccurate/ out of date. Lack of new modeling cannot verify or deny these claims.
Compliance History	Is the community in good standing with the NFIP?	• State NFIP Coordinator, FEMA NFIP Specialist, community records	Yes
	Are there any outstanding compliance issues (i.e., current violations)?		No / Unknown
	When was the most recent Community Assistance Visit (VAC) or Community Assistance Contact (CAC)?		9/19/2012 last CAV date. Note that the City has worked with FEMA (last contact 7/29/2011) in

Topic	Considerations	Where to find Information	Answer
			developing ordinances intended to comply with NMFS Biological Opinion
	Is a CAV or CAC scheduled or needed?		Unknown
Regulation	When did the community enter the NFIP?	• Community Status Book http://www.fema.gov/fema/csb.s htm	06/01/1983 regular entry
	What did the community's Flood Insurance Rate Maps (FIRMS) become effective?		January 16, 2004
	Are the FIRMS digital or paper?	• Community FPA, State or FEMA NFIP Specialists	Yes
	Does the Floodplain Ordinance meet or exceed FEMA or State minimum requirements? If so, in what ways?	• Community FPA	The current ordinance meets or exceeds standards at this time, but does not reflect Biological Opinion. City Council will consider adopting new standard that meets or exceeds standards on August 15th 2011.
	Provide an explanation of the permitting process and include a copy of floodplain permit.	• Community FPA	Review processes vary dramatically depending on specific land use proposal. Generally speaking, an application is made to the City, and is reviewed by the Community Development Department. If the development is proposed within a floodplain, the City will attach

Topic	Considerations	Where to find Information	Answer
			conditions to the development permit specifying the steps necessary to achieve compliance with flood regulations. In these cases, the development permit acts as the floodplain permit.
	Does the community participate in CRS?	• Community FPA, Sate, FEMA NFIP	Yes
	What is the community's CRS Class Ranking?	• Flood Insurance Manual Community status book report for state WA (fema.gov)	6
	What categories and activities provide CRS points and how can the class be improved?	• Community FPA, FEMA CRS Coordinator, ISO representative	N/A – However, while DOE/FEMA staff have been very cooperative on navigating various compliance issues, there haven't been opportunities to discuss ways to participate in incentive programs, etc.
	Does the plan include CRS planning requirements?	• CRS manual http://www.fema.gov/library/viewRecord.do?id=2434	N/A

NFIP CONTINUED COMPLIANCE ACTIONS

Topic	Considerations	Answer
Staff Resources	Identify need for additional staff. Identify training needs of existing staff.	Application of current flood regulations is manageable under current staff levels. If there were ways to establish universal, electronic reporting or documentation

Topic	Considerations	Answer
		processes, it could be helpful (while modeling has improved, much of the reporting seems to have not kept up with technology)
Compliance	When is the next Community Assistance visit anticipated? If unknown, discuss any need for CAV, CAC, or other compliance assistance.	Unknown. CAV's should be conducted less as an audit (though there are some auditing functions) and more as a way to provide tools to communities that may not be employing them and may not be aware of them. As development within the floodplain becomes less of an option, applications for development permits become less common. In some cases, lack of compliance may be the result of inactivity and unfamiliarity. CAV's should be conducted with the approach of trying to gain compliance, rather than searching for non-compliance.
Regulation	Are there potential ordinance changes to consider strengthening requirements? Are there potential improvements to permitting process or other administrative aspects of the community's NFIP program? Could the community enhance its floodplain services?	The floodplain management ordinance, once adopted pursuant to the Biological Opinion, should offer improved guidance for development without substantial changes. Stable regulations will allow the City to expand its services to the community. Improvements in flood modeling technology has revealed that notions of mitigating flood attenuation capacity by "digging a bigger hole" do not always work. Regulations that emphasize this philosophy without providing other methods of discovery should be reexamined.
Flood Risk Maps	Are there flood prone areas that need new flood studies? What areas are highest priority and why? Does the community have new data that can be included in future flood map updates?	The community has questioned whether the current FIRM's accurately analyze the 100-Year Flood within the downtown core; the current FIRM's reflect flood areas that have not historically flooded or given indication of potential flooding.

Topic	Considerations	Answer
Community Outreach	Consider outreach and education to provide in the community. Outreach can be targeted to increase NFIP policies, promote NFIP services, or increase knowledge of local flood risk, among other topics. Consider a variety of audiences, such as elected officials or builders.	If the Biological Opinion-compliant ordinance is adopted, the City expects to provide educational materials to elected officials and the development community.
Community Rating System (CRS)	Does the community want to participate in the CRS program? Does the community want to improve its current CRS class ranking? Identify activities the community is or will be pursuing to gain CRS points.	The City is interested in participating, pending a CAV in September/October 2011.

F6-CITY OF LYNDEN National Flood Insurance Program Participation

Topic	Considerations	Where to find Information	Answer
Insurance Summary	How many NFIP policies are in the community? What is the total premium and coverage?	• State NFIP Coordinator or FEMA NFIP Specialist	20 policies in force $5,941,900.00 insurance in force 0 repetitive loss properties
	How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	• FEMA NFIP or Insurance Specialist	6 paid losses $54,898.81 total losses paid 0 sub. damage claims since 1978
	Number of Structures exposed to flood risk within the community	• Community Floodplain Administrator (FPA)	3 to 4
	Describe any areas of flood	• Community FPA & FEMA	N/A

Topic	Considerations	Where to find Information	Answer
	risk with limited NFIP policy coverage	Insurance Specialist	
Staff Resources	Does the community have a dedicated Floodplain Manager or NFIP Coordinator?	• Community FPA	Public Works Director
	Is floodplain management an auxiliary duty?		Yes
	Is there a Certified Floodplain Manager on Staff?		Yes
	Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)		On a case by case basis
	What are the barriers to running an effective NFIP program in the community, if any?		None
Compliance History	Is the community in good standing with the NFIP?	• State NFIP Coordinator, FEMA NFIP Specialist, community records	Yes
	Are there any outstanding compliance issues (i.e., current violations)?		No
	When was the most recent Community Assistance Visit (VAC) or Community Assistance Contact (CAC)?		9/21/2012 last CAV date
	Is a CAV or CAC scheduled or needed?		
Regulation	When did the community enter the NFIP?	• Community Status Book http://www.fema.gov/fema/csb.shtm	11/03/1982 regular entry
	What did the community's Flood Insurance Rate Maps (FIRMS) become effective?		11/03/1982
	Are the FIRMS digital or paper?	• Community FPA, State or FEMA NFIP Specialists	Digital
	Does the Floodplain Ordinance meet or exceed FEMA or State minimum requirements? If so, in what ways?	• Community FPA	Meets requirements

Topic	Considerations	Where to find Information	Answer
	Provide an explanation of the permitting process and include a copy of floodplain permit.	• Community FPA	Done on a case by case basis
	Does the community participate in CRS?	• Community FPA, Sate, FEMA NFIP	No
	What is the community's CRS Class Ranking?	• Flood Insurance Manual Community status book report for state WA (fema.gov)	N/A
	What categories and activities provide CRS points and how can the class be improved?	• Community FPA, FEMA CRS Coordinator, ISO representative	N/A
	Does the plan include CRS planning requirements?	• CRS manual http://www.fema.gov/library/viewRecord.do?id=2434	N/A

NFIP CONTINUED COMPLIANCE ACTIONS

Topic	Considerations	Answer
Topic	Considerations	Answer
Staff Resources	Identify need for additional staff. Identify training needs of existing staff.	None
Compliance	When is the next Community Assistance visit anticipated? If unknown, discuss any need for CAV, CAC, or other compliance assistance.	Not needed
Regulation	Are there potential ordinance changes to consider strengthening requirements? Are there potential improvements to permitting process or other administrative aspects of the community's NFIP program? Could the community enhance its floodplain services?	N/A No N/A
Flood Risk Maps	Are there flood prone areas that need new flood studies? What areas are highest priority and why?	No None Just the information the City

Topic	Considerations	Answer
	Does the community have new data that can be included in future flood map updates?	receives from Whatcom County River and Flood
Community Outreach	Consider outreach and education to provide in the community. Outreach can be targeted to increase NFIP policies, promote NFIP services, or increase knowledge of local flood risk, among other topics. Consider a variety of audiences, such as elected officials or builders.	N/A
Community Rating System (CRS)	Does the community want to participate in the CRS program? Does the community want to improve its current CRS class ranking? Identify activities the community is or will be pursuing to gain CRS points.	Unknown

F7-CITY OF NOOKSACK National Flood Insurance Program Participation

Topic	Considerations	Where to find Information	Answer
Insurance Summary	How many NFIP policies are in the community? What is the total premium and coverage?	• State NFIP Coordinator or FEMA NFIP Specialist	39 policies in force $12,061,600.00 insurance in force 0 repetitive losses
	How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	• FEMA NFIP or Insurance Specialist	6 paid loss $53,667.65 total losses paid 0 sub. damage claims since 1978
	Number of Structures exposed to flood risk within the community	• Community Floodplain Administrator (FPA)	174 (including outbuildings) in FEMA flood zone AE areas
	Describe any areas of flood risk with limited NFIP policy coverage	• Community FPA & FEMA Insurance Specialist	None

Topic	Considerations	Where to find Information	Answer
Staff Resources	Does the community have a dedicated Floodplain Manager or NFIP Coordinator?	• Community FPA	No
	Is floodplain management an auxiliary duty?		Yes, one of duties of the Public Works Director
	Is there a Certified Floodplain Manager on Staff?		No
	Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)		Services are as listed with the exception of engineering capability
	What are the barriers to running an effective NFIP program in the community, if any?		None
Compliance History	Is the community in good standing with the NFIP?	• State NFIP Coordinator, FEMA NFIP Specialist, community records	Yes
	Are there any outstanding compliance issues (i.e., current violations)?		No
	When was the most recent Community Assistance Visit (VAC) or Community Assistance Contact (CAC)?		04/24/2008 last CAV date
	Is a CAV or CAC scheduled or needed?		No
Regulation	When did the community enter the NFIP?	• Community Status Book http://www.fema.gov/fema/csb.shtm	09/02/1982 regular entry
	What did the community's Flood Insurance Rate Maps (FIRMS) become effective?		01/16/2004, revision is currently underway.
	Are the FIRMS digital or paper?	• Community FPA, State or FEMA NFIP Specialists	Both
	Does the Floodplain Ordinance meet or exceed FEMA or State minimum requirements? If so, in what ways?	• Community FPA	The current City of Nooksack ordinance meets all requirements.

Topic	Considerations	Where to find Information	Answer
	Provide an explanation of the permitting process and include a copy of floodplain permit.	• Community FPA	Builders or individuals apply for a Floodplain Development Permit at time of Building Permit application for individual structures. Permit application attached.
	Does the community participate in CRS?	• Community FPA, Sate, FEMA NFIP	No
	What is the community's CRS Class Ranking?	• Flood Insurance Manual Community status book report for state WA (fema.gov)	
	What categories and activities provide CRS points and how can the class be improved?	• Community FPA, FEMA CRS Coordinator, ISO representative	
	Does the plan include CRS planning requirements?	• CRS manual http://www.fema.gov/library/viewRecord.do?id=2434	

NFIP CONTINUED COMPLIANCE ACTIONS

Topic	Considerations	Answer
Staff Resources	Identify need for additional staff. Identify training needs of existing staff.	As small as the City of Nooksack is, staffing is adequate.
Compliance	When is the next Community Assistance visit anticipated? If unknown, discuss any need for CAV, CAC, or other compliance assistance.	2013, if a five year visit is standard.
Regulation	Are there potential ordinance changes to consider strengthening requirements? Are there potential improvements to permitting process or other administrative aspects of the community's NFIP program? Could the community enhance its floodplain services?	There are no ordinance changes being planned, a change was made in 2010 to correct an omission from previous City Council action. The City is always looking for ways to improve the process involved.
Flood Risk Maps	Are there flood prone areas that need new flood studies? What areas are highest priority and why? Does the community have new data that can be included in future flood map updates?	The City of Nooksack recently completed a flood study that is submitted to FEMA at this time.
Community Outreach	Consider outreach and education to provide in the community. Outreach can be targeted to increase NFIP policies, promote NFIP services, or increase knowledge of local flood risk, among other topics. Consider a variety of audiences, such as elected officials or builders.	The City of Nooksack feels that additional outreach could be made, but local individuals, officials, and builders seem to understand the process if they are involved in any way.
Community Rating System (CRS)	Does the community want to participate in the CRS program? Does the community want to improve its current CRS class ranking? Identify activities the community is or will be pursuing to gain CRS points.	The City of Nooksack would be interested in participation in the CRS program. Yes Unknown

F8-CITY OF SUMAS National Flood Insurance Program Participation

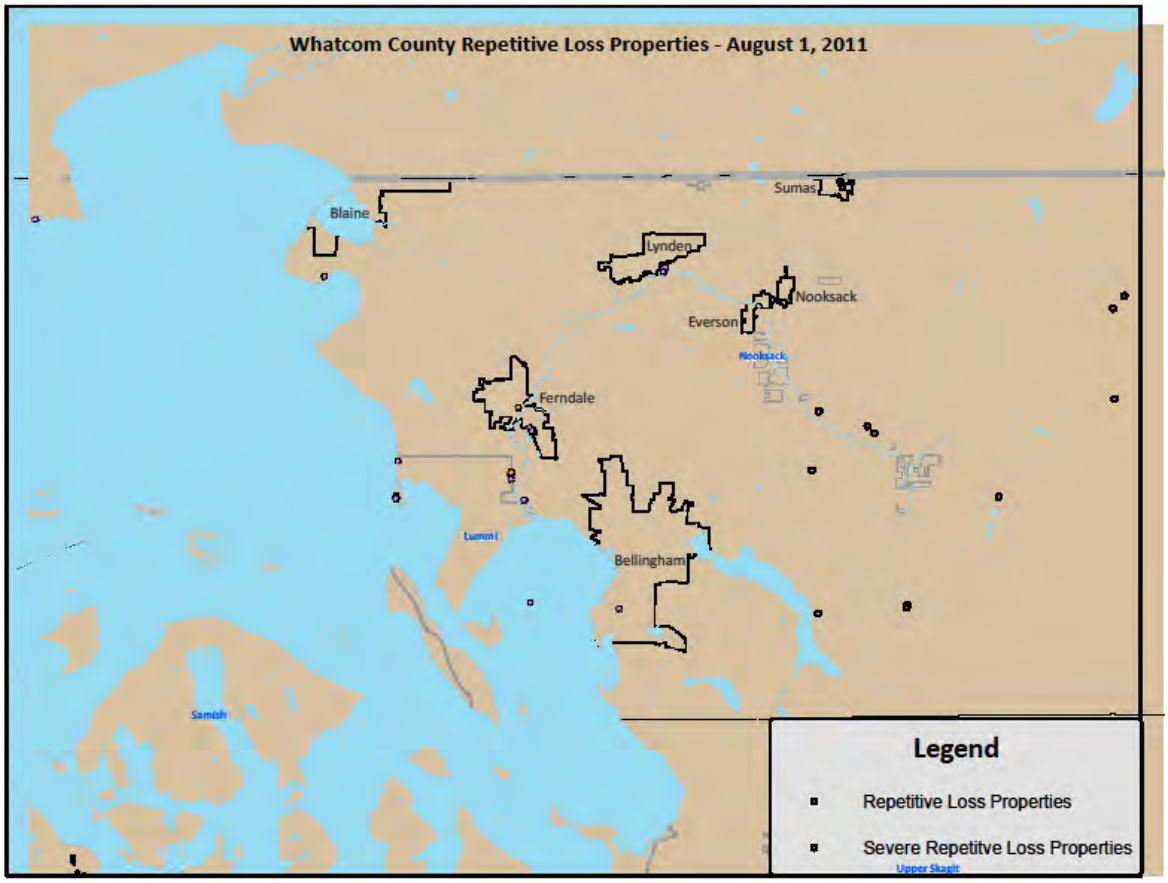
Topic	Considerations	Where to find Information	Answer
Insurance Summary	How many NFIP policies are in the community? What is the total premium and coverage?	• State NFIP Coordinator or FEMA NFIP Specialist	167 policies in force $40,899,700.00 insurance in force 8 repetitive loss properties. The Repetitive Loss Structures in Sumas are residential. This is based off the 2018 Washington State Repetitive Loss Record from the State Mitigation Strategist at the Washington Emergency Management Division. There may currently be different Repetitive Loss structure types located in Sumas, but the 2018 Repetitive Loss Record is the best available data.
	How many claims have been paid in the community? What is the total amount of paid claims? How many of the claims were for substantial damage?	• FEMA NFIP or Insurance Specialist	82 paid losses $1,043,047.34 total losses paid 5 sub. damage claims since 1978
	Number of Structures exposed to flood risk within	• Community Floodplain Administrator (FPA)	429

Topic	Considerations	Where to find Information	Answer
	the community		
	Describe any areas of flood risk with limited NFIP policy coverage	• Community FPA & FEMA Insurance Specialist	N/A
Staff Resources	Does the community have a dedicated Floodplain Manager or NFIP Coordinator?	• Community FPA	Yes, Rod Fadden
	Is floodplain management an auxiliary duty?		Yes
	Is there a Certified Floodplain Manager on Staff?		No
	Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)		I do permit reviews, Outreach CCR renewals, Inspections
	What are the barriers to running an effective NFIP program in the community, if any?		N/A
Compliance History	Is the community in good standing with the NFIP?	• State NFIP Coordinator, FEMA NFIP Specialist, community records	Yes, we get the 15% discount
	Are there any outstanding compliance issues (i.e., current violations)?		No
	When was the most recent Community Assistance Visit (VAC) or Community Assistance Contact (CAC)?		12/11/2014 last CAV date
	Is a CAV or CAC scheduled or needed?		No
Regulation	When did the community enter the NFIP?	• Community Status Book http://www.fema.gov/fema/csb.shtm	05/15/1985 regular entry
	What did the community's Flood Insurance Rate Maps (FIRMS) become effective?		01/16/2004
	Are the FIRMS digital or paper?	• Community FPA, State or FEMA NFIP Specialists	Digital
	Does the Floodplain Ordinance meet or exceed FEMA or State minimum	• Community FPA	Yes

Topic	Considerations	Where to find Information	Answer
	requirements? If so, in what ways?		
	Provide an explanation of the permitting process and include a copy of floodplain permit.	• Community FPA	The floodplain permit is issued at the time the building permit is.
	Does the community participate in CRS?	• Community FPA, Sate, FEMA NFIP	Yes
	What is the community's CRS Class Ranking?	• Flood Insurance Manual Community status book report for state WA (fema.gov)	7
	What categories and activities provide CRS points and how can the class be improved?	• Community FPA, FEMA CRS Coordinator, ISO representative	310-350, 410-450, 510-540, 610-
	Does the plan include CRS planning requirements?	• CRS manual http://www.fema.gov/library/viewRecord.do?id=2434	

NFIP CONTINUED COMPLIANCE ACTIONS

Topic	Considerations	Answer
Staff Resources	Identify need for additional staff. Identify training needs of existing staff.	Ok
Compliance	When is the next Community Assistance visit anticipated? If unknown, discuss any need for CAV, CAC, or other compliance assistance.	N/A
Regulation	Are there potential ordinance changes to consider strengthening requirements? Are there potential improvements to permitting process or other administrative aspects of the community's NFIP program? Could the community enhance its floodplain services?	No No No
Flood Risk Maps	Are there flood prone areas that need new flood studies? What areas are highest priority and why? Does the community have new data that can be included in future flood map updates?	No N/A Yes
Community Outreach	Consider outreach and education to provide in the community. Outreach can be targeted to increase NFIP policies, promote NFIP services, or increase knowledge of local flood risk, among other topics. Consider a variety of audiences, such as elected officials or builders.	We do newsletters
Community Rating System (CRS)	Does the community want to participate in the CRS program? Does the community want to improve its current CRS class ranking? Identify activities the community is or will be pursuing to gain CRS points.	Already in the program



The repetitive loss properties in the 2011 Repetitive Loss Map above are up to date. Should there be changes to the properties displayed, or additional properties are added to the repetitive loss property category, this map will be updated to reflect those changes.

APPENDIX E: WHATCOM COUNTY MITIGATION IDEAS

(Reference: FEMA's Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards (January 2013)

The purpose of this document is to provide a resource that communities can use to identify and evaluate a range of potential mitigation actions for reducing risk to natural hazards and disasters. The focus of this document is mitigation, which is action taken to reduce or eliminate long-term risk to hazards. Mitigation is different from preparedness, which is action taken to improve emergency response or operational preparedness.

This document is intended to be a starting point for gathering ideas and should not be used as the only source for identifying actions. Communities should seek innovative and different ideas for reducing risk that meet their unique needs. The actions listed are not necessarily eligible for Federal assistance programs. Users should review specific program guidance and contact their State Hazard Mitigation Officer (SHMO) or regional FEMA office for more information.

Hazard Descriptions

Risk Codes: D—Drought; EQ—Earthquake; VE—Volcanic Eruption; ER—Erosion; ET--Extreme temperatures; F—Flood; HA—Hail; LS—Landslide; L—Lightning; SW--Severe wind; WW--Severe winter weather; SU—Subsidence; T—Tornado; Tsunami—TSU; WF—Wildfire; MU--Multiple Hazards

Drought (D)

A drought is a period of unusually constant dry weather that persists long enough to cause deficiencies in water supply (surface or underground). Droughts are slow onset hazards, but, over time, they can severely affect crops, municipal water supplies, recreational resources, and wildlife. If drought conditions extend over a number of years, the direct and indirect economic impacts can be significant. High temperatures, high winds, and low humidity can worsen drought conditions and also make areas more susceptible to wildfire. In addition, human actions and demands for water resources can accelerate drought-related impacts.

Earthquake (EQ)

An earthquake is a sudden release of energy that creates a movement in the earth's crust. Most earthquake-related property damage and deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the extent and duration of the shaking. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (in mountain regions and along hillsides), and liquefaction.

Volcanic Eruption

A volcano is a vent in the earth's crust through which magma (molten rock), rock fragments, gases, and ashes are ejected from the earth's interior. A volcanic mountain is created over time by the accumulation of these erupted products on the on the earth's surface.

Erosion (ER)

Erosion wearing away of land, such as loss of riverbank, beach, shoreline, or dune material. It is measured as the rate of change in the position or displacement of a riverbank or shoreline over a period of time. Short-term erosion typically results from periodic natural events, such as flooding, hurricanes, storm surge, and windstorms, but may be intensified by human activities. Long-term erosion is a result of multi-

year impacts such as repetitive flooding, wave action, sea level rise, sediment loss, subsidence, and climate change. Death and injury are not typically associated with erosion; however, it can destroy buildings and infrastructure.

Extreme Temperatures (ET)
Extreme heat and extreme cold constitute different conditions in different parts of the country. Extreme cold can range from near freezing temperatures in the southern United States to temperatures well below zero in the northern states. Similarly, extreme heat is typically recognized as the condition where temperatures consistently stay ten degrees or more above a region's average high temperature for an extended period. Fatalities can result from extreme temperatures, as they can push the human body beyond its limits (hyperthermia and hypothermia).

Flood (F)
A flood is the partial or complete inundation of normally dry land. The various types of flooding include riverine flooding, coastal flooding, and shallow flooding. Common impacts of flooding include damage to personal property, buildings, and infrastructure; bridge and road closures; service disruptions; and injuries or even fatalities.

Hail (HA)are a potentially damaging outgrowth
Hailstorms are a potentially damaging outgrowth of severe thunderstorms. Hailstorms frequently accompany thunderstorms, so their locations and spatial extents overlap. Hail can cause substantial damage to vehicles, roofs, landscaping, and other areas of the built environment. U.S. agriculture is typically the area most affected by hail storms, which cause severe crop damage even during minor events.

Landslide (LS)
The movement of a mass of rock, debris, or earth down a slope by force of gravity is considered a landslide. Landslides occur when the slope or soil stability changes from stable to unstable, which may be caused by earthquakes, storms, volcanic eruptions, erosion, fire, or additional human-induced activities. Slopes greater than 10 degrees are more likely to slide, as are slopes where the height from the top of the slope to its toe is greater than 40 feet. Slopes are also more likely to fail if vegetative cover is low and/or soil water content is high. Potential impacts include environmental disturbance, property and infrastructure damage, and injuries or fatalities.

Lightning (L)
Lightning is a discharge of electrical energy that results from the buildup of positive and negative charges in a thunderstorm, which creates a "bolt" when the buildup of charges becomes strong enough. Lightning can strike communications equipment (e.g., radio or cell towers, antennae, satellite dishes, etc.) and hamper communication and emergency response. Lightning strikes can also cause significant damage to buildings, critical facilities, and infrastructure, largely by igniting a fire. Lightning can also ignite a wildfire.

Severe Wind (SW)
Severe wind can occur alone, such as during straightline wind events, or it can accompany other natural hazards, including hurricanes and severe thunderstorms. Severe wind poses a threat to lives, property, and vital utilities primarily due to the effects of flying debris or downed trees and power lines. Severe wind will typically cause the greatest damage to structures of light construction, particularly manufactured homes.

Severe Winter Weather (WW)
Severe winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Severe winter weather can down trees, cause widespread power outages, damage property, and cause fatalities and injuries.

Subsidence (SU)
Subsidence is the gradual settling or sudden sinking of the Earth's surface due to subsurface movement of earth materials. The level of subsidence ranges from a broad lowering to collapse of land surface. Most causes of subsidence are human-induced, such as groundwater pumpage, aquifer system compaction, drainage of organic soils, underground mining, hydrocompaction, natural compaction, sinkholes, and thawing permafrost. Areas located above or adjacent to karsts topography have a greater risk of experiencing subsidence. Sudden collapses of surface areas can damage and destroy buildings and infrastructure.

Tornado (T)
A tornado is a violently rotating column of air that has contact with the ground and is often visible as a funnel cloud. The destruction caused by tornadoes ranges from light to catastrophic depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, including residential dwellings and particularly manufactured homes. Tornadoes are more likely to occur during the months of March through May and tend to form in the late afternoon and early evening.

Tsunami (TSU)
A tsunami is a series of great waves that are created by undersea disturbances, such as earthquakes or volcanic eruptions. As opposed to typical waves that crash at the shoreline, tsunamis bring a continuously flowing "wall of water" that has the potential to cause devastating damage in coastal areas immediately along the shore. Areas at greatest risk are less than 50 feet above sea level and within 1 mile of the shoreline. Most deaths that occur during a tsunami result from drowning. Associated risks include flooding, polluted water supplies, and damaged gas lines.

Wildfire (WF)
A wildfire is any outdoor fire that is not controlled, supervised, or arranged. Wildfire probability depends on local weather conditions; outdoor activities such as camping, debris burning, and construction; and the degree of public cooperation with fire prevention measures. Wildfires can result in widespread damage to property and loss of life.

The suggested mitigation actions are summarized into five types: (1) Public Awareness; (2) Local Planning and Regulations; (3) Structural and Infrastructure Projects; (4) Natural Systems Protection; and, (5) Education and Awareness Programs.

PUBLIC AWARENESS

- Emergency preparedness education programs for schools.
- Drills, exercises in homes, workplaces, classrooms, etc.
- Public service announcements.
- Hazard "safety fairs."
- Hazard conferences, seminars.
- Hazard awareness weeks.
- Preparedness handbooks, brochures.
- Distribution of severe weather guides, homeowner's retrofit guide, etc.
- Regular newspaper articles.
- Direct mailings.
- Utility bill inserts.
- Annual correspondence with residents reminding them of the need to be hazard prepared.

LOCAL PLANNING AND REGULATIONS

D-1 Assess Vulnerability to Drought Risk

To better understand and assess local vulnerability to drought, consider actions such as:

- Gathering and analyzing water and climate data to gain a better understanding of local climate and drought history.
- Identifying factors that affect the severity of a drought.
- Identifying available water supplies.
- Determining how the community and its water sources have been impacted by droughts in the past.

D-2 Monitor Drought Conditions

Monitoring drought conditions can provide early warning for policymakers and planners to make decisions through actions including:

- Identifying local drought indicators, such as precipitation, temperature, surface water levels, soil moisture, etc.
- Establishing a regular schedule to monitor and report conditions on at least a monthly basis.

D-3 Monitor Water Supply

Monitoring the water supply and its functions can save water in the long run through actions such as:

- Regularly checking for leaks to minimize water supply losses.
- Improving water supply monitoring.

D-4 Plan for Drought

Plan for future drought events in your area through actions such as:

- Developing a drought emergency plan.
- Developing criteria or triggers for drought-related actions.

- Developing a drought communication plan and early warning system to facilitate timely communication of relevant information to officials, decision makers, emergency managers, and the general public.
- Developing agreements for secondary water sources that may be used during drought conditions.
- Establishing an irrigation time/scheduling program or process so that all agricultural land gets the required amount of water. Through incremental timing, each area is irrigated at different times so that all water is not consumed at the same time. Spacing usage may also help with recharge of groundwater.

D-5 Require Water Conservation During Drought Conditions

Require mandatory water conservation measures during drought emergencies, including:

- Developing an ordinance to restrict the use of public water resources for non-essential usage, such as landscaping, washing cars, filling swimming pools, etc.
- Adopting ordinances to prioritize or control water use, particularly for emergency situations like firefighting.

D-6 Prevent Overgrazing

Prevent overgrazing, which has been linked to drought vulnerability, through actions such as:

- Establishing a grazing policy or permitting program to prevent overgrazing.
- Reducing the number of animals and improving range management.

EQ-1 Adopt and Enforce Building Codes

Building codes reduce earthquake damage to structures. Consider actions such as:

- Adopting and enforcing updated building code provisions to reduce earthquake damage risk.
- Adopting the International Building Code (IBC) and International Residential Code (IRC).

EQ-2 Incorporate Earthquake Mitigation into Local Planning

Earthquake risk can be reduced through local planning, codes, and ordinances, including:

- Creating a seismic safety committee to provide policy recommendations, evaluate and recommend changes in seismic safety standards, and give an annual assessment of local and statewide implementation of seismic safety improvements.
- Developing and distributing guidelines or passing ordinances that require developers and building owners to locate lifelines, buildings, critical facilities, and hazardous materials out of areas subject to significant seismic hazards.
- Incorporating structural and non-structural seismic strengthening actions into ongoing building plans and activities in the capital improvement plan to ensure that facilities remain operational for years to come.
- Supporting financial incentives, such as low interest loans or tax breaks, for home and business owners who seismically retrofit their structures.

EQ-3 Map and Assess Community Vulnerability to Seismic Hazards

To better understand and assess local vulnerability to earthquakes, consider actions such as:

- Developing an inventory of public and commercial buildings that may be particularly vulnerable to earthquake damage, including pre-1940s homes and homes with cripple wall foundations.
- Collecting geologic information on seismic sources, soil conditions, and related potential hazards.
- Creating an earthquake scenario to estimate potential loss of life and injuries, the types of potential damage, and existing vulnerabilities within a community to develop earthquake mitigation priorities.
- Using Hazus to quantitatively estimate potential losses from an earthquake.
- Maintaining a database to track community vulnerability to earthquake risk.
- Using GIS to map hazard areas, at-risk structures, and associated hazards (e.g., liquefaction and landslides) to assess high-risk areas.

EQ-4 Conduct Inspections of Building Safety

Inspections can be used to assess earthquake risk, such as:

- Establishing a school survey procedure and guidance document to inventory structural and non-structural hazards in and around school buildings.
- Using rapid visual screening to quickly inspect a building and identify disaster damage or potential seismic structural and non-structural weaknesses to prioritize retrofit efforts, inventory high-risk structures and critical facilities, or assess post-disaster risk to determine if buildings are safe to re-occupy.
- Consulting industry standard publications such as American Society of Civil Engineers (ASCE) 31 - Seismic Evaluation of Existing Buildings, ASCE 41 - Seismic Rehabilitation of Existing Buildings, and Applied Technology Council (ATC) 20 - Procedures for Post-earthquake Safety Evaluation of Buildings.

ER-1 Map and Assess Vulnerability to Erosion

Erosion risk can be better assessed and monitored with mapping techniques, including the following:

- Using GIS to identify and map erosion hazard areas.
- Developing and maintaining a database to track community vulnerability to erosion.
- Using GIS to identify concentrations of at-risk structures.
- Improving mapping of hazard areas to educate residents about unexpected risks.

ER-2 Manage Development in Erosion Hazard Areas

Erosion damage can be mitigated by regulating how development occurs in hazard areas, such as the following:

- Adopting sediment and erosion control regulations.
- Adopting zoning and erosion overlay districts.
- Developing an erosion protection program for high hazard areas.
- Employing erosion control easements.
- Prohibiting development in high-hazard areas.
- Developing and implementing an erosion management plan.
- Requiring mandatory erosion surcharges on homes.
- Locating utilities and critical facilities outside of areas susceptible to erosion to decrease the risk

of service disruption.

ER-3 Promote or Require Site and Building Design Standards to Minimize Erosion Risk

Development can be designed to minimize damage due to erosion using the following techniques:

- Constructing open foundation systems on buildings to minimize scour.
- Constructing deep foundations in erosion hazard areas.
- Clustering buildings during building and site design.
- Designing and orienting infrastructure to deter erosion and accretion.

ET-1 Reduce Urban Heat Island Effect

As urban areas develop and buildings and roads replace open land and vegetation, urban regions become warmer than their rural surroundings, forming an "island" of heat. Several methods for reducing heat island effects include:

- Increasing tree plantings around buildings to shade parking lots and along public rights-of-way.
- Encouraging installation of green roofs, which provide shade and remove heat from the roof surface and surrounding air.
- Using cool roofing products that reflect sunlight and heat away from a building.

F-1 Incorporate Flood Mitigation in Local Planning

Comprehensive planning and floodplain management can mitigate flooding by influencing development. Strategies include:

- Determining and enforcing acceptable land uses to alleviate the risk of damage by limiting exposure in flood hazard areas. Floodplain and coastal zone management can be included in comprehensive planning.
- Developing a floodplain management plan and updating it regularly.
- Mitigating hazards during infrastructure planning. For example, decisions to extend roads or utilities to an area may increase exposure to flood hazards.
- Adopting a post-disaster recovery ordinance based on a plan to regulate repair activity, generally depending on property location.
- Passing and enforcing an ordinance that regulates dumping in streams and ditches.
- Establishing a "green infrastructure" program to link, manage, and expand existing parks, preserves, greenways, etc.
- Obtaining easements for planned and regulated public use of privately-owned land for temporary water retention and drainage.

F-2 Form Partnerships to Support Floodplain Management

Partnerships between local, state, and regional entities help expand resources and improve coordination. Consider the following actions:

- Developing a storm water committee that meets regularly to discuss issues and recommend projects.
- Forming a regional watershed council to help bring together resources for comprehensive analysis, planning, decision-making, and cooperation.

- Establishing watershed-based planning initiatives to address the flood hazard with neighboring jurisdictions.
- Forming a citizen plan implementation steering committee to monitor progress on local mitigation actions. Include a mix of representatives from neighborhoods, local businesses, and local government.

F-3 Limit or Restrict Development in Floodplain Areas

Flooding can be mitigated by limiting or restricting how development occurs in floodplain areas through actions such as:

- Prohibiting or limiting floodplain development through regulatory and/or incentive-based measures.
- Limiting the density of developments in the floodplain.
- Requiring that floodplains be kept as open space.
- Limiting the percentage of allowable impervious surface within developed parcels.
- Developing a stream buffer ordinance to protect water resources and limit flood impacts.
- Prohibiting any fill in floodplain areas.

F-4 Adopt and Enforce Building Codes and Development Standards

The use of building codes and development standards can ensure structures are able to withstand flooding. Potential actions include:

- Adopting the International Building Code (IBC) and International Residential Code (IRC).
- Adopting ASCE 24-05 Flood Resistant Design and Construction. ASCE 24 is a referenced standard in the IBC that specifies minimum requirements and expected performance for the design and construction of buildings and structures in the flood hazard areas to make them more resistant to flood loads and flood damage.
- Adding or increasing "freeboard" requirements (feet above base flood elevation) in the flood damage ordinance.
- Prohibiting all first floor enclosures below base flood elevation for all structures in flood hazard areas.
- Considering orientation of new development during design (e.g., subdivisions, buildings, infrastructure, etc.).
- Setting the design flood elevation at or above the historical high water mark if it is above the mapped base flood elevation.
- Using subdivision design standards to require elevation data collection during platting and to have buildable space on lots above the base flood elevation.
- Requiring standard tie-downs of propane tanks.

F-5 Improve Storm Water Management Planning

Rainwater and snowmelt can cause flooding and erosion in developed areas. Storm Water management practices to prevent this include:

- Completing a storm water drainage study for known problem areas.
- Preparing and adopting a storm water drainage plan and ordinance.
- Preparing and adopting a community-wide storm water management master plan.
- Regulating development in upland areas in order to reduce storm water run-off through a storm

water ordinance.
- Linking flood hazard mitigation objectives with EPA Storm water Phase II initiatives.
- Developing engineering guidelines for drainage from new development.
- Requiring a drainage study with new development.
- Encouraging the use of Low Impact Development techniques

F-6 Adopt Polices to Reduce Storm Water Runoff

In addition to storm water management, techniques to reduce rain runoff can prevent flooding and erosion, such as:
- Designing a "natural runoff" or "zero discharge" policy for storm water in subdivision design.
- Requiring more trees be preserved and planted in landscape designs to reduce the amount of storm water runoff.
- Requiring developers to plan for on-site sediment retention.
- Requiring developers to construct on-site retention basins for excessive storm water and as a firefighting water source.
- Encouraging the use of porous pavement, vegetative buffers, and islands in large parking areas.
- Conforming pavement to land contours so as not to provide easier avenues for storm water.
- Encouraging the use of permeable driveways and surfaces to reduce runoff and increase groundwater recharge.
- Adopting erosion and sedimentation control regulations for construction and farming.

F-7 Improve Flood Risk Assessment

Heighten awareness of flood risk with the following:
- Incorporating the procedures for tracking high water marks following a flood into emergency response plans.
- Conducting cumulative impact analyses for multiple development projects within the same watershed.
- Conducting a verification study of FEMA's repetitive loss inventory and developing an associated tracking database.
- Regularly calculating and documenting the amount of flood-prone property preserved as open space.
- Requiring a thorough watershed analysis for all proposed dam or reservoir projects.
- Developing a dam failure study and emergency action plan.
- Using GIS to map areas that are at risk of flooding.
- Obtaining depth grid data and using it to illustrate flood risk to citizens.
- Incorporating digital floodplain and topographic data into GIS systems, in conjunction with Hazus, to assess risk.
- Developing and maintaining a database to track community exposure to flood risk.
- Revising and updating regulatory floodplain maps.

F-8 Join or Improve Compliance with NFIP

The National Flood Insurance Program (NFIP) enables property owners in participating communities to purchase insurance protection against flood losses. Actions to achieve eligibility and maintain compliance include:

- Participating in NFIP.
- Adopting ordinances that meet minimum Federal and state requirements to comply with NFIP.
- Conducting NFIP community workshops to provide information and incentives for property owners to acquire flood insurance.
- Designating a local floodplain manager and/or CRS coordinator who achieves CFM certification.
- Completing and maintaining FEMA elevation certificates for pre-FIRM and/or post-FIRM buildings.
- Requiring and maintaining FEMA elevation certificates for all new and improved buildings located in floodplains.

F-9 Manage the Floodplain Beyond Minimum Requirements

In addition to participation in NFIP, implementing good floodplain management techniques that exceed minimum requirements can help minimize flood losses. Examples include:

- Incorporating the ASFPM's "No Adverse Impact" policy into local floodplain management programs.
- Revising the floodplain ordinance to incorporate cumulative substantial damage requirements.
- Adopting a "no-rise" in base flood elevation clause for the flood damage prevention ordinance.
- Extending the freeboard requirement past the mapped floodplain to include an equivalent land elevation.
- Including requirements in the local floodplain ordinance for homeowners to sign non-conversion agreements for areas below base flood elevation.
- Establishing and publicizing a user-friendly, publicly-accessible repository for inquirers to obtain Flood Insurance Rate Maps.
- Developing an educational flyer targeting NFIP policyholders on increased cost of compliance during post-flood damage assessments.
- Annually notifying the owners of repetitive loss properties of Flood Mitigation Assistance funding.
- Offering incentives for building above the required freeboard minimum (code plus).

F-10 Participate in the CRS

The Community Rating System (CRS) rewards communities that exceed the minimum NFIP requirements. Depending upon the level of participation, flood insurance premium rates are discounted for policyholders. Potential activities that are eligible to receive credit include:

- Advising the public about the local flood hazard, flood insurance, and flood protection measures.
- Enacting and enforcing regulations that exceed NFIP minimum standards so that more flood protection is provided for new development.
- Implementing damage reduction measures for existing buildings such as acquisition, relocation, retrofitting, and maintenance of drainage ways and retention basins.
- Taking action to minimize the effects of flooding on people, property, and building contents through measures including flood warning, emergency response, and evacuation planning.

F-11 Establish Local Funding Mechanisms for Flood Mitigation

Potential methods to develop local funding sources for flood mitigation include:

- Using taxes to support a regulatory system.
- Using impact fees to help fund public projects to mitigate impacts of land development (e.g., increased runoff).
- Levying taxes to fix maintenance of drainage systems and capital improvements.

LS-1 Map and Assess Vulnerability to Landslides

Improve data and mapping on specific landslide risks in the community by:

- Studying areas where riparian landslides may occur.
- Completing an inventory of locations where critical facilities, other buildings, and infrastructure are vulnerable to landslides.
- Using GIS to identify and map landslide hazard areas.
- Developing and maintaining a database to track community vulnerability to landslides.
- Assessing vegetation in wildfire-prone areas to prevent landslides after fires (e.g., encourage plants with strong root systems).

LS-2 Manage Development in Landslide Hazard Areas

Landslide risk can be mitigated by regulating development in landslide hazard areas through actions such as:

- Creating a plan to implement reinforcement measures in high-risk areas.
- Defining steep slope/high-risk areas in land use and comprehensive plans and creating guidelines or restricting new development in those areas.
- Creating or increasing setback limits on parcels near high-risk areas.
- Locating utilities outside of landslide areas to decrease the risk of service disruption.
- Restricting or limiting industrial activity that would strip slopes of essential top soil.
- Incorporating economic development activity restrictions in high-risk areas.

SLR-1 Map and Assess Vulnerability to Sea Level Rise

To better understand and assess local vulnerability to sea level rise, consider actions such as:

- Modeling various “what-if” scenarios to estimate potential vulnerabilities in order to develop sea level rise mitigation priorities.
- Using GIS to map hazard areas, at-risk structures, and associated hazards (e.g., flood and storm surge) to assess high-risk areas.
- Developing an inventory of public buildings and infrastructure that may be particularly vulnerable to sea level rise.
- Adding future conditions hydrology and areas that may be inundated by sea level rise to Digital Flood Insurance Rate Maps (DFIRM).

SLR-2 Manage Development in High-Risk Areas

Local governments can mitigate future losses resulting from sea level rise by regulating development in potential hazard areas through land use planning, including:

- Using zoning, subdivision regulations, and/or a special sea level rise overlay district to designate high-risk areas and specify the conditions for the use and development of specific areas.

- Promoting conservation and management of open space, wetlands, and/or sea level rise boundary zones to separate developed areas from high-hazard areas.
- Prohibiting the redevelopment of areas destroyed by storms or chronic erosion in order to prevent future losses.
- Encouraging compact community design in low-risk areas.
- Establishing setbacks in high-risk areas that account for potential sea level rise.

SRL-3 Prevent Infrastructure Expansion in High-Risk Areas

Future development can be protected from damage resulting from sea level rise through the following:

- Setting guidelines for annexation and service extensions in high-risk areas.
- Locating utilities and critical facilities outside of areas susceptible to sea level rise to decrease the risk of service disruption.
- Requiring all critical facilities to be built 1 foot above the 500-year flood elevation (considering wave action) or the predicted sea level rise level, whichever is higher.

SW-1 Adopt and Enforce Building Codes

Adopt regulations governing residential construction to prevent wind damage. Examples of appropriate regulations are:

- Adopting the International Building Code (IBC) and International Residential Code (IRC).
- Adopting standards from International Code Council (ICC)-600 Standard for Residential Construction in High-Wind Regions.
- Reviewing building codes and structural policies to ensure they are adequate to protect older structures from wind damage.
- Requiring or encouraging wind engineering measures and construction techniques that may include structural bracing, straps and clips, anchor bolts, laminated or impact-resistant glass, reinforced pedestrian and garage doors, window shutters, waterproof adhesive sealing strips, or interlocking roof shingles.
- Requiring tie-downs with anchors and ground anchors appropriate for the soil type for manufactured homes.
- Prohibiting the use of carports and open coverings attached to manufactured homes.
- Requiring the use of special interlocking shingles designed to interlock and resist uplift forces in extreme wind conditions to reduce damage to a roof or other structures.
- Improving nailing patterns.
- Requiring building foundation design, braced elevated platforms, and protections against the lateral forces of winds and waves.
- Requiring new masonry chimneys greater than 6 feet above a roof to have continuous reinforced steel bracing.
- Requiring structures on temporary foundations to be securely anchored to permanent foundations.

SW-2 Promote or Require Site and Building Design Standards to Minimize Wind Damage

Damage associated with severe wind events can be reduced or prevented if considered during building and site design. Examples include the following:

- Using natural environmental features as wind buffers in site design.
- Incorporating passive ventilation in the building design.
- Incorporating passive ventilation in the site design. Passive ventilation systems use a series of vents in exterior walls or at exterior windows to allow outdoor air to enter the home in a controlled way.
- Encouraging architectural designs that limit potential for wind-borne debris.
- Improving architectural design standards for optimal wind conveyance.
- Encouraging wind-resistant roof shapes (e.g., hip over gable).

SW-3 Assess Vulnerability to Severe Wind

In order to better understand and assess local vulnerability to severe wind, consider actions such as:

- Developing and maintaining a database to track community vulnerability to severe wind.
- Using GIS to map areas that are at risk to the wind hazard associated with different hurricane conditions (e.g., Category 1, 2, 3, etc.) and to identify concentrations of at-risk structures.
- Creating a severe wind scenario to estimate potential loss of life and injuries, the types of potential damage, and existing vulnerabilities within a community to develop severe wind mitigation priorities.
- Using Hazus to quantitatively estimate potential losses from hurricane wind.

SW-4 Protect Power Lines and Infrastructure

The regular maintenance and upkeep of utilities can help prevent wind damage. Possible strategies are:

- Establishing standards for all utilities regarding tree pruning around lines.
- Incorporating inspection and management of hazardous trees into the drainage system maintenance process.
- Preemptively testing power line holes to determine if they are rotting.
- Inspecting utility poles to ensure they meet specifications and are wind resistant.
- Burying power lines to provide uninterrupted power after severe winds, considering both maintenance and repair issues.
- Upgrading overhead utility lines (e.g., adjust utility pole sizes, utility pole span widths, and/or line strength).
- Avoiding use of aerial extensions to water, sewer, and gas lines.
- Using designed-failure mode for power line design to allow lines to fall or fail in small sections rather than as a complete system to enable faster restoration.
- Installing redundancies and loopfeeds.

WW-1 Adopt and Enforce Building Codes

Buildings and infrastructure can be protected from the impacts of winter storms with the following regulations:

- Adopting the International Building Code (IBC) and International Residential Code (IRC).
- Ensuring the development and enforcement of building codes for roof snow loads.
- Discouraging flat roofs in areas that experience heavy snows.

SS-1 Adopt Building Codes and Development Standards

Building codes and development standards can be established to mitigate storm surge damage. Possible

regulations include:

- Adopting the International Building Code (IBC) and International Residential Code (IRC).
- Adopting ASCE-24-05 Flood Resistant Design and Construction. ASCE 24, created by the American Society of Civil Engineers, is a referenced standard in the IBC that specifies minimum requirements and expected performance for the design and construction of buildings and structures in flood hazard areas to make them more resistant to flood loads and flood damage.
- Establishing design standards for buildings located in areas susceptible to storm surge.
- Implementing V-zone construction requirements for new development located in coastal A-zones.
- Adopting building requirements for higher elevation in inundation zones.
- Requiring open foundations (e.g., piles or piers) in coastal areas.
- Requiring deep foundations in order to avoid erosion and scour.

SS-2 Improve Land Use Planning and Regulations

Land uses should be planned and regulated to minimize the impact of storm surge. Possible measures to implement include:

- Developing and maintaining a beach management plan.
- Adopting shoreline setback regulations and establishing coastal setback lines.
- Adopting coastal zone management regulations.
- Eliminating all obstructions in areas along the coast subject to inundation by the 1-percent-annual-chance flood event with additional hazards associated with storm-induced waves (also known as the V-zone).
- Planning for future storm surge heights due to sea level rise.
- Limiting or prohibiting development in areas along the coast subject to inundation by the 1-percent-annual-chance flood event with additional hazards associated with storm-induced waves (referred to as the V-zone on Flood Insurance Rate Maps).
- Adopting coastal A-zones, areas of special flood hazard that extend inland and are subject to breaking waves between 1.5 and 3 feet, and ensuring that they are mapped accurately.
- Adopting and enforcing coastal A-zones in A-zones.

SS-3 Minimize Risk to New Facilities and Infrastructure

Infrastructure and critical facilities can be protected from storm surge damage through the following:

- Locating future critical facilities outside of areas susceptible to storm surge.
- Requiring that all critical facilities meet requirements of Executive Order 11988 and be built 1 foot above the 500-year flood elevation (considering wave action).

SS-4 Map and Assess Vulnerability to Storm Surge

Storm surge risk can be better assessed and monitored with mapping techniques, including the following:

- Using GIS to map areas that are at risk to inundation by storm surge.
- Developing and maintaining a database to track community vulnerability to storm surge.

SU-1 Map and Assess Vulnerability to Subsidence

Some areas with subsidence risk may not be fully identified in your community. Consider actions such as:

- Using GIS to map areas that are susceptible to subsidence.
- Identifying and mapping old mining areas or geologically unstable terrain so that development can be prevented or eliminated.
- Using ground-penetrating radar to detect lava tubes and map their location.
- Supporting mapping efforts to identify areas of existing permafrost.
- Improving accuracy of hazard area maps to educate residents about unanticipated risks. Upgrading maps provides a truer measure of risks to a community.

SU-2 Manage Development in High-Risk Areas

Development regulations should consider areas with poor soil conditions, including the following:

- Prohibiting development in areas that have been identified as at-risk to subsidence.
- Restricting development in areas with soil that is considered poor or unsuitable for development.

SU-3 Consider Subsidence in Building Design

If subsidence is considered during building design, future damage may be prevented. Potential actions include:

- Educating design professionals about where to locate information on subsidence rates and maps.
- Incorporating structural designs that can resist loading associated with subsidence.
- Adopting an ordinance promoting permafrost sensitive construction practices.
- Including potential subsidence in freeboard calculations for buildings in flood-prone areas.

SU-4 Monitor Subsidence Risk Factors

Several risk factors can be monitored to help predict subsidence, such as the following:

- Monitoring areas at risk to subsidence by remaining aware of changes in groundwater levels.
- Monitoring areas where natural resources are removed from underground.
- Filling or buttressing subterranean open spaces, as with abandoned mines, to prevent or alleviate collapse.

TSU-1 Map and Assess Vulnerability to Tsunami

Tsunami risk can be better assessed and monitored with mapping techniques, including the following:

- Using GIS to map areas that are vulnerable to inundation by tsunamis.
- Developing and maintaining a database to track community vulnerability to tsunamis.
- Offering GIS hazard mapping online for residents and design professionals.
- Educating map users on the appropriate uses and limitations of maps.
- More accurately mapping problem areas to educate residents about unanticipated risks. Upgrading maps provides a truer measure of risks to a community.

TSU-2 Manage Development in Tsunami Hazard Areas

Planning and regulations can mitigate tsunami damage in many ways, such as:

- Adopting and enforcing building codes and design standards that contain requirements for

tsunami-resistant design.
- Limiting new development in tsunami run-up areas.
- Encouraging new development that is configured to minimize tsunami losses by using site planning strategies that slow water currents, steer water forces, and block water forces.

TSU-3 Protect Against Fire Following Tsunami

Communities can encourage wildfire mitigation measures (i.e., tree breaks) in tsunami-prone areas to reduce impacts of fires that may occur after a tsunami hits the coastline.

WF-1 Map and Assess Vulnerability to Wildfire

The first step in local planning is to identify wildfire hazard areas and assess overall community vulnerability. Potential actions include:
- Using GIS mapping of wildfire hazard areas to facilitate analysis and planning decisions through comparison with zoning, development, infrastructure, etc.
- Developing and maintaining a database to track community vulnerability to wildfire.
- Creating a wildfire scenario to estimate potential loss of life and injuries, the types of potential damage, and existing vulnerabilities within a community to develop wildfire mitigation priorities.

WF-2 Incorporate Wildfire Mitigation in the Comprehensive Plan

Communities can review comprehensive plans to ensure wildfire mitigation has been addressed. The comprehensive plan may include the following:
- Recognizing the existence of wildfire hazards and identifying areas of risk based on a wildfire vulnerability assessment.
- Describing policies and recommendation for addressing wildfire risk and discouraging expansion in the wildland-urban interface.
- Including considerations of wildfire hazards in land use, public safety, and other elements of the comprehensive plan.

WF-3 Reduce Risk through Land Use Planning

Local governments can mitigate future losses by regulating development in wildfire hazard areas through land use planning, including:
- Using zoning and/or a special wildfire overlay district to designate high-risk areas and specify the conditions for the use and development of specific areas.
- Addressing density and quantity of development, as well emergency access, landscaping and water supply.
- Promoting conservation of open space or wildland-urban boundary zones to separate developed areas from high-hazard areas.
- Setting guidelines for annexation and service extensions in high-risk areas.

WF-4 Develop a Wildland- Urban Interface Code

Communities can develop regulations for safer construction and incorporate mitigation considerations into the permitting process. Potential actions include:

- Developing specific design guidelines and development review procedures for new construction, replacement, relocation, and substantial improvement in wildfire hazard areas.
- Addressing fire mitigation through access, signage, fire hydrants, water availability, vegetation management, and special building construction standards.
- Involving fire protection agencies in determining guidelines and standards and in development and site plan review procedures.
- Establishing wildfire mitigation planning requirements for large scale developments or planned unit developments.

WF-5 Require or Encourage Fire-Resistant Construction Techniques

A local government can encourage fire-resistant construction or may choose to require it through local regulations. Examples include:

- Encouraging the use of non-combustible materials (i.e., stone, brick, and stucco) for new construction in wildfire hazard areas.
- Using fire resistant roofing and building materials in remodels, upgrades, and new construction.
- Enclosing the foundations of homes and other buildings in wildfire-prone areas, rather than leaving them open and potentially exposing undersides to blown embers or other materials.
- Prohibiting wooden shingles/wood shake roofs on any new development in areas prone to wildfires.
- Encouraging the use of functional shutters on windows.

MU-1 Assess Community Risk

Understanding community vulnerability and level of risk is important to identify and prioritize mitigation alternatives. Improve risk assessment through the following:

- Obtaining local data including tax parcels, building footprints, critical facility locations, and other information for use in risk analysis.
- Developing and maintaining a database to track community vulnerability (i.e., exposure in known hazard areas).
- Establishing a process to coordinate with state and Federal agencies to maintain up-to-date hazard data, maps, and assessments.
- Keeping aerial photography current, especially in rapidly developing areas.
- Identifying the most at-risk critical facilities and evaluating potential mitigation techniques.

MU-2 Map Community Risk

Maps are an important tool for communicating risk. Consider the following for developing GIS capabilities:

- Developing a coordinated GIS Department. Find out who uses GIS, determine how it is used, and identify other potential uses.
- Incorporating a GIS system/management plan for tracking permitting, land use patterns, etc.
- Obtaining hazard data and using GIS to map risk for various hazards.

MU-3 Prevent Development in Hazard Areas

Limit or prohibit development in high-hazard areas through the following types of actions:

- Encouraging clustering of residential lots outside of hazard areas in subdivision design/review.
- Prohibiting or limiting public expenditures for capital improvements in known hazard areas.
- Organizing a managed retreat from very high-risk areas.
- Purchasing the "right of first refusal" for hazard-prone parcels targeted for public acquisition.
- Purchasing land and title in the name of a local governing body to remove structures and enforce permanent restrictions on development.
- Acquiring and using easements (e.g., conservation) to prevent development in known hazard areas.
- Using conservation easements to protect environmentally significant portions of parcels from development.
- Acquiring hazardous areas for conservation or restoring as functional public parks.
- Acquiring safe sites for public facilities (e.g., schools, police/fire stations, etc.).
- Prohibiting new facilities for persons with special needs/mobility concerns in hazard areas.
- Prohibiting animal shelters in known hazard areas.

MU-4 Adopt Development Regulations in Hazard Areas

Regulate development in hazard areas. Examples include:

- Using subdivision and development regulations to regulate development in hazard-prone areas.
- Evaluating the use of performance/impact zoning to set risk-based standards for land development.
- Requiring setbacks from delineated hazard areas (e.g., shorelines, wetlands, steep slopes, etc.).
- Requiring conditional/special use permits for the development of known hazard areas.
- Offering expanded development rights to developers/businesses for performing mitigation retrofits.
- Incorporating restrictive covenants on properties located in known hazard areas.
- Designating high-risk zones as special assessment districts (to fund necessary hazard mitigation projects).

MU-5 Limit Density in Hazard Areas

Limit the density of development in the hazard areas through the following techniques:

- Increasing minimum lot size for development in known hazard areas.
- Designating "agricultural use districts" in the zoning ordinance to limit densities in known hazard areas.
- Ensuring the zoning ordinance encourages higher densities only outside of known hazards areas.
- Requiring clustering for planned unit developments (PUD) in the zoning ordinance to reduce densities in known hazard areas.
- Establishing a local transfer of development rights (TDR) program for risk in known hazard areas.
- Establishing a process to use floating zones to reduce densities in damaged areas following a disaster event.

MU-6 Integrate Mitigation into Local Planning

Hazard mitigation can be integrated into local planning efforts through the following:

- Incorporating risk assessment and hazard mitigation principles into comprehensive planning efforts.
- Incorporating a stand-alone element for hazard mitigation into the local comprehensive (land use) plan.
- Incorporating hazard mitigation into broader growth management (i.e., Smart Growth) initiatives.
- Incorporating a hazard risk assessment into the local development and subdivision review process.
- Adding hazard mitigation measures to existing adequate public facilities (APF) tests and programs.
- Ensuring natural hazards are considered in all land suitability analyses (LSA).
- Determining and enforcing acceptable land uses to alleviate the risk of damage by limiting exposure in such hazard areas.
- Developing a post-disaster reconstruction plan to facilitate decision making following a hazard event.
- Involving citizens in comprehensive planning activities that identify and mitigate hazards.

MU-7 Strengthen Land Use Regulations

Land use regulations can reduce hazard risk through the following:

- Using bonus/incentive zoning to encourage mitigation measures for private land development.
- Using conditional use zoning to require or exact mitigation measures for private land development.
- Establishing a process to use overlay zones to require mitigation techniques in high-hazard districts.
- Adopting a post-disaster recovery ordinance based on a plan to regulate repair activity, generally depending on property location.
- Adopting environmental review standards.
- Incorporating proper species selection, planting, and maintenance practices into landscape ordinances.

MU-8 Adopt and Enforce Building Codes

Building codes and inspections help ensure buildings can adequately withstand damage during hazard events. Effective actions include:

- Adopting the International Building Code (IBC) and International Residential Code (IRC).
- Increasing the local Building Code Effectiveness Grading Schedule (BCEGS) classification through higher building code standards and enforcement practices.
- Incorporating higher standards for hazard resistance in local application of the building code.
- Providing advanced training to local building inspectors.
- Considering orientation of new development during design (e.g., subdivisions, buildings, infrastructure, etc.)
- Requiring standard tie-downs of propane tanks.
- Requiring tie-downs for all manufactured housing.
- Establishing moratorium procedures to guide the suspension of post-disaster reconstruction permits.
- Revising fire codes to limit hotel room occupancy to ensure timely evacuation of high-use and

multi-floor structures.
- Establishing "value-added" incentives for hazard-resistant construction practices beyond code requirements.

MU-9 Create Local Funding Mechanisms for Hazard Mitigation

Local funding resources can be developed through the following measures:
- Establishing a local reserve fund for public mitigation measures.
- Using impact fees to help fund public hazard mitigation projects related to land development (i.e., increased runoff).
- Requiring a development impact tax on new construction to mitigate the impacts of that development.
- Recruiting local financial institutions to participate in "good neighbor" lending for private mitigation practices.
- Providing local match to Federal funds that can fund private mitigation practices.

MU-10 Incentivize Hazard Mitigation

Incentives and disincentives can be used to promote hazard mitigation through the following measures:
- Using special tax assessments to discourage builders from constructing in hazardous areas.
- Using insurance incentives and disincentives (i.e., incentives for best practices).
- Providing tax incentives for development of low-risk hazard parcels.
- Waiving permitting fees for home construction projects related to mitigation.
- Using tax abatements, public subsidies, and other incentives to encourage private mitigation practices.
- Reducing or deferring the tax burden for undeveloped hazard areas facing development pressure.
- Encouraging infill development through tax incentives, streamlined approval processes, etc.

MU-11 Monitor Mitigation Plan Implementation

Monitoring the implementation of the local mitigation plan can ensure that mitigation actions are being completed through:
- Forming a plan implementation steering committee to monitor progress on local mitigation actions. Include a mix of representatives from neighborhoods, local businesses, and local government.
- Preparing a plan implementation monitoring schedule and outlining roles for those responsible for monitoring (i.e., local departments, agencies, and committees).
- Preparing and submitting an annual plan implementation progress report to the local elected body.

STRUCTURE AND INFRASTRUCTURE PROJECTS

D-7 Retrofit Water Supply Systems

Improve water supply and delivery systems to save water through actions such as:

- Designing water delivery systems to accommodate drought events.
- Developing new or upgrading existing water delivery systems to eliminate breaks and leaks.

EQ-5 Protect Critical Facilities and Infrastructure

Reduce potential damage to critical facilities and infrastructure from future seismic events through actions such as:

- Conducting seismic retrofitting for critical public facilities most at risk to earthquakes.
- Requiring bracing of generators, elevators, and other vital equipment in hospitals.
- Identifying and hardening critical lifeline systems (i.e., critical public services such as utilities and roads) to meet "Seismic Design Guidelines and Standards for Lifelines" or equivalent standards such as American Lifelines Alliance (ALA) guidance. This may distinguish a manageable earthquake from a social and economic catastrophe.
- Reviewing construction plans for all bridges to determine their susceptibility to collapse and retrofitting problem bridges.
- Using flexible piping when extending water, sewer, or natural gas service.
- Installing shutoff valves and emergency connector hoses where water mains cross fault lines.

EQ-6 Implement Structural Mitigation Techniques

Use structural mitigation measures to reduce damage from future seismic events, such as:

- Strengthening and retrofitting non-reinforced masonry buildings and non-ductile concrete facilities that are particularly vulnerable to ground shaking.
- Retrofitting building veneers to prevent failure.
- Building a safe room to provide protection during an earthquake.
- Installing window film to prevent injuries from shattered glass.
- Anchoring rooftop-mounted equipment (i.e., HVAC units, satellite dishes, etc).
- Constructing masonry chimneys greater than 6 feet above a roof with continuous reinforced steel bracing.

ER-4 Remove Existing Buildings and Infrastructure from Erosion Hazard Areas

To prevent damage to buildings and infrastructure from erosion, consider acquiring and demolishing or relocating at-risk buildings and infrastructure and enforcing permanent restrictions on development after land and structure acquisition.

F-12 Remove Existing Structures from Flood Hazard Areas

Communities may remove structures from flood-prone areas to minimize future flood losses by acquiring and demolishing or relocating structures from voluntary property owners and preserving lands subject to repetitive flooding.

F-13 Improve Storm Water Drainage System Capacity

Rainwater and snowmelt can cause flooding and erosion in developed areas. Structural storm water management projects that prevent this include:

- Installing, re-routing, or increasing the capacity of a storm drainage system.

- Increasing drainage or absorption capacities with detention and retention basins, relief drains, spillways, drain widening/dredging or rerouting, logjam and debris removal, extra culverts, bridge modification, dike setbacks, flood gates and pumps, or channel redirection.
- Increasing capacity of storm water detention and retention basins.
- Increasing dimensions of drainage culverts in flood-prone areas.
- Using stream restoration to ensure adequate drainage and diversion of storm water.
- Requiring developers to construct on-site retention basins for excessive storm water and as a firefighting water source.
- Providing grassy swales along roadsides.

F-14 Conduct Regular Maintenance for Drainage Systems and Flood Control Structures

Regular maintenance will help drainage systems and flood control structures continue to function properly. Potential activities include:

- Performing regular drainage system maintenance, such as sediment and debris clearance, as well as detection and prevention of discharges into storm water and sewer systems from home footing drains, downspouts, or sewer pumps.
- Implementing an inspection, maintenance, and enforcement program to help ensure continued structural integrity of dams and levees.
- Routinely cleaning debris from support bracing underneath low-lying bridges.
- Routinely cleaning and repairing storm water drains.
- Regularly clearing sediment build-up on riverbanks near aerial lines.
- Inspecting bridges and identifying if any repairs or retrofits are needed to prevent scour.
- Incorporating ice jam prevention techniques as appropriate.

F-15 Elevate or Retrofit Structures and Utilities

Structures and utilities can be elevated to reduce flood damage, including:

- Elevating structures so that the lowest floor, including the basement, is raised above the base flood elevation.
- Raising utilities or other mechanical devices above expected flood levels.
- Elevating and anchoring manufactured homes or, preferably, keeping manufactured homes out of the floodplain.
- Relocating utilities and water heaters above base flood elevation and using tankless water heaters in limited spaces.

F-16 Flood proof Residential and Non-Residential Structures

Flood proofing techniques may protect certain structures from flood damage, including:

- Wet flood proofing in a basement, which may be preferable to attempting to keep water out completely because it allows for controlled flooding to balance exterior and interior wall forces and discourages structural collapse.
- Encouraging wet flood proofing of areas above base flood elevation.
- Using water resistant paints or other materials to allow for easy cleanup after floodwater exposure in accessory structures or in a garage area below an elevated residential structure.
- Dry flood proofing non-residential structures by strengthening walls, sealing openings, or using waterproof compounds or plastic sheeting on walls to keep water out.

F-17 Protect Infrastructure

Mitigation techniques can be implemented to help minimize losses to infrastructure from flood events, such as:

- Elevating roads and bridges above the base flood elevation to maintain dry access. In situations where flood waters tend to wash roads out, construction, reconstruction, or repair can include not only attention to drainage, but also stabilization or armoring of vulnerable shoulders or embankments.
- Raising low-lying bridges.
- Flood proofing wastewater treatment facilities located in flood hazard areas.
- Flood proofing water treatment facilities located in flood hazard areas.
- Depending on its infrastructure capabilities, using check valves, sump pumps, and backflow prevention devices in homes and buildings.
- Using bioengineered bank stabilization techniques.

F-18 Protect Critical Facilities

Techniques to protect critical facilities from flood events include:

- Requiring that all critical facilities including emergency operations centers (EOC), police stations, and fire department facilities be located outside of flood-prone areas.
- Requiring all critical facilities to meet requirements of Executive Order 11988 and be built 1 foot above the 500-year flood elevation.
- Installing/upgrading storm water pumping stations.
- Raising electrical components of sewage lift stations above base flood elevation.
- Raising manhole openings using concrete pillars.
- Installing watertight covers or inflow guards on sewer manholes.
- Installing flood telemetry systems in sewage lift stations.
- Installing back-up generators for pumping and lift stations in sanitary sewer systems along with other measures (e.g., alarms, meters, remote controls, and switchgear upgrades).
- Building earthen dikes around flood-threatened critical facilities.
- Using bioengineered bank stabilization techniques.

F-19 Construct Flood Control Measures

Small flood control structures can be built to prevent flood damage. Examples include:

- Using minor structural projects that are smaller and more localized (e.g., floodwalls or small berms) in areas that cannot be mitigated through non-structural activities or where structural activities are not feasible due to low densities.
- Using revetments (hardened materials placed atop existing riverbanks or slopes) to protect against floods.
- Using bioengineered bank stabilization techniques.

HA-1 Locate Safe Rooms to Minimize Damage

Locate tornado safe rooms inside or directly adjacent to houses to prevent hail-induced injuries that may occur when taking shelter during a severe thunderstorm.

HA-2 Protect Buildings from Hail Damage

For new construction as well as retrofitting existing buildings, techniques to minimize hail damage include:

- Including measures such as structural bracing, shutters, laminated glass in window panes, and hail-resistant roof coverings or flashing in building design to minimize damage.
- Improving roof sheathing to prevent hail penetration.
- Installing hail resistant roofing and siding.
- Contacting the Insurance Institute for Business and Home Safety (IBHS) to learn more about the most appropriate type of roof covering for your geographic region.

LS-3 Prevent Impacts to Roadways

To prevent roadway damage and traffic disruptions from landslides, consider options such as:

- Implementing monitoring mechanisms/procedures (i.e., visual inspection or electronic monitoring systems).
- Applying soil stabilization measures, such as planting soil- stabilizing vegetation on steep, publicly-owned slopes.
- Using debris-flow measures that may reduce damage in sloping areas, such as stabilization, energy dissipation, and flow control measures.
- Establishing setback requirements and using large setbacks when building roads near slopes of marginal stability.
- Installing catch-fall nets for rocks at steep slopes near roadways.

LS-4 Remove Existing Buildings and Infrastructure from Landslide Hazard Areas

To help mitigate landslide hazards, communities can acquire and demolish or relocate at-risk buildings and infrastructure and enforce permanent restrictions on development after land and structure acquisition.

L-1 Protect Critical Facilities and Equipment

Protect critical facilities and infrastructure from lighting damage with the following measures:

- Installing lightning protection devices and methods, such as lightning rods and grounding, on communications infrastructure and other critical facilities.
- Installing and maintaining surge protection on critical electronic equipment.

SRL-4 Protect Buildings and Infrastructure

Existing structures, infrastructure, and critical facilities can be protected from sea level rise through the following:

- Acquiring and demolishing or relocating structures located in high-risk areas.
- Retrofitting structures to elevate them above potential sea level rise levels.
- Retrofitting critical facilities to be 1 foot above the 500-year flood elevation (considering wave action) or the predicted sea level rise level, whichever is higher.
- Replacing exterior building components with more hazard- resistant materials.

SW-5 Retrofit Residential Buildings

The following types of modifications or retrofits to existing residential buildings can reduce future wind damage:

- Improving the building envelope.
- Installing hurricane shutters or other protective measures.
- Retrofitting gable end walls to eliminate wall failures in high winds.
- Replacing existing non-ductile infrastructure with ductile infrastructure to reduce their exposure to hazardous events.
- Retrofitting buildings with load-path connectors to strengthen the structural frames.
- Installing safe rooms.
- Reinforcing garage doors.
- Inspecting and retrofitting roofs to adequate standards to provide wind resistance.

SW-6 Retrofit Public Buildings and Critical Facilities

Public buildings and critical facilities can be retrofitted to reduce future wind damage with the following actions:

- Improving roof coverings (e.g., no pebbles, remove ballast roof systems).
- Anchoring roof-mounted heating, ventilation, and air conditioning units.
- Retrofitting buildings with load-path connectors to strengthen the structural frames.
- Retrofitting or constructing the emergency operations center to FEMA 361 standards.
- Avoiding placing flag poles or antennas near buildings.
- Upgrading and maintaining existing lightning protection systems to prevent roof cover damage.
- Requiring upgrading of reused buildings that will house critical facilities.
- Protecting traffic lights and other traffic controls from high winds.
- Converting traffic lights to mast arms.

WW-2 Protect Buildings and Infrastructure

Buildings and infrastructure can be protected from the impacts of winter storms with the following techniques:

- Adding building insulation to walls and attics.
- As buildings are modified, using new technology to create or increase structural stability.
- Retrofitting public buildings to withstand snow loads and prevent roof collapse.

WW-3 Protect Power Lines

Power lines can be protected from the impacts of winter storms with the following techniques:

- Establishing standards for all utilities regarding tree pruning around lines.
- Burying overhead power lines.
- Using designed-failure mode for power line design to allow lines to fall or fail in small sections rather than as a complete system to enable faster restoration.
- Installing redundancies and loop feeds.

WW-4 Reduce Impacts to Roadways

The leading cause of death during winter storms is from automobile or other transportation accidents, so it is important to consider ways to lessen roadway impacts. Potential strategies include:

- Planning for and maintaining adequate road and debris clearing capabilities.
- Using snow fences or "living snow fences" (e.g., rows of trees or other vegetation) to limit blowing and drifting of snow over critical roadway segments.
- Installing roadway heating technology to prevent ice/snow buildup.

SS-5 Construct Structural Control Techniques

Structural controls can be used to lessen the impact of storm surge. Examples include the following:

- Constructing groins to capture material along the shoreline in order to trap and retain sand.
- Installing geotextile sand tubes to trap sand or protect beachfront properties.
- Building a coastal berm to absorb waves and protect the shoreline from erosion.
- Building a storm berm to keep rock protection in place and provide a slow supply of sediment to the coastal system.

SS-6 Protect Infrastructure and Critical Facilities

Infrastructure and critical facilities can be protected from damage by storm surge through the following:

- Reorienting near-shore roads so they are parallel (not perpendicular) to the beach to prevent the channelization of storm surge and wind inland.
- Constructing seawalls or other structures to protect critical facilities located on the shoreline.
- Relocating existing vulnerable critical facilities outside of high-risk areas.

SU-5 Remove Existing Structures from Subsidence Hazard Areas

To prevent property loss, acquire and demolish or relocate buildings and infrastructure in high-risk areas.

TSU-4 Build Tsunami Shelters

Ensure the population is adequately protected from tsunami inundation by constructing tsunami shelters.

TSU-5 Protect Buildings and Infrastructure

Ensure buildings and infrastructures are adequately protected from tsunami inundation with the

following:

- Requiring coastal structures to be built to standards that allow for proper vertical evacuation and to be specially designed and constructed to resist both tsunami and earthquake loads.
- Locating new and relocating existing infrastructure and critical facilities outside of the tsunami hazard area.
- Elevating existing buildings above the inundation level.
- Relocating fire-prone infrastructure such as electrical lines or case tanks.

WF-6 Retrofit At-Risk Structures with Ignition-Resistant Materials

Existing structures in wildfire hazard areas can be protected through the use of non-combustible materials and technologies, including:

- Installing roof coverings, sheathing, flashing, skylights, roof and attic vents, eaves, and gutters that conform to ignition-resistant construction standards.
- Installing wall components that conform to ignition-resistant construction standards.
- Protecting propane tanks or other external fuel sources.
- Purchasing and installing external, structure-specific water hydration systems (sprinklers); dedicated power sources; and dedicated cisterns if no water source (e.g., lake, river, or swimming pool) is available.

WF-7 Create Defensible Space around Structures and Infrastructure

Local governments can implement defensible space programs to reduce risk to structures and infrastructure, including:

- Creating buffers around residential and non-residential structures through the removal or reduction of flammable vegetation, including vertical clearance of tree branches.
- Replacing flammable vegetation with less flammable species.
- Creating defensible zones around power lines, oil and gas lines, and other infrastructure systems.

WF-8 Conduct Maintenance to Reduce Risk

Local governments can implement maintenance procedures to reduce wildfire risk, including:

- Performing arson prevention cleanup activities in areas of abandoned or collapsed structures, accumulated trash or debris, and with a history of storing flammable materials where spills or dumping may have occurred.
- Preventing or alleviating wildfires by proper maintenance and separation of power lines as well as efficient response to fallen power lines.
- Routinely inspecting the functionality of fire hydrants.
- Requiring and maintaining safe access for fire apparatus to wildland-urban interface neighborhoods and properties.

MU-12 Protect Structures

Damage to structures can be prevented through the following actions:

- Acquiring or relocating structures located in hazard areas.
- Moving vulnerable structures to a less hazardous location.

- Relocating or retrofitting public buildings located in high-hazard areas.
- Relocating or retrofitting endangered public housing units in high- hazard areas.
- Retrofitting fire and police stations to become hazard resistant.
- Identifying and strengthening facilities to function as public shelters.

MU-13 Protect Infrastructure and Critical Facilities

Infrastructure and critical facilities can be protected from damage by the following:

- Incorporating hazard mitigation principles into all aspects of public-funded building.
- Incorporating mitigation retrofits for public facilities into the annual capital improvements program.
- Engineering or retrofitting roads and bridges to withstand hazards.
- Relocating or undergrounding electrical infrastructure.
- Designing and building water tanks or wells for use in times of water outage.
- Installing quick-connect emergency generator hook-ups for critical facilities

NATURAL SYSTEMS PROTECTION

D-8 Enhance Landscaping and Design Measures

Encourage drought-tolerant landscape design through measures such as:

- Incorporating drought tolerant or xeriscaping practices into landscape ordinances to reduce dependence on irrigation.
- Providing incentives for xeriscaping.
- Using permeable driveways and surfaces to reduce runoff and promote groundwater recharge.

EQ-7 Increase Earthquake Risk Awareness

There are many ways to increase awareness of earthquake risk, including:

- Working with insurance industry representatives to increase public awareness of the importance of earthquake insurance. Residential structural improvements can be factored into the process of obtaining insurance coverage or reduced deductibles.
- Developing an outreach program about earthquake risk and mitigation activities in homes, schools, and businesses.
- Educating homeowners on safety techniques to follow during and after an earthquake.
- Offering GIS hazard mapping online for residents and design professionals.

EQ-8 Conduct Outreach to Builders, Architects, Engineers, and Inspectors

Building susceptibility to earthquake damage can be improved if design professionals are made aware of proper design and building requirements. Outreach activities include:

- Conducting information sessions or other forms of outreach on seismic code provisions for new and existing buildings to enhance code use and enforcement by local architects, engineers, contractors, and code enforcement personnel.
- Training building department staff and officials on Form ATC-20 for post-earthquake building

evaluation. The ATC-20 report and addendum, prepared by the Applied Technology Council, provide procedures and guidelines for making on-the-spot evaluations and decisions regarding continued use and occupancy of earthquake- damaged buildings.

EQ-9 Provide Information on Structural and Non-Structural Retrofitting

Property owners can retrofit existing structures to reduce damage from seismic events. Potential actions include the following:

- Educating homeowners about structural and non-structural retrofitting of vulnerable homes and encouraging retrofit.
- Developing a technical assistance information program for homeowners. Teaching them how to seismically strengthen their houses can be an effective mitigation activity. The program can include providing local government building departments with copies of existing strengthening and repair information for distribution.
- Developing an outreach program to encourage homeowners to secure furnishings, storage cabinets, and utilities to prevent injuries and damage. Examples include anchoring tall bookcases and file cabinets, installing latches on drawers and cabinet doors, restraining desktop computers and appliances, using flexible connections on gas and water lines, mounting framed pictures and mirrors securely, and anchoring and bracing propane tanks and gas cylinders.
- Establishing a library of technical documents on structural and non-structural mitigation options as well as model ordinances and procedures that have been used by other jurisdictions to reduce earthquake risk.

ER-5 Stabilize Erosion Hazard Areas

To stabilize slopes susceptible to erosion, consider options such as:

- Preventing erosion with proper bank stabilization, sloping or grading techniques, planting vegetation on slopes, terracing hillsides, or installing riprap boulders or geotextile fabric.
- Stabilizing cliffs with terracing or plantings of grasses or other plants to hold soil together.
- Prohibiting removal of natural vegetation from dunes and slopes.
- Planting mature trees in the coastal riparian zone to assist in dissipation of the wind force in the breaking wave zone.
- Using a hybrid of hard/soft engineering techniques (i.e., combine low-profile rock, rubble, oyster reefs, or wood structures with vegetative planting or other soft stabilization techniques).
- Implementing marine riparian habitat reinstatement or revegetation.
- Using a rock splash pad to direct runoff and minimize the potential for erosion.
- Using bioengineered bank stabilization techniques.

F-20 Protect and Restore Natural Flood Mitigation Features

Natural resources provide floodplain protection, riparian buffers, and other ecosystem services that mitigate flooding. It is important to preserve such functionality with the following:

- Protecting and enhancing landforms that serves as natural mitigation features (i.e., riverbanks, wetlands, dunes, etc.).
- Using vegetative management, such as vegetative buffers, around streams and water sources.
- Protecting and preserving wetlands to help prevent flooding in other areas.
- Establishing and managing riparian buffers along rivers and streams.
- Retaining natural vegetative beds in storm water channels.

- Retaining thick vegetative cover on public lands flanking rivers.

F-21 Preserve Floodplains as Open Space

Preserving natural areas and vegetation benefits natural resources while also mitigating potential flood losses. Techniques include:

- Developing an open space acquisition, reuse, and preservation plan targeting hazard areas.
- Developing a land banking program for the preservation of the natural and beneficial functions of flood hazard areas.
- Using transfer of development rights to allow a developer to increase densities on another parcel that is not at risk in return for keeping floodplain areas vacant.
- Compensating an owner for partial rights, such as easement or development rights, to prevent a property from being developed.

F-22 Increase Awareness of Flood Risk and Safety

Ideas for increasing flood risk awareness include the following:

- Encouraging homeowners to purchase flood insurance.
- Annually distributing flood protection safety pamphlets or brochures to the owners of flood-prone property.
- Educating citizens about safety during flood conditions, including the dangers of driving on flooded roads.
- Using outreach programs to advise homeowners of risks to life, health, and safety.
- Offering GIS hazard mapping online for residents and design professionals.
- Establishing a Program for Public Information (PPI) with a PPI committee (as suggested by Activity 332 of the CRS Coordinator's Manual).

SLR-5 Preserve High-Hazard Areas as Open Space

Preserve open space to benefit natural resources and to reduce risk to structures from potential sea level rise. Techniques include:

- Developing an open space acquisition, reuse, and preservation plan targeting hazard areas.
- Developing a land banking program for the preservation and management of the natural and beneficial functions of flood hazard areas.
- Adopting rolling easements along the shoreline to promote natural migration of shorelines.
- Using transfer of development rights to allow a developer to increase densities on another parcel that is not at risk in return for keeping floodplain areas vacant.
- Compensating an owner for partial rights, such as easement or development rights, to prevent a property from being developed.

SLR-6 Protect and Restore Natural Buffers

Natural resources provide floodplain protection, riparian buffers, and other ecosystem services that mitigate sea level rise. It is important to preserve such functionality with the following:

- Examining the appropriate use of beach nourishment, sand scraping, dune-gap plugs, etc., for coastal hazards.
- Implementing dune restoration, plantings (e.g., sea oats), and use of natural materials.

- Examining the appropriate use of sediment-trapping vegetation, sediment mounds, etc., for coastal hazards.
- Planting sediment-trapping vegetation to buffer the coast against coastal storms by collecting sediment in protective features such as dunes or barrier islands.
- Performing sand scraping—using bulldozers to deposit the top foot of sand above the high-tide line—to reinforce the beach without adding new sand.
- Using sediment mounds to act as artificial dunes or plugs for natural dune gaps in order to slow the inland progress of storm- related wind and water.

SS-7 Protect and Restore Natural Buffers

Natural resources provide floodplain protection, riparian buffers, and other ecosystem services that mitigate storm surge risk. It is important to preserve such functionality with the following:

- Examining the appropriate use of beach nourishment, sand scraping, dune-gap plugs, etc., for coastal hazards.
- Implementing dune restoration, plantings (e.g., sea oats), and use of natural materials.
- Evaluating the appropriate use of sediment-trapping vegetation, sediment mounds, etc., for coastal hazards.
- Planting sediment-trapping vegetation to make the coast more resistant to coastal storms by collecting sediment in protective features such as dunes or barrier islands.
- Performing sand scraping—using bulldozers to deposit the top foot of sand above the high-tide line—to reinforce the beach without adding new sand.
- Using sediment mounts to act as artificial dunes or plugs for natural dune gaps in order to slow the inland progress of storm-related wind and water.

WF-9 Implement a Fuels Management Program

A fuels management program may be implemented to reduce hazardous vegetative fuels on public lands, near essential infrastructure, or on private lands by working with landowners. The program can include the following:

- Performing maintenance including fuel management techniques such as pruning and clearing dead vegetation, selective logging, cutting high grass, planting fire-resistant vegetation, and creating fuel/fire breaks (i.e., areas where the spread of wildfires will be slowed or stopped by the removal of fuels).
- Using prescribed burning to reduce fuel loads that threaten public safety and property.
- Identifying and clearing fuel loads created by downed trees.
- Cutting firebreaks into public wooded areas in the wildland-urban interface.
- Sponsoring local “slash and clean-up days” to reduce fuel loads along the wildland-urban interface.
- Linking wildfire safety with environmental protection strategies (i.e., improving forest ecology, wildlife habitat, etc.).
- Developing a vegetation management plan.

EDUCATION AND AWARENESS PROGRAMS

D-9 Educate Residents on Water Saving Techniques

Encourage citizens to take water-saving measures, such as the following:

- Installing low-flow water saving showerheads and toilets.
- Turning water flow off while brushing teeth or during other cleaning activities.
- Adjusting sprinklers to water the lawn and not the sidewalk or street.
- Running the dishwasher and washing machine only when they are full.
- Checking for leaks in plumping or dripping faucets.
- Installing rain-capturing devices for irrigation.
- Encouraging the installation of gray water systems in homes to encourage water reuse.

D-10 Educate Farmers on Soil and Water Conservation Practices

Encourage farmers to implement soil and water conservation practices that foster soil health and improve soil quality to help increase resiliency and mitigate the impacts of droughts. Potential conservation practices include the following:

- Rotating crops by growing a series of different types of crops on the same fields every season to reduce soil erosion.
- Practicing contour farming by farming along elevation contour lines to slow water runoff during rainstorms and prevent soil erosion, allowing the water time to absorb into the soil.
- Using terracing on hilly or mountainous terrain to decrease soil erosion and surface runoff.
- Planting “cover crops,” such as oats, wheat, and buckwheat, to prevent soil erosion.
- Using zero and reduced tillage to minimize soil disturbance and leave crop residue on the ground to prevent soil erosion.
- Constructing windbreaks to prevent evaporation from reclaiming salt-affected soil.
- Collecting rainwater and using natural runoff to water plants.

D-11 Purchase Crop Insurance

Preserve economic stability during a drought by encouraging agricultural interests to obtain crop insurance to cover potential losses due to drought.

ER-6 Increase Awareness of Erosion Hazards

Consider ways to help citizens become more aware of specific erosion risks in your area, such as:

- Notifying property owners located in high-risk areas.
- Disclosing the location of high-risk areas to buyers.
- Developing a brochure describing risk and potential mitigation techniques.
- Offering GIS hazard mapping online for residents and design professionals.

ET-2 Increase Awareness of Extreme Temperature Risk and Safety

The impacts of extreme temperatures on public health can be lessened if citizens know how to prepare and protect themselves. Ideas for increasing awareness include the following:

- Educating citizens regarding the dangers of extreme heat and cold and the steps they can take to protect themselves when extreme temperatures occur.

ET-3 Assist Vulnerable Populations

Measures should be taken to ensure vulnerable populations are adequately protected from the impacts of extreme temperatures, such as:

- Organizing outreach to vulnerable populations, including establishing and promoting accessible heating or cooling centers in the community.
- Requiring minimum temperatures in housing/landlord codes.
- Encouraging utility companies to offer special arrangements for paying heating bills, if not already required by state law.
- Creating a database to track those individuals at high risk of death, such as the elderly, homeless, etc.

ET-4 Educate Property Owners About Freezing Pipes

Extreme cold may cause water pipes to freeze and burst, which can cause flooding inside a building. Ideas for educating property owners include the following:

- Educating homeowners and builders on how to protect their pipes, including locating water pipes on the inside of building insulation or keeping them out of attics, crawl spaces, and vulnerable outside walls.
- Informing homeowners that letting a faucet drip during extreme cold weather can prevent the buildup of excessive pressure in the pipeline and avoid bursting.

F-23 Educate Property Owners about Flood Mitigation Techniques

Educate property owners regarding options for mitigating their properties from flooding through outreach activities such as:

- Using outreach activities to facilitate technical assistance programs that address measures that citizens can take or facilitate funding for mitigation measures.
- Encouraging homeowners to install backflow valves to prevent reverse-flow flood damages.
- Encouraging residents in flood-prone areas to elevate homes.
- Educating the public about securing debris, propane tanks, yard items, or stored objects that may otherwise be swept away, damaged, or pose a hazard if picked up and washed away by floodwaters.
- Asking residents to help keep storm drains clear of debris during storms (not to rely solely on Public Works).

HA-3 Increase Hail Risk Awareness

Conduct outreach activities to increase public awareness of hail dangers, including:

- Mailing safety brochures with monthly water bills.
- Posting warning signage at local parks, county fairs, and other outdoor venues.
- Teaching school children about the dangers of hail and how to take safety precautions.

L-2 Conduct Lightning Awareness Programs

Use outreach programs to promote awareness of lightning dangers. This could include ideas such as:

- Developing a lightning brochure for distribution by recreation equipment retailers or outfitters

in mountainous areas.
- Mailing safety brochures with monthly water bills.
- Posting warning signage at local parks.
- Teaching school children about the dangers of lightning and how to take safety precautions.

SLR-7 Increase Awareness of Sea Level Rise

Improve public awareness of risks due to sea level rise through outreach activities such as:
- Encouraging homeowners to purchase flood insurance.
- Using outreach programs to facilitate technical assistance programs that address measures that citizens can take or facilitate funding for mitigation measures.
- Annually distributing flood protection safety pamphlets or brochures to the owners of property in high-risk areas.
- Educating citizens about safety during flood conditions, including the dangers of driving on flooded roads.
- Using outreach programs to advise homeowners of risks to life, health, and safety.
- Offering GIS hazard mapping online for residents and design professionals.
- Disclosing the location of possible sea level rise areas to potential buyers.

SW-7 Increase Severe Wind Risk Awareness

Improve public awareness of severe wind through outreach activities such as:
- Informing residents of shelter locations and evacuation routes.
- Educating homeowners on the benefits of wind retrofits such as shutters, hurricane clips, etc.
- Ensuring that school officials are aware of the best area of refuge in school buildings.
- Instructing property owners on how to properly install temporary window coverings before a storm.
- Educating design professionals to include wind mitigation during building design.

WW-5 Conduct Winter Weather Risk Awareness Activities

Public awareness of severe winter storms can be improved through the following efforts:
- Informing the public about severe winter weather impacts.
- Producing and distributing family and traveler emergency preparedness information about severe winter weather hazards.
- Including safety strategies for severe weather in driver education classes and materials.
- Encouraging homeowners to install carbon monoxide monitors and alarms.
- Educating citizens that all fuel-burning equipment should be vented to the outside.

WW-6 Assist Vulnerable Populations

Protect vulnerable populations from the impacts of severe winter storms through the following efforts:
- Identifying specific at-risk populations that may be exceptionally vulnerable in the event of long-term power outages.
- Organizing outreach to vulnerable populations, including establishing and promoting accessible heating centers in the community.

SS-8 Provide Information on High-Risk Areas

Increase public awareness of storm surge risk through the following actions:

- Offering GIS hazard mapping online for residents and design professionals.
- More accurately mapping problem areas to educate residents about unanticipated risks. Upgrading maps provides a truer measure of risks to a community.
- Educating property owners in high-risk areas about mitigation options.
- Educating the public about risks, preparedness measures, and evacuation procedures.

SU-6 Educate Residents about Subsidence

Increase residents' knowledge of subsidence through the following:

- Promoting community awareness of subsidence risks and impacts.
- Offering GIS hazard mapping online for residents and design professionals.

T-3 Conduct Tornado Awareness Activities

Conduct outreach activities to increase awareness of tornado risk. Activities could include the following:

- Educating citizens through media outlets.
- Conducting tornado drills in schools and public buildings.
- Teaching school children about the dangers of tornadoes and how to take safety precautions.
- Distributing tornado shelter location information.
- Supporting severe weather awareness week.
- Promoting use of National Oceanic and Atmospheric Administration (NOAA) weather radios.

TSU-6 Increase Public Awareness of Tsunami Hazard

Improve public awareness and better prepare citizens for evacuation during a tsunami by the following:

- Educating citizens regarding the dangers of tsunami and inform them of emergency procedures and routes to use should a tsunami warning be issued.
- Conducting tsunami drills.
- Designating tsunami inundation zones and marking evacuation routes.
- Developing maps showing possible tsunami inundation areas and steering developers away from high-risk areas.
- Participating in NOAA's TsunamiReady Community program.

WF-10 Participate in Firewise Program

The Firewise program provides a series of steps that individual residents and their neighbors can take to keep their homes and neighborhoods safer from fire. Consider actions such as:

- Joining the "Firewise Communities/USA" recognition program sponsored by the National Wildlife Coordinating Group (firewise.org).
- Sponsoring Firewise workshops for local officials, developers, civic groups, and neighborhood/ homeowners' associations.
- Consulting Firewise guidance and encouraging or requiring best practices in your community.

WF-11 Increase Wildfire Risk Awareness

Education and outreach programs can target citizens, businesses, developers, landscapers, and insurers among others to increase awareness of wildfire risk and strategies for protecting homes and infrastructure. Consider actions such as:

- Offering GIS hazard mapping online for residents, developers, and design professionals.
- Organizing a local fire department tour to show local elected officials and planners the most vulnerable areas of the community's wildland-urban interface and increase their understanding of risks.
- Working with insurance companies, utility providers, and others to include wildfire safety information in materials provided to area residents.
- Developing partnerships with neighborhood groups, homeowners' associations, and others to conduct outreach activities.
- Using local fire departments to conduct education programs in schools.
- Informing the public about proper evacuation procedures.
- Forming a citizen plan implementation steering committee to monitor progress of local mitigation actions. Include a mix of representatives from neighborhoods, local businesses, and local government.

WF-12 Educate Property Owners about Wildfire Mitigation Techniques

Educate property owners on actions that they can take to reduce risk to property, such as the following:

- Installing fire mitigation systems such as interior and exterior sprinkler systems.
- Performing safe disposal of yard and household waste rather than open burning.
- Removing dead or dry leaves, needles, twigs, and combustibles from roofs, decks, eaves, porches, and yards.
- Creating a defensible space or buffer zone cleared of combustible materials around property.
- Installing and maintaining smoke detectors and fire extinguishers on each floor of their homes or other buildings.
- Safely using and storing necessary flammable materials, including machine fuels.
- Approved safety cans should be used for storing gasoline, oily rags, and other flammable materials. Firewood should be stacked at least 100 feet away and uphill from homes.
- Keeping flammables, such as curtains, secured away from windows or using heavy fire-resistant drapes.

MU-14 Increase Hazard Education and Risk Awareness

Hazard education and awareness activities that address multiple hazards include:

- Developing and implementing a multi-hazard public awareness program.
- Providing information on all types of hazards, preparedness and mitigation measures, and responses during hazard events.
- Establishing a "hazard awareness week" in coordination with the media to promote hazard awareness (seasonal).
- Establishing an interactive website for educating the public on hazard mitigation and preparedness measures.
- Annually hosting a public hazards workshop or exposition for all residents.
- Establishing hazard information centers.
- Creating a speakers bureau for disaster-related topics that focus on mitigation and preparedness measures.

- Enhancing hazard awareness of the private sector, particularly lenders, insurance agents, and realtors.
- Scheduling an annual "what's new in mitigation" briefing for the local governing body (possibly with SHMO, etc.).

MU-15 Improve Household Disaster Preparedness

Educate the public on how to prepare for hazards and disasters, including the following:

- Encouraging property owners to purchase hazard insurance not as an alternative to mitigation, but rather to add financial protection if damage does occur.
- Encouraging residents to prepare by stocking up the necessary items and planning for how family members should respond during a disaster. Publicized information about household preparedness can be found at www.ready.gov.
- Providing hazard vulnerability checklists for homeowners to conduct their own inspections.
- Promoting the purchase and use of NOAA weather radios by residents.
- Encouraging citizens to secure loose items (i.e., patio furniture).
- Participating in Nation Weather Service StormReady Program.
- Purchasing and installing NOAA weather radios in schools, government buildings, parks, etc.
- Storing digital or hard copies of public records in low-risk, offsite locations.

MU-16 Promote Private Mitigation Efforts

Encourage private mitigation efforts that address multiple hazards through the following:

- Using outreach programs to: 1) advise homeowners of risks to life, health, and safety; 2) facilitate technical assistance programs that address measures that citizens can take; or 3) facilitate funding for mitigation measures.
- Establishing, maintaining, and publicizing a library section on hazard mitigation techniques for local residents.
- Identifying and recruiting civic groups and volunteer agencies for community mitigation projects.
- Establishing a network for a business-to-business mitigation mentoring program.
- Offering hazard susceptibility audits of local small businesses.
- Completing a "demonstration model" showing use of hazard mitigation techniques for public display.
- Establishing a technical assistance program for residents to access data or resources for mitigation purposes.
- Educating the public on tradeoffs associated with multi-hazard design.

APPENDIX F: MITIGATION ACTION PROGRESS REPORT FORM

[Name of Jurisdiction] Hazard-Specific Action Items 2021-2025 – Annual Review and Progress						
Action Items	**Status** *(Choose One & **Enter Letter**):* **A.** Completed; **B.** In Progress (on schedule); **C.** In Progress (delayed); **D.** Delayed Until Funding Available; **E.** Canceled					
	2021	**2022**	**2023**	**2024**	**2025**	**Notes on yearly progress**
GENERAL: ALL HAZARDS						
Add New Action Items if Applicable						
DAM/LEVEE FAILURES						
Add New Action Items if Applicable						
DROUGHTS/HEAT WAVES						
Add New Action Items if Applicable						
EARTHQUAKES						
Add New Action Items if Applicable						

FLOODING						
Add New Action Items if Applicable						
LANDSLIDES/EROSION						
Add New Action Items if Applicable						
LAND SUBSIDENCE						
Add New Action Items if Applicable						
TORNADOES						
Add New Action Items if Applicable						
TSUNAMI						
Add New Action Items if Applicable						
WILDFIRES						
Add New Action Items if Applicable						

WINTER STORMS/FREEZES (SEVERE WINTER WEATHER)						
Add New Action Items if Applicable						
SEVERE STORMS						
Add New Action Items if Applicable						
EXTREME TEMPERATURES						
Add New Action Items if Applicable						
LANDSLIDE						
Add New Action Items if Applicable						
LIGHTNING						
Add New Action Items if Applicable						
SEVERE WIND						
Add New Action Items if Applicable						

MULTIPLE HAZARDS						
Add New Action Items if Applicable						

Progress Report Period	**From Date:**	**To Date:**
Action Item		
Responsible Agency		
Contact Name		
Contact Phone/Email		
Action Status	❑ Action completed ❑ Action canceled ❑ Action on schedule Anticipated completion date: _____ ❑ Action delayed Explain: _____	

Summary of Action Progress for this Report Period

1. **What was accomplished for this Action during this reporting period?**

2. **What obstacles, problem, or delays did the Action encounter?**

3. **If uncompleted, is the Action still relevant? Should the Action be changed or revised?**

4. **Other comments**

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APPENDIX G: WHATCOM COUNTY CONTACT LIST

#	Jurisdiction Name	Jurisdiction Type (city/borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone
1	Whatcom County	Whatcom County-unincorporated area	Deputy Director John Gargett	3888 Sound Way Bellingham ,WA 98226	ggargett@co.whatcom.wa.us	360-676-6681
2	City of Bellingham	City	Emergency Manager, Office of Emergency Management Liz Coogan	Fire Dept. 1800 Broadway Bellingham, WA 98225	Liz Coogan(ecoogan@cob.org)	(360) 778-8444
3	City of Blaine	City	Community Development Services Director Stacie Pratschner	435 Martin St. Blaine, WA 98230	spratschner@cityofblaine.com	360-332-8311
4	Sumas	City	Rollin Harper	433 Cherry Street, Sumas, WA 98295	'rollinh@sehome.com'	(360) 733-6033
5	Everson	City	Rollin Harper	433 Cherry Street, Sumas, WA 98295	'rollinh@sehome.com'	(360) 733-6033
6	Nooksack	City	Rollin Harper	433 Cherry Street, Sumas, WA 98295	'rollinh@sehome.com'	(360) 733-6033

7	Whatcom County Flood Zone	Special purpose District	Paula Harris River &Flood Manager	322 N Commercial Street, Suite 110 Bellingham, WA 98225	PHarris@co.whatcom.wa.us>	(360) 778-6285
8	Ferndale	City	City Administrator Jori Burnett	P.O. Box 936, Ferndale, WA 98248		(360) 685-2351
9	Lake Whatcom Water and Sewer District	Special purpose District	Justin Clary – General Manager	LAKE WHATCOM WATER & SEWER DISTRICT 1220 Lakeway Drive Bellingham, WA 98229	justin.clary@lwwsd.org	(360) 734-9224
10	Lynden	City	Mike Martin, City Administrator	City of Lynden 300 4th St. Lynden, WA 98264	martinm@Lyndenwa.org	(360) 354-1170, ext 5
11	Meridian School District	School District	Superintendent, Dr. James Everett	214 West Laurel Road, Bellingham, WA 98226	Jeverett@meridian.webnet.edu	360-398-7111
12	Port of Bellingham	Port	Emergency Management/Security Officer Scott McCreery	1801 Roeder Avenue Bellingham, WA	scottm@portofbellingham.com	(360) 303-5211

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