Clallam County Multi-Jurisdictional Hazard Mitigation Plan

DRAFT – 2019 Plan Update

Prepared by:

Clallam County Emergency Management

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MEMORANDUM OF TRANSMITTAL

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PLAN ADOPTION AND APPROVAL

44 CFR §201.6(c)(5) 44 CFR §201.7(c)(6) require that the Clallam County Multi-Jurisdictional Hazard Mitigation Plan be formally adopted by the Board of County Commissioners and all participating cities, tribes, and special districts (participating jurisdictions). The Hazard Mitigation Plan has been adopted by each jurisdiction as of the following dates. The plan adoption resolution follows.

Jurisdiction	Adopting Body	Adoption Date
Clallam County	Board of County Commissioners	
City of Port Angeles	City Council	
City of Sequim	City Council	
City of Forks	City Council	
Lower Elwha Klallam Tribe	Tribal Council	
Jamestown S'Klallam Tribe	Tribal Council	

This plan was approved by the Federal Emergency Management Agency on [INSERT DATE HERE]. The official approval letter follows.

ACKNOWLEDGEMENTS

The development of the Clallam County Multi-Jurisdictional Hazard Mitigation Plan was made possible by the tireless work of the Mitigation Planning Team. Over the course of 12 months, the team held five formal workshops and met informally many other times. This cross-sector team identified the hardest hitting hazards, described their risks and cascading impacts, and developed a comprehensive mitigation strategy to reduce risk to community members and their property. The following individuals are acknowledged for their efforts to develop an effective plan and sustainable program.

Name	Title	Department/Agency
Ron Cameron	Undersheriff, Emergency Manager	Clallam County Emergency Management Department
Anne Chastain	EOC Coordinator	Clallam County Emergency Management Department
Jamye Wisecup	Emergency Management	Clallam County Emergency Management Department
Rod Fleck	City Attorney/Planner	City of Forks
David Garlington	Public Works Director	City of Sequim Public Works Department
Ann Soule	Resource Manager	City of Sequim Public Works Department
Peter Tjemsland	Utilities Manager	City of Sequim Public Works Department
Jim Buck	Volunteer	Clallam County Emergency Management Department
Luke Strong-Cvetich	Tribal Planner	Jamestown S'Klallam Tribe
Glen Roggenbuck	Emergency Management Coordinator	Lower Elwha Klallam Tribe
Marty Martinez	Campus Safety Operations Manager	Peninsula College
Ken Dubuc	Fire Chief	Port Angeles Fire Department
Dan Gase	Airport & Real Estate Manager	Port of Port Angeles
Dan Shea	Operations Supervisor	Port of Port Angeles
Larry Morris	Safety Manager	Public Utilities District No. 1

Support for the 2019 update of the Clallam County Hazard Mitigation Plan was provided under contract by Ecology and Environment, Inc.

RECORD OF PLAN UPDATE AND APPROVAL

The Clallam County Multi-Jurisdictional Hazard Mitigation Plan is required to be updated once every five years and submitted to the Board of County Commissioners for adoption and the Washington State Emergency Management Division and the Federal Emergency Management Agency for approval. The County may update the plan on a more frequent basis as needed without approval.

Refer to Chapter 7 for more information on Plan Implementation guidance.

Date of Update	Date of Adoption	Date of FEMA Approval
2010	August 14, 2011	August 14, 2011
2019	[INSERT DATE]	[INSERT DATE]

TABLE OF CONTENTS

JURISDICTION ANNEXES

APPENDICES

LIST OF TABLES AND FIGURES

Tables

Figures

ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
COOP	Continuity of Operations
County	Clallam County
CRS	Community Rating System
CWPP	Community Wildfire Protection Plan
CSZ	Cascadia Subduction Zone
DMA 2000	Disaster Mitigation Act of 2000
DEC	Department of Ecology
DEM	Department of Emergency Management
DFIRM	Digital Flood Insurance Rate Map
DNR	Washington State Department of Natural Resources
E & E	Ecology and Environment, Inc.
FEMA	Federal Emergency Management Agency
FIRMs	Flood Insurance Rate Maps
EMD	Emergency Management Division
GIS	Geographic Information System
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HMP	Hazards Mitigation Plan
LEPC	Local Emergency Planning Committee
M	magnitude

mph	miles per hour
MPT	Mitigation Planning Team
NFIP	National Flood Insurance Program
NHMP	Natural Hazards Mitigation Plan
PHMSA	Pipeline and Hazardous Materials Safety Administration
PUD	Public Utility District
Stafford Act	Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988
USDA	United States Department of Agriculture
USGS	United State Geological Survey
WERP	Wind Energy Research Program
WSDA	Washington State Department of Agriculture
WSDOT	Washington State Department of Transportation
WUI	Wildland-Urban Interface

1 INTRODUCTION

Chapter 1 describes the authorities and principles that provide the basis for Clallam County's (County's) mitigation program as well as provides a description of the program's organization and how the plan is organized to support it.

1.1 Authority

The Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Stafford Act), as amended by the Disaster Mitigation Act of 2000 (DMA 2000), Public Law 106-390, and its implementing Code of Federal Regulations (CFR) provisions, 44 CFR § 201, provide the legal authority for local hazard mitigation planning. The DMA 2000 requires state, local, and tribal governments to develop a Hazard Mitigation Plan (HMP) that identifies the jurisdiction's natural hazards, risks, vulnerabilities, and mitigation strategies. The planning process requirements mandated by the Federal Emergency Management Agency (FEMA) (outlined in 44 CFR §201.6) include the following activities:

- Document the planning process;
- Provide stakeholders with an opportunity to participate;
- Conduct and document public involvement;
- Incorporate existing plans and reports;
- Discuss continued public participation and plan maintenance; and
- Provide a method for monitoring, evaluating, and updating the HMP.

Once complete, the HMP must be submitted to FEMA for approval. FEMA's approval of an HMP is a prerequisite for federal Hazard Mitigation Assistance (HMA) grant program eligibility (outlined in 42 CFR §5165(a)).

The Clallam County Multi-Jurisdictional Hazard Mitigation Plan (HMP) was prepared in accordance with the requirements of the Stafford Act, as amended by the DMA 2000, and the implementing 44 CFR § 201 provisions. The County and all participating communities will integrate appropriate Americans with Disabilities Act (ADA) standards into mitigation projects and actions implemented as a part of the planning process. For example, alterations to existing facilities, such as seismic retrofits, will comply with all applicable federal accessibility requirements.

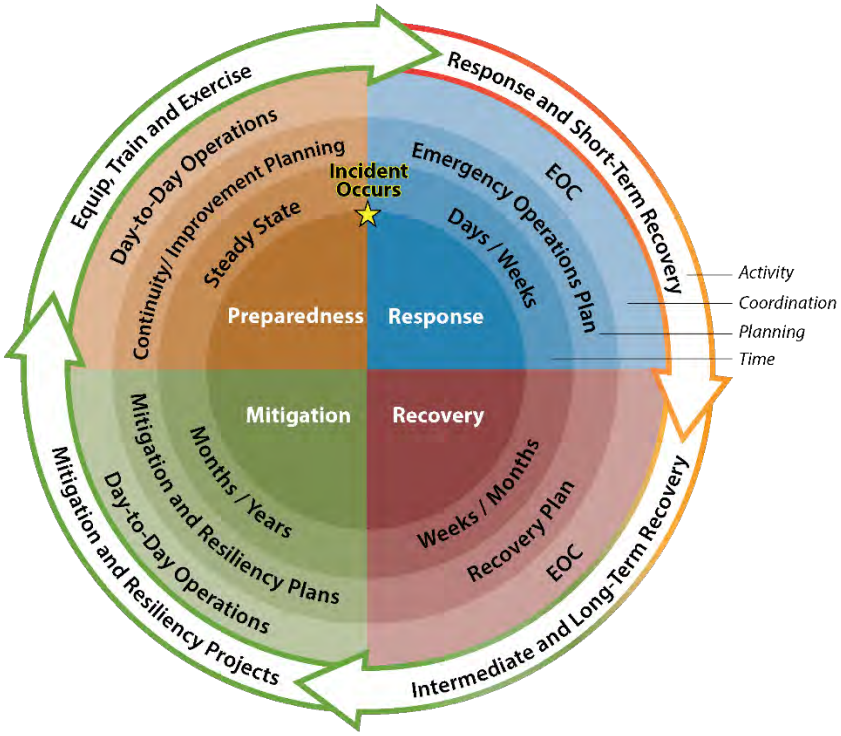
1.2 What is Hazard Mitigation?

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property posed by hazards (44 CFR §201.2). Hazard mitigation activities may be implemented prior to, during, or after an event. However, it has been demonstrated that mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs.

Additionally, hazard mitigation planning is one of the five mission areas presented in the National Preparedness Goal: Mitigation, Prevention, Protection, Response, and Recovery (see Figure 1-1). The Clallam County HMP is an integral piece of the County's comprehensive approach to emergency

management and is designed to align and integrate with other existing plans and emergency management activities.

Figure 1-1 Emergency Management Cycle



Mitigation planning is important because it not only encourages communities to become more flexible and adapt to change more easily, but it also:

- Guides mitigation activities in a coordinated and efficient manner;
- Integrates mitigation into existing County plans/programs;
- Considers future growth and development trends;
- Makes the community more disaster-resilient; and
- Ensures eligibility for grant funding.

1.3 Purpose and Scope

1.3.1 Purpose

The Clallam County HMP assesses the potential impact of all prioritized hazards to community members and property and provides mitigation strategies and actions to reduce such risks. The HMP prioritizes these strategies and includes an implementation plan to ensure strategic actions are carried out. The 2019 HMP is the required update of the County's 2010 HMP, expanded to account for both natural and human-caused hazards. The updated HMP ensures community members have access to the most up-to-date hazard risk information and maintains the County and participating communities' eligibility to receive federal mitigation funding.

1.3.2 Scope

While the HMP is focused on community members and property, strategies for broader community risk reduction are included. The County represents a geographically large area with communities throughout. The HMP attempts to account for all areas of risk concern and address the needs of each participating jurisdiction. The HMP is designed to integrate with other planning efforts and neighboring county mitigation plans. The Clallam County HMP is designed to be multi-jurisdictional and represents the efforts of the following participating jurisdictions:

- Clallam County
- City of Port Angeles
- City of Sequim
- City of Forks
- Jamestown S'Klallam Tribe
- Lower Elwha Klallam Tribe
- Makah Tribe (not formally involved in process)
- Quileute Tribe (not formally involved in process and maintains standalone HMP)

In addition to this HMP Basic Plan, each participating jurisdiction has developed standalone Jurisdictional Annexes that identify unique capabilities, risks, and mitigation strategies to lead their mitigation programs.

Refer to each Jurisdictional Annex for additional community-specific details.

1.4 Clallam County Hazard Mitigation Program

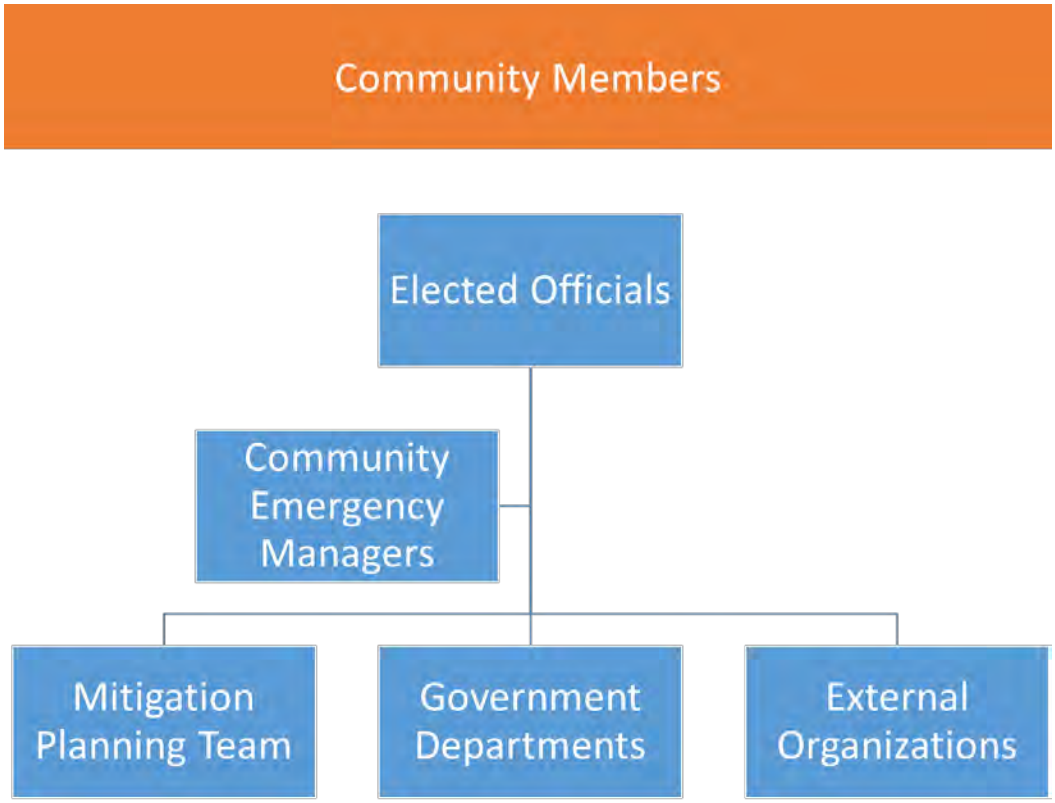
The HMP is one component of the County's approach to hazard mitigation. While not as heavily populated as many counties within Western Washington, the County and its partners maintain capabilities to ensure all elements of the participating communities are able to support hazard mitigation activities (see Chapter 5).

See Chapter 6 for details on ongoing implementation of the County's mitigation program.

1.4.1 Organization

Figure 1-2 illustrates how the County organizes to ensure an engaged and collaborative approach to mitigation planning and program implementation. This organization is informally referred to in this plan as the County's mitigation program.

Figure 1-2 Clallam County Multi-Jurisdictional Mitigation Program Organization



1.4.2 Roles and Responsibilities

The HMP exists as a framing document for the County's overall mitigation program. All community members, governmental entities, and businesses play a role in mitigation, and this section outlines those roles and responsibilities.

1.4.2.1 Community Members

Prepared and educated community members are a critical aspect of the County's resiliency, and the County and participating communities actively encourages its members to participate in efforts to minimize vulnerability to hazards by engaging in the following activities:

- Participate in preparedness programs. More information can be found in newsletters, Facebook pages, and through direct engagement; and
- Engage in personal and family preparedness and mitigation activities at home and at work.

1.4.2.2 Elected Officials

Elected leadership plays a key role in the County's mitigation program. As the local decision makers, they are responsible for balancing budgetary needs with the need to reduce risks. Participating

community elected officials perform the following activities in support of the County's mitigation program:

- Develop and set policy guidance and direction for the County's hazard mitigation program;
- Pass required ordinances to support the hazard mitigation program;
- Provide resources, funding, and direction for protecting and enhancing the lives of community members, and protecting cultural and natural resources;
- Adopt the HMP; and
- Approve funding and projects outlined in the HMP.

1.4.2.3 Jurisdictional Emergency Managers

Each participating jurisdiction employs an emergency manager or emergency management department. These community emergency managers serve as the lead coordinator for the community mitigation program. The emergency manager facilitates mitigation activities, including updates to the HMP, and provides technical assistance to other departments. Key responsibilities of the emergency managers include the following:

- Facilitate the jurisdiction's hazard mitigation program;
- Provide technical support to departments regarding integration of hazard mitigation into department activities; and
- Keep elected officials apprised of the status of the County's hazard mitigation program.

1.4.2.4 Mitigation Planning Team

The Mitigation Planning Team (MPT) includes representatives from each participating jurisdiction and was developed to ensure the HMP was reflective of capabilities, resources, and concerns throughout the County. Moving forward, the MPT will regularly convene to monitor, evaluate, and implement the County's mitigation program. Additional key responsibilities of the MPT include the following:

- Support ongoing implementation of the County's hazard mitigation program (see Chapter 7);
- Meet quarterly to address progress made on mitigation actions to date; and
- Provide input and technical support for updating and maintaining the HMP.

Refer to Chapter 2 for a discussion of the role of the MPT in the 2019 update of the Clallam County HMP.

1.4.2.5 Governmental Departments and Agencies

The success of the County's mitigation program is dependent on mitigation being a shared endeavor across all organizational elements of the governmental departments of each participating jurisdiction. Departments are strongly encouraged to incorporate hazard mitigation into their plans and programs and be active participants in the County's efforts to enhance resiliency. Key responsibilities of County departments include the following:

- Implement actions identified in the HMP;

- Incorporate hazard mitigation into other departmental planning efforts; and
- Assign a representative to serve as a liaison to the MPT.

1.4.2.6 Community Partners and Neighboring Jurisdictions

The County is committed to a collaborative mitigation program that strives to integrate with other community efforts to mitigate the impacts of hazards. While the scope of the HMP primarily includes participating jurisdiction departments, the County will continue to look for opportunities to partner with neighboring jurisdictions, private industry, nonprofit organizations, and community- and faith-based organizations in its mitigation program. In particular, the County will coordinate with Jefferson and Grays Harbor Counties, the State of Washington, and FEMA Region X among others, on an ongoing basis to ensure its hazard mitigation program considers the resources and implications on neighboring jurisdictions. Key responsibilities of community partners include the following:

- Incorporate hazard mitigation into organizational and business activities; and
- To the greatest extent possible, coordinate hazard mitigation activities with those of the County and other community partners.

Refer to Chapter 2 for a discussion of how community partners were engaged in the 2019 update of the Clallam County HMP.

1.5 Plan Organization

The 2019 update of the HMP is organized into the following chapters:

- **Chapter 1 – Introduction.** Identifies the authorities on which the plan is based, describes the plan's purpose and scope, describes how the plan is organized, and identifies changes to the plan since 2010.
- **Chapter 2 – Planning Process.** Describes the process used to update the plan, including data sources and plan integration activities, outreach and engagement strategies, MPT activities, and plan development milestones.
- **Chapter 3 – Community Profile.** Provides a summary community profile for the County including geographic, demographic, and economic characteristics that make the area unique.
- **Chapter 4 – Hazard Profiles and Vulnerability Assessments.** Contains a summary of the hazards that could potentially impact the community, including a hazard-ranking table.
- **Chapter 5 – Capability Assessment.** Identifies the existing mitigation capabilities of departments and organizations and highlights mitigation accomplishments over the last planning cycle.
- **Chapter 6 – Mitigation Strategy.** Provides updated goals and objectives for the County's mitigation program and identifies a comprehensive set of prioritized mitigation actions that would contribute to the County's resiliency.
- **Chapter 7 – Program Implementation.** Describes the County's plan for monitoring, evaluating, and updating the Clallam County HMP over the next five-year period.
- **Chapter 8 – References.** Identifies sources of data used to inform HMP.

In addition to the base document, the HMP is supported by a series of appendices that provide documentation of the planning process, expanded map sets, and additional data supporting the Risk and Vulnerability Assessment.

1.6 What's New in the 2019 Update?

The 2019 Clallam County Multi-Jurisdictional HMP serves as a continuation of the County's long-standing mitigation efforts. Throughout the update planning process, the MPT has sought to ensure that the process is more inclusive with more engagement and planning team consideration to what the plan's content means for its actual functionality. The County desires to go beyond creating an approved HMP and instead continue to develop its County-wide mitigation program that is constantly integrating hazard mitigation into daily operations.

The 2019 update of the HMP includes the following major revisions to the 2010 plan:

- A streamlined Basic Plan that is designed to be user-friendly and improve readability;
- An expanded public involvement process designed to solicit wide-ranging feedback on hazard mitigation planning from local jurisdictions. This included an online survey that was disseminated through social media and three interactive public workshops held in Port Angeles, Forks, and Sequim over the course of the plan development process (Chapter 2.5);
- Incorporation of additional hazards, including human-induced hazards (Chapter 4);
- Expanded hazard profiles that includes discussion of the impact of climate change on each hazard (Chapter 4);
- Focused mitigation strategy and prioritization methodology (STAPLEE) (Chapter 6); and
- Jurisdictional annexes that delve into the concerns of local and tribal governments, including tailored hazard rankings and risk assessments.

Additionally, to aid in plan review and to ensure that all FEMA planning requirements are met, text box callouts have been inserted into the plan that identify the planning element, based on FEMA's mitigation plan review tool, that is addressed in that particular section of the plan. The plan also strives to make robust use of internal call outs to ensure that plan users can easily find related information. For example, in Chapter 2, which addresses the planning process, the following text box appears:

FEMA	A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for [Clallam County]? (Requirement §201.6(c)(1))

See Appendix E for the completed FEMA Local Plan Mitigation Review Tool for the Clallam County HMP.

2 PLANNING PROCESS

Chapter 2 provides a narrative description of the planning process the County conducted to ensure that the County's mitigation strategy was informed by input from key departments, community partners, and community members. The process was based on strategies for inclusive engagement and integration with existing planning efforts.

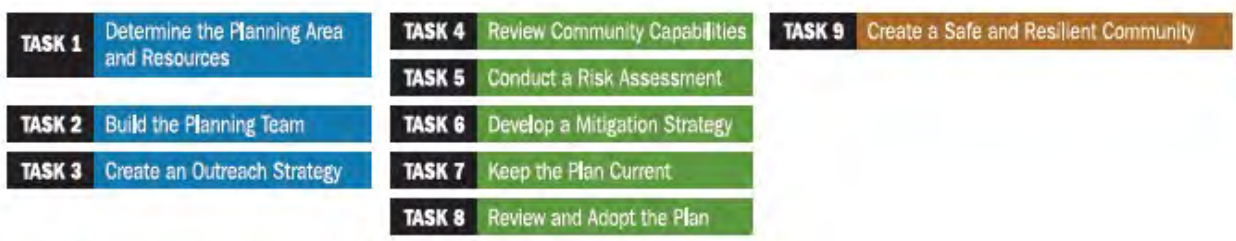
FEMA	A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for [Clallam County]? (Requirement §201.6(c)(1))

A HMP's organization is driven by the needs of the County. The following priorities were used to steer development of the HMP:

- Communicate priorities and values through mitigation strategies;
- Build community through a comprehensive and inclusive planning process; and
- Engage community members, elected officials, and our partners to ensure an equitable plan and mitigation program.

FEMA recommends nine tasks for developing or updating local HMPs (see Figure 2-1). Tasks 1 through 3 include the people and process involved in the all-hazards mitigation plan development or update; Tasks 4 through 8 focus on the analytical and decision steps that need to be taken; and Task 9 includes suggestions for plan implementation.

Figure 2-1 FEMA-Recommended Mitigation Planning Tasks



Source: FEMA Local Mitigation Planning Handbook, March 2013

2.1 Planning Area

Clallam County is uniquely positioned as a gateway to the Olympic Peninsula. As a result, the County faces mitigation planning challenges as it becomes an increasingly popular destination to live and recreate, while maintaining its historical communities and industries. While the County is not densely populated, visitors and seasonal residents result in large population expansions over short periods of time. Visitors and new residents may not be acquainted with the ways natural hazards impact a county that is not densely populated and whose services are limited along a few transportation corridors.

Much of the planning area is encompassed by the Olympic National Park; in all, the federal government owns approximately 523,000 acres (30.6 %) of land within Clallam County (Peninsula Daily News 2018).

This makes mitigation planning unique, as the County and local jurisdictions may be affected by natural hazards originating from federally managed lands.

See Figure 2-2 for a map of the planning area.

2.2 Data Collection and Incorporation of Existing Plans

FEMA	A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(1))

Data collection efforts for the Clallam County HMP focused on documents pertaining to the planning area. The primary source documents for the plan update were the 2010 HMP and Geographic Information System (GIS) data. Additionally, related emergency management plans; current local, tribal, county, and state HMPs; and plans with relevant hazard mitigation topics were reviewed as part of the data collection efforts. Examples of hazard mitigation planning best practices were also reviewed for their applicability to the HMP, including the State of Washington Enhanced HMP, Clallam County Community Wildfire Protection Plans (CWPPs), and others.

2.2.1 2010 Clallam County Multi-Jurisdictional Hazard Mitigation Plan

As part of the 2019 plan update, the following actions were taken to ensure that the update reflected progress in the County's mitigation efforts and any changes in priorities:

- Review and refinement of 2010 plan goals and objectives by the hazard mitigation planning team;
- Update of department mitigation capabilities; and
- Update of status for all mitigation actions identified in the 2010 plan.

Refer to Chapter 6, Table 6-5 for a review of the status of all mitigation actions identified in the 2010 plan update.

2.2.2 State of Washington Enhanced Hazard Mitigation Plan (2015)

The State of Washington Enhanced HMP identifies and prioritizes potential actions throughout the state that would reduce the state's vulnerability to natural hazards. In addition, the plan satisfies the requirements of FEMA to ensure the state is eligible to receive hazard mitigation and disaster assistance funds from the federal government. The current version of plan was approved on October 1, 2018 as an enhanced plan and is effective through 2023.

2.2.3 Integration of Geographic Information Systems Data

Efforts were made to ensure the HMP incorporates the most up-to-date and comprehensive data available. These data were used to develop maps contained within the HMP and develop comprehensive risk assessments that describe exposure to risk in terms of dollar amount and provide property counts (where available).

Refer to Appendix B for a comprehensive list of all GIS source data.

2.3 Coordination with Other Planning Efforts

FEMA	A5. Does the plan include a discussion on how the planning process was integrated to the extent possible with other ongoing County planning efforts as well as other FEMA programs and initiatives? (Requirement §201.6(c)(1)(iv))

The County has sought to incorporate its hazard mitigation planning into the planning efforts of local jurisdictions, tribal governments, and other entities:

- Other County-wide emergency plans, including the recent update of the Comprehensive Emergency Management Plan.
- Local comprehensive planning, including the City of Forks 2018 – 2038 Comprehensive Plan.
- Statewide emergency planning efforts involving exercises and trainings, including participation in the 2016 Cascadia Rising Functional Exercise.
- Washington State 2018 Enhanced HMP, which is a multi-agency statewide document.

Clallam County Emergency Management has developed operational areas throughout Clallam County that are separated geographically. This division allows emergency plans to be developed and risks evaluated based on the unique situations in those areas.

2.4 Mitigation Planning Team

The County began preparing for the update of the HMP by preparing an application to receive FEMA funding via the Pre-Disaster Mitigation Grant Program. Funding was received in April 2018, which allowed for the planning process to commence with contract support provided by Ecology and Environment, Inc. (E & E). The County Emergency Manager initiated the planning process through pre-planning via internal meetings and email exchanges with MPT members.

The MPT was convened at the start of the HMP update project to facilitate department and community member input into the HMP update. The MPT aided in the revision of mitigation goals and objectives, determination of risks and vulnerabilities, identification of mitigation strategies, refinement of mitigation review criteria, and prioritization and implementation of mitigation strategies. This planning process focused on improving intergovernmental coordination to ensure that the resulting document met the needs of all participating jurisdiction departments.

2.4.1 MPT Members

The MPT was led and organized by the County Emergency Manager. The members of the MPT who participated in the plan update and their associated organizations and departments are listed in Table 2-1. Each of these individuals participated in one or more workshops.

Table 2-1 Mitigation Planning Team Members

Name	Title	Agency
Bill Wheeler	Volunteer	American Red Cross
Rod Fleck	City Attorney/Planner	City of Forks

Table 2-1 Mitigation Planning Team Members

Name	Title	Agency
James Burke	Utilities & Public Works Director	City of Port Angeles
David Garlington	Public Works Director	City of Sequim Public Works Department
Ann Soule	Resource Manager	City of Sequim Public Works Department
Jennifer Chenoweth	Environmental Coordinator	Clallam County
Mark Ozias	District 1 Commissioner	Clallam County
Bill Peach	District 3 Commissioner	Clallam County
Jen Garcelon	Environmental Health Director	Clallam County
Jim Buck	Volunteer	Clallam County Emergency Management Department
Mark Lane	Chief Financial Officer	Clallam County Finance Department
Bill Paul	District Chief	Clallam County Fire District #1
Paul Howard	Firefighter	Clallam County Fire District #2
Jake Patterson	Deputy Chief	Clallam County Fire District #2, Rescue
Dan Orr	Assistant Chief	Clallam County Fire District #3
Greg Waters	Fire Chief	Clallam County Fire District $4
Tom Reyes	Deputy Director HR & Risk Management	Clallam County Human Resources
Tom Shindler	Geographic Information System (GIS) Coordinator	Clallam County Information Technology
Monicka Anderson	Information Systems Specialist	Clallam County Information Technology
Ross Tyler	Public Works Director	Clallam County Road Department
Kevin Gallacci	Acting General Manager	Clallam Transit System
David Bingham	Superintendent	Crescent School District
Leanne Jenkins	Tribal Planning Director	Jamestown S'Klallam Tribe
Luke Strong-Cvetich	Tribal Planner	Jamestown S'Klallam Tribe
Glen Roggenbuck	Emergency Management Coordinator	Lower Elwha Klallam Tribe
Joseph Schooler	Regional Outreach and Training Manager	Master Sergeant, Washington Army National Guard, 10th Homeland Regional Response Force
Julie Black	Director of Support Services	Olympic Medical Center
Marty Martinez	Campus Safety Operations Manager	Peninsula College
Robert Seavey	Volunteer	Pet Posse
Shari Hamilton	Volunteer	Port Angeles Pet Posse
Ken Dubuc	Fire Chief	Port Angeles Fire Department
Dan Gase	Airport & Real Estate Manager	Port of Port Angeles
Dan Shea	Operations Supervisor	Port of Port Angeles
Larry Morris	Safety Manager	Public Utilities District No. 1
Bill Henderson	Maintenance & Facilities Manager	Quileute School District
Sheri Crain	Chief of Police	Sequim Police Department
Ron Cameron	Undersheriff, Emergency Manager	Clallam County Emergency Management Department
Anne Chastain	EOC Coordinator	Clallam County Emergency Management Department
Jamye Wisecup	Emergency Management	Clallam County Emergency Management Department
Zane Beall	Contract Support, Project Manager	Ecology and Environment, Inc.
Manique Talaia-Murray	Contract Support, Emergency Planner/Project Manager	Ecology and Environment, Inc.
Tyler Chatriand	Contract Support, Engineer	Ecology and Environment, Inc.

1 *See Appendix A for full MPT member contact information and meeting participation.*

2.4.2 MPT Meetings

Plan needs were discussed, and key deliverables were reviewed at the MPT's formal meetings. The MPT convened for a series of six meetings over the course of the project (see Table 2-2), where representatives from key departments and other stakeholders had the opportunity to provide project insights, engage with the contractors, and collaboratively work on plan content. MPT members were informed of meetings via email reminders and conference call-in lines were provided for those unable to attend meetings.

The MPT meetings served as the primary data gathering mechanism throughout the planning process, and the importance of these meetings cannot be overstated. While contract support to develop the plan was provided by E & E, community members and government employees within the MPT crafted every concept outlined in the HMP. This includes data collection, determination of goals and objectives, articulation of specific hazards and risks, and development of a comprehensive mitigation strategy. MPT meeting outputs are referred to throughout each chapter of the HMP, indicated by MPT Meeting Deliverable graphic displayed to the right.

Table 2-2 Mitigation Planning Team Meeting Schedule

Mitigation Planning Team (MPT) Meeting	Date	Objectives
Meeting #1: Project Kickoff Workshop	11/6/2018	Project kickoff, including review of the planning process, ranking of hazards, determination of goals and objectives, and information gathering.
Meeting #2: Risk Assessment Workshop	1/29/2019	Review of updated risk assessment and development of additional risk characteristics (held concurrently with Public Meeting #1 in Port Angeles).
Meeting #3: Mitigation Strategy Workshop	3/27/2019	Development and prioritization of mitigation strategies (held concurrently with Public Meeting #2 in Forks).
Meeting #4: Data Gaps Review	7/15/2019 – 7/17/2019	Resolution of data gaps. MPT Meeting held in Port Angeles, with follow-up meetings with jurisdictions (held concurrently with Public Meeting #3 in Sequim).
Meeting #5: Draft Plan Review	10/8/2019	Draft plan review for MPT and community members (Webinar).
Meeting #6: Final Presentation	[TBD]	Final plan review, MPT approval

See Appendix A for documentation of all MPT activities.

In addition to six MPT meetings, the MPT was engaged through follow-up emails and requests to provide additional information pertaining to internal capabilities, department-specific risks, and

mitigation strategy development. MPT members unable to attend meetings were consulted after all meetings to ensure all inputs and perspectives were represented in the final HMP.

2.5 Inclusive Outreach and Public Engagement

FEMA	A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in 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(b)(2)) A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))

A critical component of the HMP update effort is a robust stakeholder engagement process that provides "an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval" (44 CFR §201.6). While providing an opportunity for public comment on the draft plan is one opportunity to engage with the public around hazard concerns, the planning team wanted to ensure the public had a meaningful way to participate in the process, which is outlined in the following sections.

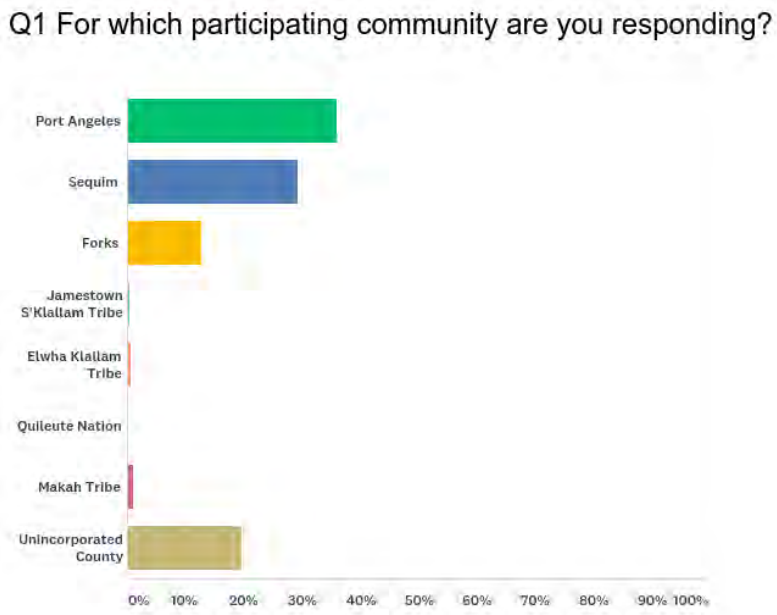
2.5.1 Inclusive Outreach and Public Engagement Plan

Inclusive public engagement was key throughout the County hazard mitigation process. The County provided multiple venues in which community members could participate in plan development. The use of online tools, interactive public meetings, and attendance at community events ensured there were a diversity of options to educate the public on the principles of hazard mitigation planning and to allow them to weigh in on the vulnerability of their communities.

2.5.1.1 Online Outreach

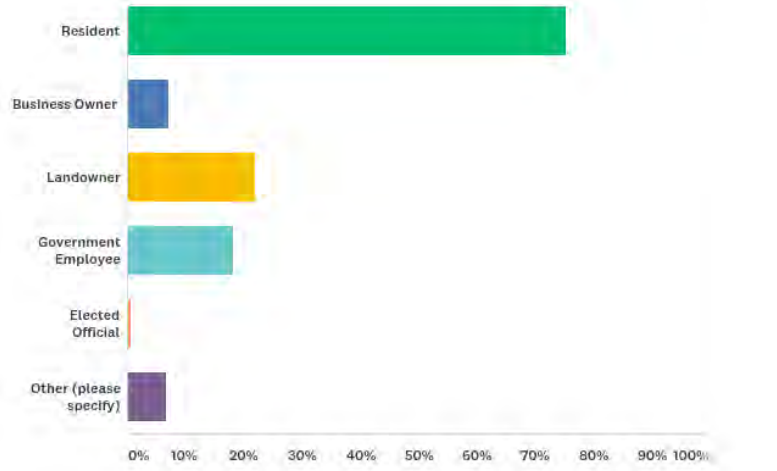
Public engagement was initiated soon after the HMP Kickoff Meeting (MPT Meeting #1). An online survey was developed to learn more about the public's initial concerns prior to plan development. The initial online survey was socialized through social media (e.g., Facebook, Next Door, etc.) beginning on December 6, 2018. Over the course of two months, over 550 individuals had responded to the survey and provided their feedback. The following figures indicate some of the key findings of the initial survey.

See Appendix A for complete survey results.



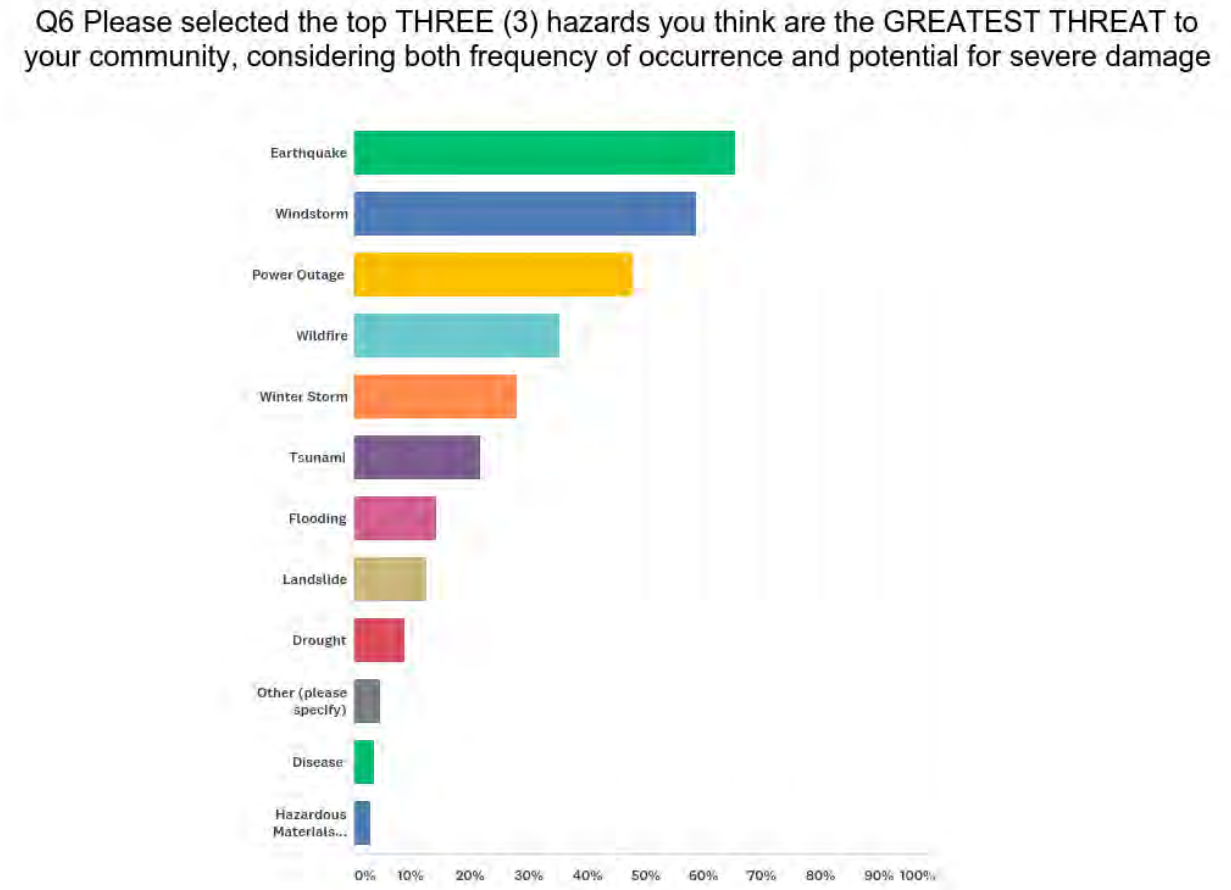
1

The initial survey was not nearly as effective at engaging tribal partners in the process, which informed future outreach efforts.



2

3 Survey respondents came from all walks of life and confirmed that it was not simply reaching government employees already engaged in the effort.



The public's initial hazard rankings were very similar to the MPT's (see Section 4.2), but also exposed potential areas of perceived risk that the MPT had not yet considered.

2.5.1.2 Public Meetings

The MPT hosted a series of public meetings to ensure additional stakeholders were reached who may not routinely respond to online surveys. To avoid the issues associated with traditional public meetings (e.g., low attendance, one-way communication), the MPT embraced an open house meeting concept that allowed the public to learn and discuss different HMP components in an interactive setting. As an example, the first Public Open House contained the following workstations for engagement:

- *What is Hazard Mitigation?* – Educational material related to the planning process.
- *Risk Assessment Mapping* – Access to a computer/projector to allow for participatory mapping/GIS.
- *Storytelling* – A table established specifically for the public to tell the County Emergency Manager about their experience with disasters.
- *Mitigation Ideas* – Access to a computer/projector to allow the public to share their ideas on mitigation projects and discuss the potential costs and benefits.

The following table provides a summary of public meetings held during the HMP update process.

Table 2-3 Public Meeting Schedule

Outreach Event	Date	Objectives	Attendance
Public Open House – Peninsula College, Port Angeles, WA	1/29/2019	Open house workshop dedicated to gathering feedback around major plan components including risk assessment, hazard information, and initial mitigation ideas.	50 members of the public participated.
Public Open House – Forks High School, Forks, WA	3/27/2019		17 members of the public participated.
Public Open House – Sequim, WA	7/17/2019		22 members of the public participated.

See Appendix A for additional public meeting documentation.

2.5.1.3 Community Events

The MPT engaged with the community beyond public meetings by attending community events to reach more members of the community and educate the public about the HMP and process. The MPT was present at the following community events:

- Clallam County Home Show: March 16-17, 2019
- Clallam County Fair: August 15-18, 2019

2.5.1.4 Plan Review

Community members were provided with the draft HMP from October 27, 2019 to the present on County and City websites and informed through various social media (e.g., Facebook and NextDoor).

An initial public comment period was held from October 27 through November 29, 2019.]. Members of the public were invited to share their thoughts about what hazards concern them most, and how they think the County and participating jurisdictions should prioritize activities to reduce hazard risks. During this time period, 7 public comments were received.

See Appendix A for a summary of outreach and engagement activities.

Table 2-3 Stakeholder and Public Outreach Activities Schedule

Outreach Event	Date	Objectives
Online Survey Outreach	12/13/2018-3/30/2019	Online survey developed to solicit input from community members regarding hazards of concerns.
Public Open House – Port Angeles	1/29/2019	Open house workshop dedicated to gathering feedback around major plan components including risk assessment, hazard information, and initial mitigation ideas.

Table 2-3 Stakeholder and Public Outreach Activities Schedule

Outreach Event	Date	Objectives
Public Open House – Forks	3/27/2019	Open house workshop dedicated to gathering feedback around major plan components including risk assessment, hazard information, and initial mitigation ideas.
Public Open House - Sequim	7/17/2019	Open house workshop dedicated to gathering feedback around major plan components including risk assessment, hazard information, and initial mitigation ideas.
Community Member Review Period	10/27/2019 – 11/29/2019	Public review of draft plan available on jurisdiction websites.
Final Hazards Mitigation Plan Approval	[TBD]	Planning Team Members provided with opportunity to provide input on plan prior to Federal Emergency Management Agency review.

2.5.2 Neighboring Jurisdiction and Partner Engagement Strategies

Clallam County represents a large geographic area, which requires the coordination of many external stakeholders to support the community's needs. These partners were invited to participate in the MPT Meetings to ensure the HMP properly identified risks that county, city, and tribal agencies may not be as familiar with. Other entities in attendance included:

- American Red Cross;
- Clallam County Public Utility District;
- Clallam Transit;
- Crescent School District;
- Peninsula College;
- Port of Port Angeles;
- Quileute School District;
- Olympic Medical Center; and
- Washington Army National Guard.

In addition, the partners provided feedback to the draft HMP, which was provided to the following jurisdictions and agencies at operational area meetings during the initial review period discussed above:

- Jefferson County Department of Emergency Management;
- Olympic Climate Action;
- Washington State Department of Corrections (Clallam Bay Prison);
- Cape Flattery School District;
- Quillayute School District;
- Forks Community Hospital;
- Crescent School District;
- Port Angeles School District;

- Clallam Transit.

2.6 Plan Development and Review

FEMA	A6. Does the plan include a description of the method and schedule for keeping the plan current (monitoring, evaluating, and updating the mitigation plan within the plan update cycle)? (Requirement §201.6(c)(4)(i))

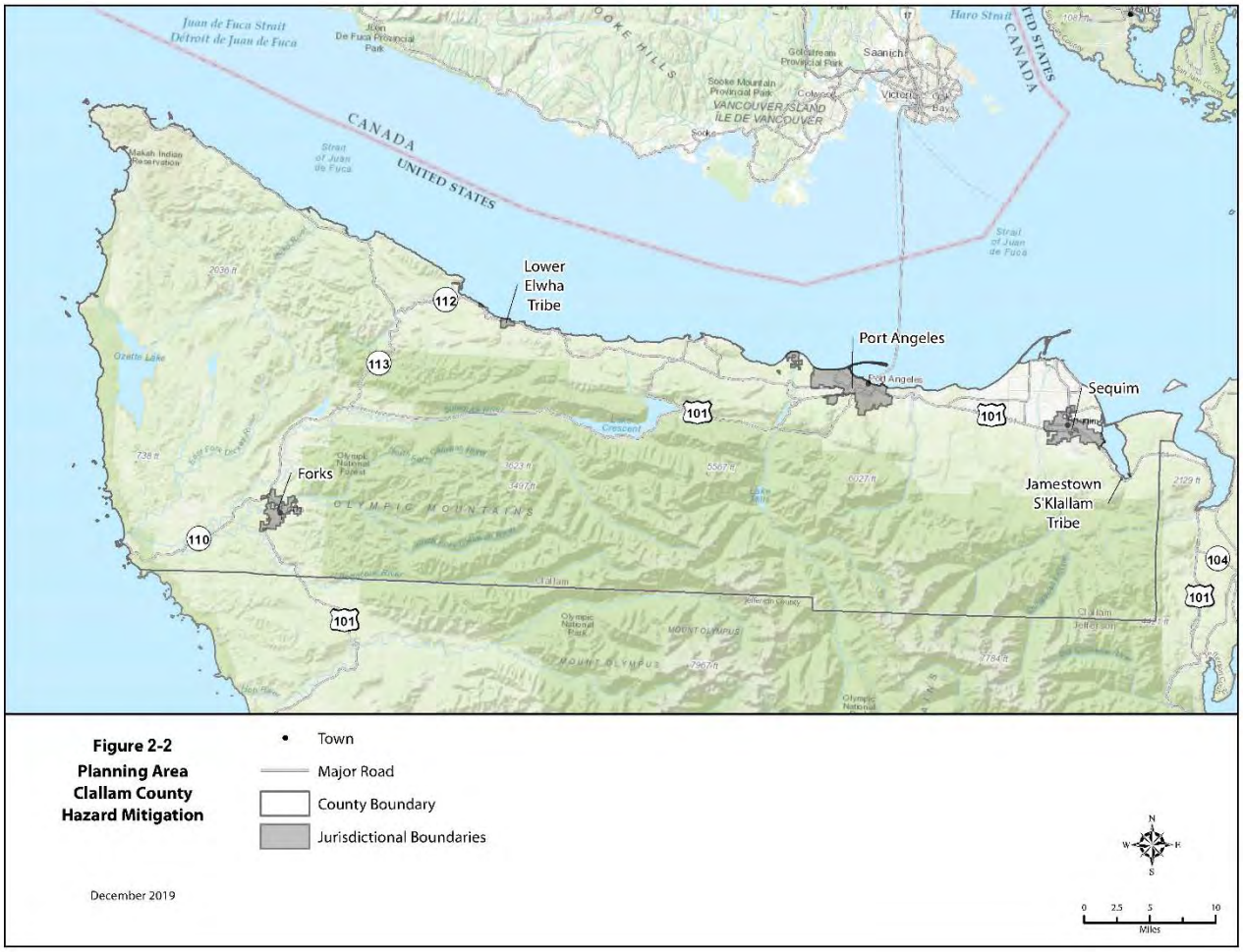
The HMP development was conducted according to the process outlined above and described in detail in FEMA's Local Mitigation Planning Handbook. The MPT reviewed the previous plan during the Project Kickoff Workshop and identified sections that required revision.

Updating the County's risk profiles and mitigation strategies were treated as the plan's primary purpose and the plan serves as the written record of the comprehensive planning process. In addition, the HMP reflects the County's current needs and hazard concerns. The development of the HMP update occurred over a 11-month period from November 2018 to October 2019. The plan development was conducted through a series of seven steps as detailed in Table 2-4. Many of the steps occurred concurrently. Table 2-4 also illustrates the corresponding FEMA local mitigation planning task for each HMP development milestone. The requisite State Hazard Mitigation Officer and FEMA review periods occurred during the draft and final HMP steps.

Table 2-4 Clallam County HMP Update Milestones and Timeline

Clallam County Hazards Mitigation Plan (HMP) Update Development Milestone	Corresponding FEMA-Recommended Mitigation Planning Task	Timeline	Updates Made? (Yes/No)
1. Data Collection and Document Review	Task 1 – Determine the Planning Area and Resources Task 5 – Conduct a Risk Assessment	October 2018-December 2018	Yes
2. Mitigation Planning Team Coordination	Task 2 – Build the Planning Team	November 2018-July 2019	Yes
3. Stakeholder Engagement and Outreach	Task 3 – Create an Outreach Strategy	January 2019-July 2019	Yes
4. Hazard Mitigation Strategy Update	Task 4 – Review Capabilities Task 6 – Develop a Mitigation Strategy	March 2019-August 2019	Yes
5. Draft Hazard Mitigation Plan[1]	Written documentation of the planning process (all tasks)	November 2018-October 2019	Yes
6. Final Hazard Mitigation Plan	Written documentation of the planning process (all tasks)	[Insert Dates Here]	Yes
7. Plan Adoption	Task 8 – Review and Adopt the Plan	[Insert Dates Here]	Yes

Figure 2-2 Clallam County HMP Planning Area



3 COMMUNITY PROFILE

Chapter 3 provides a summary of the County's key features. The County's mitigation strategy is designed to be reflective of the County's unique components.

3.1 Governance

Three County commissioners oversee governance of three districts: District 1 (East), District 2 (Central), and District 3 (West). The departments are as follows:

- Assessor
- Auditor
- Board of Equalization
- Boundary Review Board
- Community Development
- Cooperative Extension
- Clerk of Superior Court
- District I Court (East/Port Angeles)
- District II County (West/Forks)
- Health & Human Services
- Human Resources (Personnel)
- Information Technology
- Juvenile and Family Services
- Parks, Fair and Facilities
- Prosecuting Attorney
- Public Works
- Sheriff
- Superior Court
- Treasurer

3.2 Geography and Climate

Clallam County is endowed with a striking natural setting. The mild, maritime climate and amazing diversity of natural landscapes create a uniquely desirable place to live and work. The County is an elongated area 80 miles in length and 36 miles wide, located on the northern side of Washington State's Olympic Peninsula. Because of the Olympic Mountain range, transportation routes are restricted to a narrow portion of the coastal shelf. A single two-lane highway (U.S. Highway 101) transects the County from east to west, with an additional two-lane highway connecting with the northwest portion (State Routes 110, 112, 113, and 117). Various county roads and city streets make up the remainder (Clallam County 2010).

The geography includes coastal plains and the Olympic Mountains. The Olympic Mountains reach elevations of nearly 8,000 feet and are deeply incised by rivers. The area is impacted by winter storms that move inland from over the ocean, resulting in frequent heavy precipitation and winds of gale force. Wind velocities in the lower elevations can be expected to reach 90 to 100 miles per hour once every 100 years. Wind velocities in excess of 100 miles per hour occur in the higher elevations almost every winter (Clallam County 2010).

The "rainforest" area along the western slopes of the Olympic Mountains receives the heaviest precipitation in the continental United States. Annual precipitation ranges from 70 to 100 inches over the Coastal Plains to 150 inches or more along the windward slopes of the mountains. Winter season snowfall ranges from 10 to 30 inches in the lower mountainous elevations and between 250 to 500 inches at higher elevations. In midwinter, the snowline in the Olympic Mountains is between 1,500 and 3,000 feet above sea level (Clallam County 2010).

The Olympic "rainshadow" includes the lower elevations along the northeastern slope of the Olympic Mountains extending east along the Strait of Juan de Fuca from Port Angeles, east to Whidbey Island, and then north to the Strait of Juan de Fuca. The Olympic Mountains and the extension of the Coastal Range on Vancouver Island in the north shield this area from winter storms moving inland from the ocean. The area within the rainshadow is the driest in western Washington (Clallam County 2010).

Out of the three incorporated cities in Clallam County, Forks had the greatest average annual precipitation levels (119.7 inches) from 1981 to 2010. Sequim and Port Angeles are both located within the rainshadow of the Olympic Mountains and had the least precipitation on average during that time span (Sequim: 16 inches). Annual maximum and minimum average temperature were roughly equivalent between Port Angeles, Forks, and Sequim, with the maximum average temperatures typically occurring in June, July, August, and September (Western Regional Climate Center 2010). In Port Angeles the maximum average annual temperature from 1981 to 2010 was 59°F, and the minimum average annual temperature was 42°F for the same time period.

3.3 Population and Demographics

According to the 2010 Census, the population of Clallam County was 71,404. The percent population growth from 2010 to 2017 was approximately 5.7%, resulting in an estimated 2017 population of 75,474 (US Census 2017).

Table 3-1 Clallam County Population and Demographics

Population	Clallam County	Washington State (2016)
Population by age, 2017		
Under 5 years old	4.7%	6.2%
Under 18 years old	17.3%	22.4%
65 years and older	28.8%	14.8%
Women, 2017	50.6%	50.0%
Race/Ethnicity, 2017		
White	87.3%	80.0%
Black	1.2%	4.1%
American Indian, Alaskan Native	5.6%	1.9%
Asian, Native Hawaiian, other Pacific Islander	2.0%	9.4%
Hispanic or Latino, any race	6.3%	12.4%

Source: United States Census Bureau Quick Facts for Clallam County, WA (2017)

As of 2017, an estimated 14.3% of Clallam's County population under the age of 65 years is disabled, and 8.9% of the County population under age 65 do not have health insurance. The median household income from 2013 to 2017 was $48,002, with 16.4% of the County population living in poverty. In the time range between 2013 and 2017, approximately 5% of persons age 5 years or greater spoke a language other than English at home (U.S. Census 2017).

Between 2013 and 2017, Clallam County had 36,912 housing units, of which 69.6% are owner-occupied. The median value of owner-occupied homes is $227,400. During this time, 87% of households owned a computer, and 80% had a broadband internet subscription (U.S. Census 2017).

3.4 Economy

The following text is sourced from the Clallam County profile developed by the Washington State Employment Security Department (2017):

Around 1851, the first white settlers staked their claims in the area. Clallam County was created in 1854 from bordering Jefferson County. The county's name is derived from the Klallam or S'Klallam people who continue to play a significant role in the county. In 1890, Port Angeles was named the county seat. Sequim and Forks are the other two incorporated cities in the county.

Initially, logging was the primary industry, and benefitted greatly when railroads made it possible to reach further and further into the great conifer stands. Hydroelectric power from the Elwha River dam spurred the first large sawmill in the area. The "Big Mill" was the largest employer in the county for the next 25 years. World War I fueled the need for spruce, which was vital to building the first airplanes. In the 1920s, pulp production took off in Port Angeles, providing the growing need for newsprint and cellulose.

After World War II, growth continued in timber and agriculture. Commercial and sport fishing activities became increasingly important. In the 1960s, Clallam County tribes reclaimed traditions and reasserted tribal rights to shares of fish harvests. The Jamestown S'Klallam tribe won federal recognition in 1981, and received trust land at Blyn on Sequim Bay, which now houses a tribal center and casino.

The service sector has been experiencing growth over the past decade. In 2016 is accounted for 88.7% of all non-farm employment. The county houses two prisons, a hospital and school district, which are top employers. The City of Forks continues to be a tourist attraction after the Twilight movies put it on the map.

Other new industries have moved into the county in the past decade. Advanced composites manufacturing has been established in and around the Port Angeles area, providing manufactured parts to the aerospace and marine industries. Advanced Composites resulting is also continuing with the new Composites Recycling Technology Center developments.

Over the past 20 years, the economy in Clallam County has experienced slow but steady growth. This economic growth has been shaped by a vibrant port district in the county's major coastal city of Port Angeles. New in-migration is also on the rise as many retirees are attracted to Sequim's "sunbelt" climate. (WA ESD 2017)

3.5 Land Use

Table 3-2 contains the Clallam County land use designations as defined in the Comprehensive Plan (Clallam County 2019a). The majority (58%) of lands are designated natural resource lands and include commercial forest and agricultural lands. The designated Urban Growth Areas (UGAs) account for only 2% of the total county and include both incorporated and unincorporated areas of Port Angeles, Forks, and Sequim.

Table 3-2 Clallam County General Comprehensive Plan Land Use Designations

General Land Use Designation	Acres	% of County
Urban Growth Areas (UGA)[1]	21,579 ac. (Total)	1.94% (Overall)
Sequim UGA	5,219 ac.	0.47%
Port Angeles UGA	9,193 ac.	0.83%
Forks UGA	4,867 ac.	0.44%
Carlsborg UGA	557.8 ac.	0.05%
Clallam Bay-Sekiu UGA	1,386 ac.	0.12%
Joyce UGA	357 ac.	0.03%
Natural Resource Lands[2]	640,743 ac. (Total)	57.63% (Overall)
Commercial Forest	634,569 ac.	57.08%
Agricultural Retention	6,168 ac.	0.55%
Rural Lands	100,765ac. (Total)	9.06% (Overall)
Rural	92,176 ac.	8.29%
Residential "limited area of more intensive rural development" (LAMIRD)	6,224 ac.	0.56%
Commercial and Mixed Use LAMIRDs	2,364 ac.	0.21%
Public Lands[3]	4,734 ac.	0.40%
Other Lands[4]	343,858 ac. (Total)	30.93% (Overall)
Olympic National Park	312,685 ac.	28.13%
Tribal Reservation & Trust	31,173 ac.	2.80%

Notes:
[1] The Forks, Port Angeles and Sequim UGA's include both unincorporated and incorporated areas.
[2] Commercial forest lands are also designated under the comprehensive plan as mineral resource lands of long-term commercial significance.
[3] Excludes public land designations within UGA's. The Public Land designations include county and state parks, the Dungeness Wildlife Refuge, and some other public ownerships not otherwise designated as Natural Resource and Rural Lands.
[4] Olympic National Park and Tribal Reservation and Trust lands are not subject to the GMA or County comprehensive plan and development regulations.

3.6 Transportation & Commuting Patterns

Forty percent of residents live in the incorporated cities of Forks, Port Angeles, and Sequim. Other unincorporated communities inside Clallam Bay – Sekiu, Neah Bay, and Joyce. The population density per square mile is 41.1 individuals, as of the 2010 U.S. Census (Clallam County 2010).

Transportation routes are restricted to the coastal shelf because of the Olympic Mountain range. U.S. Highway 101, a two-lane highway, is the main east-west transportation route across the County and is vulnerable to multiple hazards. Additional State Routes 110, 112, 113, and 117, and various county roads and city streets, are also important transportation routes. Every winter, landslides, erosion,

standing water, and fallen trees affect the population's ability to travel throughout the County. Most people commute to and from work in their private cars. Clallam County Transit provides economical and efficient transport throughout the County unless they are impacted by natural hazards. ParaTransit provides services to disabled individuals by appointment (Clallam County 2010).

Airports with hard surface runways are located in Port Angeles, Sequim, Forks, Diamond Point, Sekiu, Quillayute, and the US Coast Guard station on Ediz Hook. The Port Angeles harbor is classified as a deep-water seaport. There are 180 miles of open coastline adjacent to major international shipping lanes, all shipping en route to Seattle, Tacoma, upper Puget Sound, and Vancouver, B.C., Canada (Clallam County 2010).

4 HAZARD PROFILES AND VULNERABILITY ASSESSMENTS

Chapter 4 contains hazard profiles and vulnerability assessments to determine the potential impact of hazard to the people, economy, and built and natural environments of Clallam County. They have been streamlined to increase the effectiveness and usability of the HMP. Additional detail is contained within Appendix C.

FEMA	B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect [Clallam County]? (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 [Clallam County]? (Requirement §201.6(c)(2)(i)) B3. Does the plan include a description of each identified hazard's impact as well as an overall summary of the vulnerability of the planning area? [44 CFR § 201.6(c)(2)(ii)]

4.1 General

The County has received 20 major disaster declarations, including 5 since the previous HMP update. Table 4-1 identifies these declarations.

Table 4-1 Past FEMA Disaster Declarations

DR #	HM Program Declared	Title	Incident Begin Date	Incident End Date
4418	Yes	SEVERE WINTER STORMS, STRAIGHT-LINE WINDS, FLOODING, LANDSLIDES, MUDSLIDES, TORNADO	12/10/2018	12/24/2018
4253	Yes	SEVERE WINTER STORM, STRAIGHT-LINE WINDS, FLOODING, LANDSLIDES, MUDSLIDES, AND A T	12/1/2015	12/14/2015
4249	Yes	SEVERE STORMS, STRAIGHT-LINE WINDS, FLOODING, LANDSLIDES, AND MUDSLIDES	11/12/2015	11/21/2015
4242	Yes	SEVERE WINDSTORM	8/29/2015	8/29/2015
4056	Yes	SEVERE WINTER STORM, FLOODING, LANDSLIDES, AND MUDSLIDES	1/14/2012	1/23/2012
1825	Yes	SEVERE WINTER STORM AND RECORD AND NEAR RECORD SNOW	12/12/2008	1/5/2009
1817	Yes	SEVERE WINTER STORM, LANDSLIDES, MUDSLIDES, AND FLOODING	1/6/2009	1/16/2009
1734	Yes	SEVERE STORMS, FLOODING, LANDSLIDES, AND MUDSLIDES	12/1/2007	12/17/2007
1682	Yes	SEVERE WINTER STORM, LANDSLIDES, AND MUDSLIDES	12/14/2006	12/15/2006
1641	Yes	SEVERE STORMS, FLOODING, TIDAL SURGE, LANDSLIDES, AND MUDSLIDES	1/27/2006	2/4/2006
3227	No	HURRICANE KATRINA EVACUATION	8/29/2005	10/1/2005
1499	Yes	SEVERE STORMS AND FLOODING	10/15/2003	10/23/2003
1361	Yes	EARTHQUAKE	2/28/2001	3/16/2001

Table 4-1 Past FEMA Disaster Declarations

DR #	HM Program Declared	Title	Incident Begin Date	Incident End Date
1172	No	HEAVY RAINS, SNOW MELT, FLOODING, LAND & MUD SLIDES	3/18/1997	3/28/1997
1159	Yes	SEVERE WINTER STORMS, LAND & MUDS SLIDES, FLOODING	12/26/1996	2/10/1997
1079	Yes	SEVERE STORMS, HIGH WIND, AND FLOODING	11/7/1995	12/18/1995
1037	No	THE EL NINO (THE SALMON INDUSTRY)	5/1/1994	10/31/1994
883	Yes	SEVERE STORMS & FLOODING	11/9/1990	12/20/1990
757	Yes	SEVERE STORMS & FLOODING	1/16/1986	1/19/1986
623	Yes	VOLCANIC ERUPTION, MT. ST. HELENS	5/21/1980	5/21/1980
612	No	STORMS, HIGH TIDES, MUDSLIDES & FLOODING	12/31/1979	12/31/1979

Source: FEMA 2019a. Disaster Declarations by State and County. https://www.fema.gov/data-visualization-disaster-declarations-states-and-counties.

The hazard profiles and vulnerability assessments contained in this chapter represent a considerable amount of work performed by the MPT. MPT members ranked hazards using a number of key considerations, followed up by activities to validate hazard analysis results and identify specific areas of risk. Table 4-2 displays the hazards that MPT selected for further assessment.

Table 4-2 Hazards Addressed in Plan

Hazard Type	Hazard Name
Natural Hazards	Earthquake Wildfire Windstorm Winter Storm Landslide Flooding Tsunami Drought
Human-Caused Hazards	Disease Active Threat Hazardous Materials Incident

4.2 Hazard Ranking Methodology

The hazards identified in the HMP were initially ranked based on MPT feedback during MPT Meeting #1. Participants were asked to rank hazards on a scale of 1 (lowest concern) to 5 (highest concern) based on five key attributes:

- **Probability:** Likelihood of the hazard occurring.
- **Magnitude:** Areas potentially impacted, the overall impacts, and the chance of one hazard triggering another hazard, thus causing a cascading effect.
- **Onset:** The time between recognition of an approaching hazard and when the hazard begins to affect the community.
- **Duration:** The length of time the hazard remains active, the length of time emergency operations continues after the hazard event, and the length of time that recovery will take.
- **Frequency:** How often a hazard has resulted in an emergency or disaster.

Following the individual hazard ranking activity, the results were added up and aggregated to show an average score for the MPT members from each participating jurisdiction. The aggregate results were shared with the MPT at MPT Meeting #2 and the final rankings were adopted for the HMP and are available in Table 4-3.

The hazard ranking findings for each participating jurisdiction are available within the Jurisdictional Annexes.

Table 4-3 Hazard Ranking Table

Clallam County - Local Hazards							
	Magnitude (1=lowest, 5=highest)	Onset (1=slowest, 5=fastest)	Duration (1=shortest, 5=longest)	Frequency (1=lowest, 5=highest)		Average	Rank
Cascadia Earthquake	4.75	4.83	3.08	1.25		3.48	1
Earthquake	4.33	4.67	3.17	1.42		3.40	2
Disease	3.58	3.17	3.83	2.82		3.35	3
Power Outages	1.75	4.50	2.83	4.17		3.31	4
Wildfire	2.25	4.00	3.25	2.75		3.06	5
Windstorm	1.92	3.50	2.33	4.42		3.04	6
Winter Storm	2.00	3.25	2.75	4.00		3.00	7
Active Shooter	2.92	5.00	2.17	1.42		2.88	9
Hazardous Materials Accident	1.92	4.92	2.67	1.83		2.83	10
Landslide	1.50	4.42	2.58	2.67		2.79	11
Flooding	1.67	3.33	2.42	3.25		2.67	12
Tsunami	3.25	4.08	2.17	1.08		2.65	13
Drought	1.83	1.58	3.92	2.67		2.50	14
Note: Other hazards receiving votes included: pandemic, smoke inhalation, snowpack drought, and heat exposure.							

Refer to Appendix B for individual hazard ranking results.

4.3 Hazard Considerations

Hazards cannot be simply viewed in a vacuum. Each community interacts with hazards according to several place-specific values.

4.3.1 Limitations of Mitigation

Mitigation plans speak to the need to reduce the risks associated with hazards. However, not all risks can always be reduced. Whether mitigation actions are too expensive or otherwise unfeasible, certain aspects to hazards have been removed from this plan as the County views them as unattainable.

4.3.2 Future Conditions

We often think of hazards as having a linear occurrence interval. This notion is being challenged by a changing climate. Hazards such as flood that were once considered linear in nature are now being witnessed in a non-linear and irregular pattern.

Our natural and built environment is shaped by climate—humidity, precipitation, temperature, wind and seasons. Changes to these elements over an extended period of time are referred to as climate change, which is driven by an increase in average global temperatures due to the accumulation of greenhouse gasses in the earth's atmosphere.

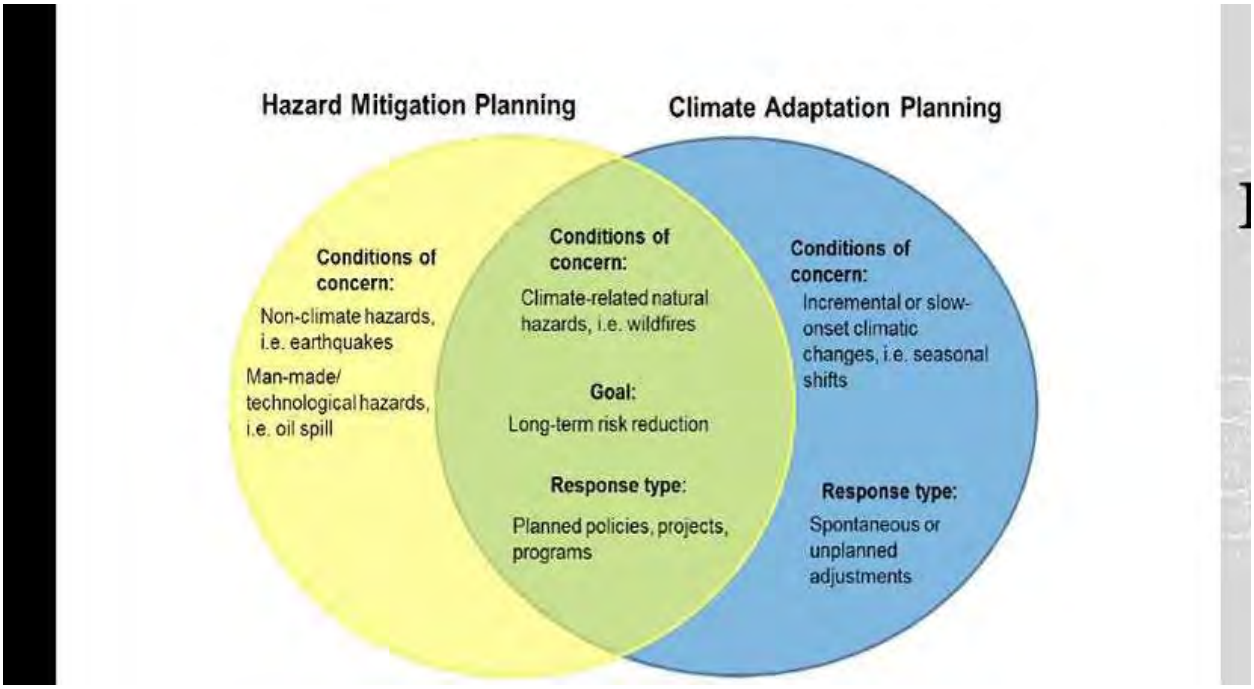
Potential impacts of future climate conditions include increased average temperatures, decreased snow accumulation, and increased peak stream flow. The increasing average temperature is expected to be more pronounced during summer months, and decreased summer precipitation is expected to accompany this shift. The frequency and magnitude of extreme precipitation events is also expected to increase, particularly in the winter. In short, what is currently viewed as a 100-year event, may soon be reconsidered as a 50-year event or even a 10-year event. This would place further stress onto storm drainage systems and natural stream systems; placing community members at an increased risk for flooding (IPCC 2001).

Furthermore, changing precipitation and temperature may impact potable water and first food availability. If precipitation falls during a shorter period of the year, with a longer, drier, hotter summer, the need for water storage may grow. Decreased water availability combined with increased demand may exacerbate water rights conflicts (Local 2020 2019).

Finally, changing climate conditions can impact ecosystems, with complicated feedbacks that may affect ecosystem services that the public relies on for recreation, water quality, and overall well-being.

Impacts from climate change effect the ways that communities are able to mitigate hazards, because the trends of the past are not necessarily aligned with future climate conditions. Mitigation planning and climate adaptation planning are linked, by necessity (Figure 4-1).

Figure 4-1 Climate Adaptation in Mitigation Planning



4.3.3 Cascading Impacts

Hazards do not occur in a vacuum and the occurrence of one hazard has the potential to cause multiple other hazards and adverse effects. As such, the County has attempted to take the risk assessment one step further by identifying the potential cascading, or secondary impacts that may be generated by a hazard. In better understanding these cascading impacts, the County will be better prepared to holistically address their risks and vulnerabilities.

4.4 Risk-Driven Planning

The risk assessments discussed in this section were developed through a combination of stakeholder feedback and comprehensive GIS analyses. The combined findings shaped a risk-driven planning process that resulted in mitigation strategies focused on the real risks and vulnerabilities that the County faces.

4.4.1 Stakeholder Feedback

In addition to the hazard ranking activity identified in Section 4.2, MPT participants were also engaged during MPT Meeting #2 to provide insights regarding the risk assessment portion of the HMP. As part of the workshop, participants were asked to review each hazard based on the following attributes (which are very closely aligned with the attributes identified in Section 4.5):

- **Geographic Scope:** A description of the locations most likely to be impacted by the hazard.
- **Health Impacts:** A description of the potential short- and long-term human health complications related to the hazard.

- **Displacement:** A description of the hazard's likelihood to cause the displacement of residents or visitors accompanied by an estimate on the anticipated displacement duration.
- **Economic Impacts:** A description of the potential economic and financial losses related to the hazard.
- **Environmental Impacts:** A description of the potential impacts that may adversely affect natural systems.
- **Structural Impacts:** A description of the scale and scope of potential building and infrastructure damages related to the hazard.
- **Critical Services:** A summary of the County departments and functions most likely to be taxed following the hazard.
- **Cascading Effects:** A brief overview of potential secondary hazards caused by the onset of the initial hazard in question.

See Appendices B-1 and B-2 for the results of the MPT Risk Assessment Activity.

4.4.2 GIS Analyses

CASCADING IMPACT EXAMPLE

An earthquake stands as a singular hazard presenting unique risks, but an earthquake in and of itself is likely to cause secondary hazards for the community such as:

- Landslides
- Utility Failure
- Urban Fires
- Transportation Accidents

Numerous risk assessments are supported by maps and tables generated through comprehensive GIS analyses. A series of processes were performed to identify areas in which County properties intersect with mapped hazards and estimate the potential economic losses associated with such losses. This project relied heavily upon publicly available data compiled by the Washington State Department of Natural Resources (DNR). The data is newly updated and represents some of the best data available in the United States, providing a locally, sourced reference for hazard information. Table 4-4 indicates the data sources used to estimate such losses.

Table 4-4 GIS Data Sources

Data Grouping	Specific Data Files
Hazard Data	Earthquake Fault Lines
	Cascadia Subduction Zone Peak Ground Acceleration
	Fire Hazard Ratings
	Flood Hazard Zones
	Hazardous Materials Storage
	Environmental Cleanup Sites
	Other Hazardous Materials Sources
	Historic Landslides
	Landslide Deposits
	Landslide Susceptibility

Table 4-4 GIS Data Sources

Data Grouping	Specific Data Files
	Liquefaction Susceptibility
Jurisdictional Data	Parcels/Properties
	Building Footprints
	Land Use
	Vegetation
Additional Asset Data	Education Facilities
	Hospitals and Medical Facilities
	Fire Stations
	Other Infrastructure
Base Map Data	Arterials and Highways
	Waterways and Streams
	County Administrative Lines
	Railways
	City Outlines

See Appendix C-1 for GIS Data Sources.

4.5 Hazard-Specific Profiles and Risk Assessments

The following section profiles each hazard identified in Section 4.2 and assesses the risk associated with each. Each risk assessment considers the following attributes:

- **Hazard Description:** A brief introduction to the mechanisms behind the hazard.
- **Location:** An indication of geographic areas that are most likely to experience the hazard.
- **Past Occurrences/History:** Similar to Location, a chronological highlight of recent occurrences of the hazard accompanied by an extent or damage cost, if available.
- **Potential Impacts from Future Climate Conditions:** A brief overview indicating ways in which the hazard profile may change over time due to a changing climate, if applicable.
- **Extent/Probability:** A description of the potential magnitude of the hazard, accompanied by the likelihood of the hazard occurring (or a timeframe of recurrence, if available).
- **Cascading Impacts:** A brief overview of secondary hazards often associated with the hazards.
- **Vulnerability:** A description of the potential magnitude of losses associated with the hazard. Vulnerability may be expressed in quantitative or qualitative values depending upon available data. Identifies development trends impact on the County's vulnerability to each hazard since the 2010 plan development (increased, decreased, unchanged).

To enhance the usability of the HMP, risk assessments have been streamlined to provide only critical information within the body of this section. Additional information including detailed, close-up maps can be found in Appendix C.

In addition, the hazards have been organized into three sub-sections (high-, medium-, and low-priority) to illustrate the risk-driven nature of the HMP. Each hazard has been given serious consideration of all attributes discussed within. However, low-priority hazards may be shorter in length and with less quantitative analyses, as a lack of usable data is frequently present when considering low-likelihood or low-magnitude events. The three sub-sections below represent County MPT representatives' hazard prioritization:

- **High-Priority:** Cascadia Earthquake, Earthquake, Disease, Power Outages.
- **Medium-Priority:** Wildfire, Windstorm, Winter Storm, Active Shooter, Hazardous Materials Incident.
- **Low-Priority:** Landslide, Flooding, Tsunami, Drought.

4.5.1 Earthquake

Earthquake

Hazard	Magnitude	Onset	Duration	Frequency	Average	Rank
Cascadia Earthquake	4.75	4.83	3.08	1.25	3.48	1
Earthquake (other)	4.33	4.67	3.17	1.42	3.40	2

Hazard Description

An earthquake is the movement of the earth's surface following a tectonic shift. This can be caused by dislocation or volcanic eruption. While it is difficult to predict when an earthquake will happen, they do often reoccur along the same fault zones, meaning we know where they are most likely to occur. The County is most likely to be widely impacted by movement along the Cascadia Subduction Zone (CSZ) (where the Juan de Fuca plate is being pushed beneath the North American plate), deep earthquakes along the Juan de Fuca plate, and shallow crustal faults. The CSZ extends from northern California to southern British Columbia and is located 100 miles from Washington's outer coast. An earthquake could occur along this zone when built-up pressure causes the plates to slide rapidly past each other (Clallam County 2013).

The shallower, crustal earthquakes may also cause widespread damage. The Lake Creek – Boundary Creek fault is one of at least nine upper-plate active faults in the Puget Lowland region (Seismological Society of America 2017). The epicenters of these earthquakes will be closer to population centers. Studies in the vicinity of the Lake Creek-Boundary Creek fault shows there have been at least three earthquakes over the past 8,000 years in the eastern section of the fault and there is evidence for multiple earthquakes on the western section of the fault (DNR 2012).

Tectonic action can also result in soil liquefaction (when strong earthquake shaking causes soil to rapidly lose its strength and behave like quicksand), tsunami (when deep-sea tectonic action causes long wavelength, small amplitude waves that grow in height as water becomes shallower), and landslides or bluff failure.

Location

The CSZ poses a great risk to all coastal communities along its length. Earthquakes have the potential to damage critical infrastructure, such as bridges and roads, cutting off county and tribal communities from outside aid in the aftermath of an event and forming isolated "micro-islands."

The relatively shallow Lake Creek-Boundary Creek Fault runs east-west through Clallam County, approximately from the vicinity of Lake Crescent to Siebert Creek. An earthquake along a shallow crustal fault such as the Lake Creek – Boundary Creek Fault could potentially lead to more widespread shaking and damage in the population centers of Port Angeles and Sequim.

See Section 4.5.11 for the localities at risk for tsunami. Liquefaction typically occurs in areas with artificial fill or of loose sandy soils that are saturated with water (e.g., low-lying coastal areas, lakeshores, and river valleys). Areas that contain soils with high risk of liquefaction include (but are not limited to) the Quillayute River basin from La Push to Forks; parts of the Sol Duc River basin; along the north shore of Lake Ozette; the communities of Neah Bay, Clallam Bay, and Pysht; coastal Port Angeles; and much of Sequim (DNR 2004).

See *Appendix C-1 for more details.*

Earthquake

Eastern and western section of Lake-Creek Boundary Creek fault (Nelson et al., BSSA, 2017)

Previous Occurrence/History

The most recent earthquake that damaged Clallam County was the 2001 Nisqually Earthquake. Small earthquakes occur regularly throughout the region and go unnoticed by residents. Over the last 135 years, there have been nine earthquakes with a magnitude (M) greater than 6.0 in the area that we consider the Northwest. Five of those large quakes (including the Nisqually earthquake) directly impacted the Olympic Peninsula, according to eye-witness accounts (Clallam County 2010).

- 1700, CSZ Earthquake, M9.0
- 1909, San Juan Island, M6.0
- 1939, Vashon Island, M6.1
- 1949, Olympia, M7.1
- 1965, Seattle – Tacoma, M6.5
- 2001, Nisqually, M6.8

Potential Impacts from Future Climate Conditions

Future climate conditions are unlikely to have any effect on earthquake magnitude, severity, or probability.

Earthquake

Cascadia Subduction Zone

Source: Oregon Office of Emergency Management, http://www.oregon.gov/oem/hazardsprep/Pages/Cascadia-Subduction-Zone.aspx

Extent and Probability

Earthquakes pose a widespread hazard along the north side of the Olympic Mountains. The cascading impacts of earthquakes, such as tsunami and liquefaction, are dependent on geography and soil type, as detailed above.

The CSZ has produced earthquakes measuring M8.0 and above at least seven times in the past 3,500 years. The time intervals between these events has varied from 140 to 1,000 years, with the last event occurring just over 300 years ago.

A comprehensive study of faults along the northern Olympic Mountains concluded that "there were three to five large, surface-rupturing earthquakes along the faults within the last 13,000 years" (Seismological Society of America 2017). The study notes that while the time intervals between earthquakes on shallow, or upper-plate, faults are thousands of years, "…the chances of a damaging earthquake on one of those many faults is higher than it is for a megathrust earthquake, at least on average, over the last few thousands of years" (Seismological Society of America 2017).

Future Probability Trend – Future weather and development trends play no known role in the probability of future earthquake events. However, both may play a role in the magnitude of earthquake impacts, as increased development may push populations into higher risk areas.

Earthquake

Cascading Impacts

- Landslides
- Tsunamis
- Utility failure
- Infrastructure failure
- Conflagration
- Food, water, medical supply shortages
- Economic disruption

Vulnerability

Vulnerability posed by earthquakes to Clallam County is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of this plan, the following County-wide infrastructure types are classified as a **high to severe** combined earthquake hazard level (including earthquake shaking hazard and liquefaction potential):

- Airports and Runways (8 structures)
- Electric Power Systems (42 structures)
- Hazardous Materials Facilities (17 structures)
- Propane Systems (4 structures)
- Water Supply (64 structures)
- Wastewater and Sewer Systems (24 structures)
- Communication Systems (19 structures)
- Hospitals and Clinics (17 structures)
- Public Safety Facilities (21 structures)
- Roads and Bridges (15 structures)
- Schools (22 structures)
- Local Government and Law Enforcement Buildings (50 structures)
- Shelters (120 structures)
- Commercial Buildings (11 structures)

Awareness of the County's vulnerability to a CSZ earthquake has increased with participation in regional drills and public outreach efforts and more structures are being designed to be resilient to tectonic activity. However, development has increased in areas on the West End that are particularly vulnerable to a Cascadia event. Furthermore, the Lake Creek Fault is located near the growing population centers of Port Angeles and Sequim. Given these changes, the vulnerability of Clallam County to earthquakes has remained **unchanged.**

See Appendix B for full Risk Exposure Tables and Appendix C for additional maps.

4.5.2 Disease

Disease

Magnitude	Onset	Duration	Frequency
3.58	3.17	3.83	2.82

Average	Rank
3.35	3

Hazard Description

Although chronic disease has placed a lasting strain on the healthcare system, acute infectious diseases are a greater immediate threat to the system's capacity. Infectious diseases may be caused by pathogenic bacteria, viruses, fungi, or parasites, and many are characterized by symptoms such as fever, diarrhea, fatigue, muscle aches, coughing and other respiratory symptoms, and rashes (Mayo Foundation for Medical Education and Research 2019). Infectious disease outbreak has the potential to paralyze socioeconomic activity and critical government functions. Various acute disease concerns are discussed below.

- Some diseases, such as Salmonella and E. coli infections, can be spread quickly through food and water sources. Though these diseases are treatable they can lead to severe symptoms or death if not addressed quickly. Containing the spread of these diseases requires identifying and addressing the source of contamination of the food or water supply and communicating risks and safety measures to the public.
- Diseases spread through animal vectors (i.e., living organisms that can transmit infectious diseases) are constantly evolving, and diseases that were previously unknown to affect humans may evolve the ability to infect human hosts. For example, West Nile virus is an emerging pandemic that has affected communities across the country. West Nile is transmitted through mosquito bites and can be spread to birds, horses, and humans, causing severe symptoms or death.
- Diseases that affect livestock, such as West Nile virus or mad cow, aside from their potential to infect humans, can rapidly spread through livestock flocks or herds, sometimes requiring entire flocks/herds to be put down and causing significant financial hardship.

Many potentially devastating diseases are spread through physical contact, ingestion, insect bites, and inhalation. Airborne diseases and those spread through physical contact pose higher risks to the community because they are difficult to isolate and control. Diseases such as influenza, pertussis, tuberculosis, and meningitis are spread by these pathways and pose a significant threat to communities.

The Clallam County Public Health Services administers public health awareness programs to provide information on diseases influencing the County population. The following facilities are communicable disease testing sites:

- Private healthcare provider offices
- Clinicare Walk-In Clinic
- Volunteers in Medicine of the Olympics Clinic for uninsured/low income
- Planned Parenthood for sexually transmitted diseases, human immunodeficiency viruses, and Hepatitis C
- Clallam County Public Health Section on a limited, case by case basis.

Disease

Previous Occurrence/History

- February 2015: A kindergartner was diagnosed with measles in the City; a total of 5 people in Clallam County were diagnosed with measles; 1 fatality (Seattle Times 2015).

Potential Impacts from Future Climate Conditions

- Changing weather patterns resulting in changing disease outbreak patterns

Extent and Probability

Although it is impossible to predict the next infectious disease outbreak, history shows that outbreaks are not uncommon and can devastate communities. Infectious diseases can affect the County's entire population. Diseases may also infect livestock herds and can potentially be communicated from animal vectors to humans. Recent medical advancements increase our ability to counteract such outbreaks and limit their extent, but additional concerns related to diseases building resistance to drugs is an ongoing concern.

Future Probability Trend – Based on potential changing weather patterns, the County may be impacted by an **increase** in the probability of emerging infectious disease.

Cascading Impacts

- Loss of revenues – fear of infection or lack of workforce availability
- Disease mutations
- Social unrest
- Transportation route closures and supply chain disruption
- Lack of food, water, and medical resources

Vulnerability

Epidemic and pandemic diseases have been known to spread quickly throughout communities. Many diseases spread through close contact, meaning that highly populated areas are more prone to widespread outbreaks; a lot of public activities are centered out of the Port Angeles and Sequim area. However, compared to a metropolitan area, the smaller relative population density of the two major County communities decreases the likelihood of a widespread outbreak in comparison to a more densely populated area.

The rural nature of much of the County also presents a key vulnerability: Healthcare resources and hospitals are in short supply and would likely become overburdened immediately following a disease outbreak.

Given the expansion of population centers such as Port Angeles and Sequim, the vulnerability of the County to disease has **increased**.

4.5.3 Utility Failure

Utility Failure

Magnitude	Onset	Duration	Frequency
1.75	4.50	2.83	4.17

Average	Rank
3.31	4

Hazard Description

A utility failure is defined as an abrupt pause to the availability of utility services. A utility failure represents any occurrence in which vital utilities or services are rendered inoperable. A utility failure may be caused by electrical blackouts, pipeline or pump malfunction, or an unanticipated surge in demand. A utility failure may impact any of the following services:

- Electric Power Systems (Clallam Public Utility District [PUD], Port Angeles City Light, US Bonneville Power Administration)
- Water Supply (Clallam PUD, Crescent Water Association, Diamond Point Private Water System, City of Port Angeles Water System, City of Sequim Water System, Sunland Water System)
- Wastewater and Sewer Systems (Clallam PUD, City of Port Angeles, Clallam Bay Correction Center, Sunland Water System, City of Sequim Water System, City of Forks)
- Communications Systems (Amateur Radio Emergency Services, Marine Band, Air Band, Simplex line-of-sight-only repeaters, portable satellite systems, military internal tactical communications)

Source: Buck 2016

Location

Numerous County properties are at risk of being affected by utility failures. Rural and populated areas alike are known to experience power outages during winter and windstorms that can last anywhere from several hours to several weeks. In addition, the Clallam County PUD operates extensive utility and information technology networks that could be at a risk to exposure of a hazard that could lead to a utility failure. In the County, power outages are mostly focused west of the Elwha River. Forks, Lapush, Clallam Bay, and Neah Bay are often without power due to windstorms.

Previous Occurrence/History

Historically, utility disruptions and failures have been caused by natural disasters and human-caused accidents but have not been recorded in a way that is publicly accessible. Numerous utility failures occur every year, most frequently in the form of electricity outages that may last as short as hours or as long as weeks. Most recently, the County faced widespread utility failures during the December 2018 windstorms and during Hurricane Songda in 2016.

Potential Impacts from Future Climate Conditions

- Increased demand during high-intensity heat could result in widespread outages

Utility Failure

Downed Power Lines

Extent and Probability

It is difficult to predict the impacts of future utility failures, but they have the potential to impact all government and business operations and cause extensive economic losses among other impacts. Due to the sporadic nature of failures, it is also difficult to estimate how frequently such failures will occur or their duration. Various parts of Clallam County generally deal with power outages multiple times per year with many of them only lasting a matter of hours. Every several years, a large utility failure is experienced.

Future Probability Trend – Based on potential increases in heat waves and increasing development trends resulting in greater demand, the County may be impacted by an increase in the probability of future utility failure. However, mitigation actions outlined in this HMP are designed to decrease such strain on utility systems.

Cascading Impacts

- Human health impacts
- Revenue losses

Vulnerability

Electric Power Systems

Power facilities in Clallam County are generally protected from wildland/urban interface fires by defensible space. A limited number are threatened by tsunami, flood, and landslide hazards. All facilities are threatened to varying degrees by destructive earthquakes.

Water Supply

- There are numerous water districts and at least two private water systems in Clallam County that supply customers in their areas with water. Many are threatened by tsunami, flood, wildland/urban interface fire and landslides. All of these districts are expected to sustain some type of damage and/or outage immediately following a destructive earthquake.
- Most water service ceases to function if electrical power is unavailable.
- Service main and line breaks will cause reduced water pressure in affected areas. Pressure reductions could reduce firefighting capability.
- Water utilities will shut down system components to mitigate damage from pressure loss, pipe leaks and breaks inside of buildings.
- To mitigate possible public health threats in both urban and rural areas, public health authorities may issue boil water advisories. Following repair, systems will require quality testing and system flushing to ensure safety.

Utility Failure

Wastewater and Sewer Systems

- There are six public and one private wastewater treatment systems in the County. None are subject to floods, wildland/urban fire or landslides. All systems are threatened by destructive earthquake hazards. Most waste-water service ceases to function if electrical power is unavailable.
- Wastewater and sewer system damage will include cracked pipe walls, pipe section collapse, and separation between pipe joints. Liquefaction may push some pipes out of the ground, reducing the downward gradient of the system, causing it to stop flowing and/or backup in some areas. Sewer pump stations and their pressure mains will suffer varying damage. Some will require complete replacement. As a result, it is possible that effluent will flow in streets, ditches and waterways. This will cause a severe public health hazard.
- Wastewater and sewer breaks will occur near damaged potable water lines putting the potable water systems at risk. Authorities may issue boil water notices to mitigate public health threats.
- Septic systems requiring power will not work. Those and gravity systems may fail due to broken pipes contaminating wells and surface water.

Communications Systems

- Urban facilities will not be subject to tsunami, flood, wildland/urban interface fires or landslides. Rural facilities may be subject wildland/urban interface fires and landslides to the facility sites or access roads. All facilities are subject to damage from major earthquakes.
- All primary and secondary forms of communication will be intermittent and unreliable due to power failure. Systems affected include cell phones, land lines, internet via fiber lines, cable television, AM/FM (amplitude modulation/frequency modulation radio stations). Power to transmit will have to be supplied by Backup generators.

Source: Buck 2016

With the expansion of utilities systems with new development in recent years, the County's vulnerability to utility failure has **increased**.

4.5.4 Wildfire

Wildfire

Magnitude	Onset	Duration	Frequency
2.25	4.00	3.25	2.75

Average	Rank
3.06	5

Hazard Description

Agricultural – Fires burning in areas where the primary fuels are flammable cultivated crops, such as hay and pasture. This type of fire tends to spread very rapidly but is relatively easy to suppress if adequate resources are available. Structures threatened are usually few and generally belong to the property owner. There may be significant losses in terms of agricultural products from such fires.

Wildfire

Forest – The classic wildfire; these fires burn in fuels composed primarily of timber and associated fuels, such as brush, grass, and logging residue. Due to variations of fuel, weather, and topography, this type of fire may be extremely difficult and costly to suppress. In wilderness areas these types of fires are often monitored and allowed to burn for the benefits brought by the ecology of fire, but also pose a risk to private lands when these fires escape these wilderness areas.

Wildland-Urban Interface (WUI) – These fires occur in areas where urbanization and natural vegetation fuels are mixed together. This mixture may allow fires to spread rapidly from natural fuels to structures and vice versa. Such fires are known for the large number of structures simultaneously exposed to fire. Especially in the early stage of WUI fires, structural fire suppression resources may be quickly overwhelmed, which may lead to the destruction of many structures. Nationally, wildland interface fires have frequently resulted in catastrophic structure losses.

Wildland fire protection is provided by federal, state, county, city and private fire protection agencies and private timber companies. Factors affecting the risk of wildland fires include rainfall, type of vegetation, number of snags, amount of old growth timber and proximity to firefighting agencies. Fire damage to watersheds may increase the vulnerability to flooding.

Smoke from regional fires also may present a hazard; diminished air quality impacts vulnerable populations in particular.

Location

According to the *Clallam County CWPP* (Clallam County 2009a), large fires in western Washington typically occur on steep south-facing slopes, and often result from a combination of circumstances including a source of ignition in areas of dry, heavy fuels, an extended period of drought, and dry east winds. Forest fires in this area usually occur during the dry summer months of July, August, and early September, but they can occur anytime between April and October given the right conditions. Fire hazard increases in the late summer and early fall when hot, dry east winds (subsidence winds) occur more frequently and the area has experienced the low point of the annual precipitation cycle. The portion of the Peninsula with the highest potential for major fires is the area between Port Angeles and Hood Canal, though as residents of Forks can attest, large forest can occur anywhere on the Peninsula (Clallam County 2010).

Forks is surrounded by commercial forests and is particularly susceptible to WUI fires. Many of the older structures in the County, such as in Port Angeles, may be vulnerable to urban fires because of their construction prior to modern fire codes and fire resistive materials, including electrical wiring. The Port Angeles Fire Department indicated many of the fire damages represent commercial structures, with a large portion in any year representing a single large fire (Clallam County 2010).

Wildfire

Previous Occurrence/History

Previous wildland fires that have affected Clallam County include "The Great Forks Fire of 1951," 1955 in the West Twin River area, and 2002 in the Clallam Bay area. The fires in 1951 began near Lake Crescent and burned into and around Forks. Approximately 30 buildings and between 33,000 and 38,000 acres of timber were lost. The 1955 fire burned approximately 5000 acres of timber. The 2002 fire started as slash burnings on private land. In July 2004, a wildfire ignited near Joyce at Striped Peak, burning between three and four acres of private hillside land. Joyce experienced another wildfire in May 2006 when a controlled burn near the town grew into a five-acre wildfire. From January 2008 to August 2009, 38 different wildfire incidents have occurred within Clallam County, outside of Olympic National Park (Clallam County 2010).

In December 2003, the City of Port Angeles experienced a significant fire at the Elks Naval lodge, one of the City's largest structures located in the downtown core (Clallam County 2010).

See Appendix C for more detail.

Potential Impacts from Future Climate Conditions

- Reduced snowpack
- Prolonged drought and heat
- Stressed and weakened forest ecology
- Increase in insect infestation of trees
- Drier vegetation or lower water content in vegetation leading to faster and hotter burning fires

March 13, 2015—Garage fire east of Port Angeles (Photo courtesy of Peninsula Daily News)

Wildfire

Extent and Probability

A Headwaters Economics study found that Clallam County has more square miles of developed land within the wildland-urban interface than any other county in Washington State (72 square miles) and the fifth most area in the WUI in the entire United States. The same study found that 13,271 homes were located within the WUI throughout the County (Headwaters Economics 2013).

Weather conditions greatly influence the impact and extent of wildfires. Drought, high temperatures, and wind contribute to a dynamic and changing conditions of wildfires. Fuel load and vegetation contribute to the size and intensity of wildfires.

Wildfires are frequent and inevitable. Within the region, most wildfires burn during the June to October time period.

Future Probability Trend – Based on potential decreases in annual snowpack and increases in the frequency and magnitude of drought and heat, the County may be impacted by an **increase** in the probability of future fires.

Cascading Impacts

- Landslides, washouts, erosion, and potential re-burns
- Degraded water quality and damage to fisheries
- Power outages and communications disruptions
- Degraded air quality
- Health effects from smoke, including asthma

Wildfire

Vulnerability

Wildfires in Clallam County generally occur in the lower lying, WUI areas, particularly near Forks, Sequim and Blyn. The City of Forks is vulnerable to fires because of its location near multiple east-west river valleys and the fact that it is surrounded by commercial forest lands. Large fires are likely to start in the east and burn down the valley, toward Forks.

Due to the limited number of land-based evacuation routes, the County may become isolated during a wildfire—limiting access to healthcare facilities, shelters, and other resources. Other critical infrastructures vulnerable to wildfires include water systems, refined fuel systems, communications systems.

Vulnerability posed by wildfires (particularly WUIF) to Clallam County is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of this plan, the following County-wide infrastructure types are classified as being vulnerable to WUIF:

- Communication Systems (9 structures)
- Electric Systems (13 structures)
- Fire Department (5 structures)
- Government Buildings (3 structures)
- Hazardous Materials Storage (4 structures)
- Medical Facilities (5 structures)
- Propane (1 structure)
- School (1 structure)
- Shelter (16 structures)
- Water systems (17 structures)

Since the 2010 County Hazard Mitigation Plan, development in Clallam population centers has expanded further into the WUI; therefore, the vulnerability has **increased**.

See Appendix B for full Risk Exposure Tables and C for additional maps.

4.5.5 Windstorm

Windstorm

Magnitude	Onset	Duration	Frequency
1.92	3.50	2.33	4.42

Average	Rank
3.04	6

Hazard Description

A windstorm is a short duration event involving straight-line winds and/or gusts in excess of 50 miles per hour (mph). Windstorms can affect areas of Clallam County with significant tree stands, as well as areas with exposed property, major infrastructure, and above ground utility lines. Windstorms can result in collapsed or damaged buildings, damaged or blocked roads and bridges, damaged traffic signals, and uprooted and/or knocked down trees. Windstorms are most common from October to March, which is why they are often associated with winter storms (Clallam County 2010).

Location

All county and tribal properties and structures can be affected by windstorms. Properties with infrastructures, utilities, and tree stands can have more damaging impacts during windstorms, especially in coastal areas where winds speeds can reach 40 to 60 mph during the winter months.

Previous Occurrence/History

Recent windstorms occurring in Clallam County resulting in major damage include:

- 17 December 2018 – Clallam and East Jefferson Counties Windstorm
- 15-16 October 2016 – Typhoon Songda
- 14 December 2006 – "Hanukkah Eve" Windstorm
- 20 January 1993 – "Inaugural Day" Storm

These windstorms have caused damage to County structures and housing; extensive utilities damage; restricted access to public lands; and required increased strain on the government's operations.

Windstorm

December 14, 2018—Wood debris at Lincoln Park in Port Angeles (Photo courtesy of Peninsula Daily News)

Potential Impacts from Future Climate Conditions

- Warmer winters, which can change meteorological patterns
- More severe and extreme weather patterns and phenomenon

Extent and Probability

Coastal areas of Clallam County experience higher winds than other areas. However, windstorms can occur anywhere throughout the County. Windstorms can damage buildings, structures, utilities, and tree stands, causing millions of dollars' worth of damage.

Future Probability Trend – Future weather conditions have the potential to lead to an increase in severe and extreme weather patterns, leading to an **increase** in the probability of a windstorm. In addition, increased development has the potential to expose more assets to the impacts of windstorms.

Cascading Impacts

- Human health risks (i.e., respiratory illness)
- Utility failures
- Fuel loading for potential forest fires
- Landslides from downed trees
- Transportation issues

Windstorm

Vulnerability

The County's vulnerability to severe windstorms are related to power outages and debris blocking land-based transportation routes. Because nearly all social and economic activity is dependent on transportation, damage from windstorms can have a serious impact.

Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. More rural communities located in the foothills are particularly vulnerable to road outages and face longer delays in debris removal. Additionally, vehicle accidents rise among those who try to drive during windstorms (United States Department of Transportation 2018).

Power outages can result from physical damage to electrical infrastructure as a result of downed trees and blown debris. Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe windstorms. Additionally, persons with electric-based health support systems are vulnerable to power outages everywhere.

Since the 2010 plan, the County's vulnerability to windstorms has **increased** as weather patterns change due to climate change, and as increased development has resulted in more infrastructure that can be exposed to damage during severe weather.

1

4.5.6 Winter Storm

Winter Storm

Magnitude	Onset	Duration	Frequency
2.00	3.25	2.75	4.00

Average	Rank
3.00	7

Hazard Description

Severe winter storms can produce rain, freezing rain, ice, snow, cold temperatures, and wind. Severe winter storms affecting Clallam County lands typically originate in the Gulf of Alaska and the central Pacific Ocean and are most common between October and March. Much of northeastern Clallam County is in the rain shadow of the Olympic Mountains, resulting in less precipitation than average compared to other parts of Western Washington. The amount of precipitation a location receives during winter storms largely depends on elevation, with areas at higher elevations (particularly along the western coast) receiving more precipitation (over 100 inches annually in some places). Winter season snowfall ranges from ten to thirty inches in the lower elevations and between 250 to 500 inches in the higher mountains. In the lower elevations, snow melts rather quickly and depths seldom exceed six to fifteen inches.

Location

While much of the County can be affected by winter storms, the higher elevation and western coastal areas are exposed to the more damaging impacts of winter storms. Furthermore, many of the communities along the western coast of Clallam County are very remote and have limited road infrastructure that can quickly become compromised during a winter storm.

Previous Occurrence/History

Recent winter storms occurring in Clallam County resulting in major damage include (snowstorms listed below; see Section 4.5.5, Windstorms, for other types of winter weather):

- 9 February 2019 – North Olympic Peninsula severe winter weather
- 14 March 2014 – Sequim/Port Angeles Blizzard
- 27 December 1996 – Christmas Snowstorm

Potential Impacts from Future Climate Conditions

- Potential for warmer, wetter winters
- Potential decrease in snow events, but increase in ice events

Winter Storm

Extent and Probability

Severe freezes, when daily high temperatures remain below freezing for five or more days, occur on average every three to five years in Clallam County. Winter storm weather is common in the winter, but typically lasts a short time; ice storms (sleet and freezing rain) likewise are typically brief events.

Winter storms may be more extreme during La Niña weather years, such as the 1996 flooding associated with the 1996-1997 La Niña pattern.

Future Probability Trend – The impact of changing weather patterns may have an impact on the probability of future winter storm events. Based on potential decreases in annual snowpack and increases in the frequency and magnitude of drought and heat, it would seem the County may be impacted by a **decrease** in the probability of future winter storms. However, it is also possible that changing weather patterns could result in an increased likelihood of precipitation during sub-zero temperatures, resulting in an **increase** in the probability of winter storms.

Cascading Impacts

- Human health risks (i.e., respiratory illness)
- Vehicular accidents
- Hypothermia
- House fires
- Utility failure
- Agricultural die-off

Winter Storm

Vulnerability

The County's primary vulnerability from severe weather is from power outages and impairment of transportation. Because nearly all social and economic activity is dependent on transportation, snow can have a serious impact.

Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. Vehicle accidents rise among those who try to drive. Power outages can result from physical damage to electrical infrastructure as a result of ice or snow or increases in demand beyond the capacity of the electrical system.

Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe winter weather events. Persons who are older, are isolated or have disabilities may be more vulnerable, especially those that may be trapped in their homes from power failures, heavy snow and ice, and debris from falling trees and power lines. Power losses during winter storms have resulted in deaths from carbon monoxide poisoning if people attempt to keep warm by lighting charcoal fires or operating backup generators indoors.

Snowstorms also slow the local economy, but there is a debate about whether these slowdowns cause permanent revenue losses. Productivity and sales may decline but often accelerate after a storm. Some permanent effects may occur if some areas in the region are accessible and some are not.

For workers, snow can be a hardship, especially for those who lack benefits and vacation time. For local governments, responding to snowstorms can be a major unbudgeted expense. Some have even had to issue emergency bonds to cover snowstorm recovery costs.

Since the 2010 plan, the County vulnerability to winter storms has **increased** as weather patterns change due to climate change and as increased development has resulted in more infrastructure that can be exposed to damage during severe weather.

1

4.5.7 Active Threat

Active Threat

Magnitude	Onset	Duration	Frequency
2.92	5.00	2.17	1.42

Average	Rank
2.88	9

Hazard Description

An active threat is any situation that presents an immediate and ongoing danger to the safety of people in the community. In addition to individuals using firearms, other types of weapons and erratic behavior can create active threat situations.

Location

Any populated area can be impacted by active threat. These areas include, but are not limited to, shopping structures, clinics, schools, government offices and buildings, and residential areas.

Previous Occurrence/History

There have been no active threat incidents in Clallam County's recent history, however there was one potential incident.

In 1999, a confirmed terrorist attempted to enter the U.S. from Canada with materials to create an explosive. Although destined to be used in a more populated effort, the threat was discovered in Clallam County.

Potential Impacts from Future Climate Conditions

There are no direct connections between active threat and future climate conditions.

Extent and Probability

With no existing records of recent active threat directly impacting the County, it is difficult to estimate the extent or probability of its occurrence. Nonetheless, it can be deduced that active threat could affect all populated areas in Clallam County; government facilities and schools may be most likely targeted.

Future Probability Trend – Future weather conditions have no direct connections to active threats. However, increased development and urbanization have the potential to **increase** the probability of a future active threat.

Cascading Impacts

- Long term trauma and mental health issues
- Political and social divisions

Active Threat

Vulnerability

No estimates are available to determine potential losses associated with active threat. However, we can assume that if an active threat were to be directed at the County, schools and government buildings would likely be a top target. Active threats could have an impact on the community in the following ways: loss of human life, damage to buildings and structures, temporary displacement during the threat and/or investigation, stress on medical and security services, loss of hospitality business during the event, and an increased need for emergency services and funding.

Since the 2010 plan, there more public awareness about how to respond in the event of an active threat. School districts and police departments hold drills to practice response actions. The County's vulnerability to an Active Threat is **unchanged.**

4.5.8 Hazardous Materials Incident

Hazardous Materials Incident

Magnitude	Onset	Duration	Frequency
1.92	4.92	2.67	1.83

Average	Rank
2.83	10

Hazard Description

Accidental releases of petroleum, toxic chemicals, gases and other hazardous materials occur frequently throughout the state. Even small releases can have the potential to endanger public health and contaminate groundwater, surface water, and soils. Environmental damage from such releases depends on the material spilled and the extent of contamination. Many are releases of small quantities that are contained and cleaned up quickly with little damage to the environment. In other instances, material releases seep through the soil and eventually into the groundwater, this can make water supplies unsafe to drink. Vapors from spilled materials can become inhalation hazards and collect in houses and businesses, creating fire and explosion hazards.

Transportation corridors that carry hazardous materials include highways and navigable waterways.

Washington State Department of Ecology (Ecology) regulates three classes of facilities related to the spills program (Ecology 2019):

- Class 1: Large, fixed shore-side facilities such as refineries and refueling terminals. This definition includes facilities that transfer to or from tank vessels and pipelines.
- Class 3: Mobile facilities, such as tank trucks and portable tanks.
- Class 4: Small tank farms and terminals that transfer oil to non-recreational vessels that have a fuel capacity of 10,500 gallons or more. This definition does not include facilities that transfer to tank vessels and pipelines, as they are Class 1 facilities.

Location

Numerous fixed-location storage sites exist near County properties but have rarely caused an incident. Therefore, the County views the most likely hazardous materials incident to be caused by a traffic accident along Highway 101 or the railroad corridor. The Port of Port Angeles is also a major

Hazardous Materials Incident

shipping facility with an increased potential for hazardous materials incident. Furthermore, the Strait of Juan de Fuca is a major thoroughfare for oil tankers.

There are 6 state-regulated marine spills program facilities in Clallam County (Ecology 2019):

- U.S. Coast Guard Station, Quillayute River, Class 4 Facility (Diesel/Marine Gas Oil, Gasoline)
- U.S. Coast Guard Station, Neah Bay, Class 4 Facility (Gasoline, Diesel/Marine Gas Oil)
- U.S. Coast Guard Station, Port Angeles, Class 4 Facility (Gasoline, Diesel/Marine Gas Oil)
- John Wayne Marina, Class 4 Facility (Gasoline, Diesel/Marine Gas Oil)
- Port of Port Angeles, Class 3 Facility (Gasoline, Diesel/Marine Gas Oil)
- Tesoro Marine SVS, Port Angeles, Class 1 Facility (Bunker Oil/HFO, Diesel/Marine Gas Oil)

Previous Occurrence/History

Since 2015, the majority of oil spills in Clallam County have involved volumes less than 100 gallons released from commercial or recreational fishing vessels (Ecology 2019). The three largest oil spills (volumes greater than 100 gallons) since 2015 are listed below:

- May 20, 2019, Strait of Jan de Fuca, 122 gallons of diesel/marine gas oil from an unknown vessel
- April 5, 2016, Port of Neah Bay, 500 gallons of diesel/marine gas oil from a fishing vessel
- December 17, 2015, 38 miles off La Push, 250 gallons of diesel/marine gas oil from a fishing vessel

The Port Angeles Harbor experienced the following oil spills:

- 1985, ARCO Anchorage Spill, 270,000 gallons
- 2001, ATC Prince William Sound, 500 gallons
- 2003, GA2 Diamond, 500 gallons

Hazardous Materials Incident

A review of the Pipeline and Hazardous Materials Safety Administration incident reporting database showed the following hazardous materials incidents along transportation corridors since 1975 (PHMSA 2019):

Incident Route	Incident City	Date of Incident	Quantity Released	Unit	Commodity Long Name
MM-196	Forks	2/23/2011	4300	LGA	Diesel Fuel
	Forks	8/8/1984	8	LGA	Fuel Oil
	Forks	3/17/1982	20	LGA	Combustible Liquid
	Forks	7/11/1978	100	LGA	Fuel Oil
707 MAIN ST	La Push	6/25/1991	0.5	LGA	Isopropynol or Isopropyl Alcohol
3216 EAST HIGHWAY 101	Port Angeles	8/11/2014	0.25	LGA	Corrosive Liquids
3216 EAST HIGHWAY 101	Port Angeles	4/21/2011	0		Aerosols, Flammable
224 Easy St	Port Angeles	1/7/2011	1	LGA	Corrosive Liquids
	Port Angeles	2/7/2003	100	LGA	Phosphoric Acid Solution
MARINE ROAD	Port Angeles	2/1/2001	0.5	LGA	Corrosive Liquids
MARION DRIVE	Port Angeles	3/1/1993	0.125	LGA	Corrosive Liquids
MARINE DRIVE BOX 271	Port Angeles	4/15/1992	6	LGA	Sodium Hydroxide, Solution
	Port Angeles	11/16/1989	5	LGA	Sulfur Dioxide
	Port Angeles	6/5/1979	344	LGA	Gasoline
W/B SR 101 MILE POST 275.80	Sequim	11/3/2011	0		Gasoline
HWY 101 M.P. 275	Sequim	7/31/2000	0		Fuel Oil
HIGHWAY 101	Sequim	7/11/1990	0.06684	GCF	Sulfur Dioxide
	SEQUIM	2/24/1981	200	LGA	Gasoline
	SEQUIM	12/13/1975	0		Gasoline

Key:
LGA = Liquid – gallon
GCF = gallons per cubic foot

No fatalities resulted from these incidents.

Potential Impacts from Future Climate Conditions

- Increased precipitation events causing an increase in traffic accidents.

Hazardous Materials Incident

Extent and Probability

The uncontrolled release of hazardous materials during transport can result in death or injury to people and damage to property and the environment through the material's flammability, toxicity, corrosiveness, chemical instability, and/or combustibility. Individuals may be exposed to hazardous materials at acute or chronic levels. In the event of a marine oil spill, ecological systems could be damaged from the pollution and recreational activities subsequently limited.

Future Probability Trend – Increased development trends and potential increase in high-intensity precipitation events present the potential for an increase in hazardous materials passing through the area and traffic accidents, respectively. Each presents the potential for an **increase** in future hazardous materials incidents.

Cascading Impacts

- Long-term health and environmental monitoring costs
- Contamination of water and air
- Conflagration (urban fire)
- Long-term economic impacts to tourism or fishing

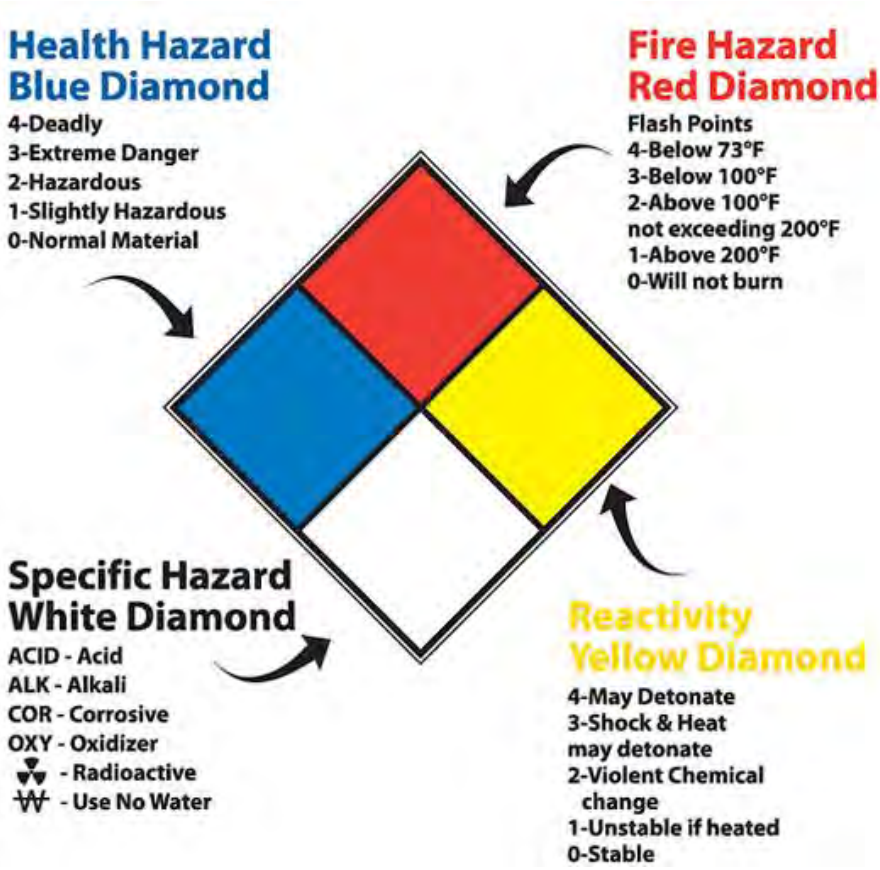
Vulnerability

The County's hazardous materials threats stem from facilities that include gas stations, marinas, propane storage sites, port facilities, and the Nippon Paper Plant. Much of the County's population and most of its assets are located near to these facilities.

Since the 2010 plan, the County's vulnerability to hazardous materials incidents has **increased**.

Refer to Appendix B for the complete hazard profile and Appendix C for GIS mapping of hazardous materials incidents.

Hazardous Materials Placard



Source:(ESS 2019)https://environmentalsafetysvc.com/nfpa.html

4.5.9 Landslide

Landslide

Magnitude	Onset	Duration	Frequency
1.50	4.42	2.58	2.67

Average	Rank
2.79	11

Hazard Description

Landslides (or mass movement) are caused by a combination of geological and climatological conditions. A landslide is the movement of a mass of rock, earth, or debris down a slope. Landslides may be small or very large and can move at slow to very high speeds. They can be initiated by storms, earthquakes, fires, volcanic eruptions, and human modification of the land. The factors that directly cause a landslide include one or a combination of the following:

- Change in slope gradient or increased weight through development
- Shocks and vibrations (particularly earthquake)
- Change in water content
- Weathering of rocks
- Removal of (for example, by wildfire or through grading) or change in the type of vegetation covering slopes

Landslide failures in Clallam County result from failures along planes in sedimentary bedrock, shoreline erosion, shallow landslides in soil deposits that overlie bedrock, and landslides and mass wasting in the upper watersheds and forest lands (such as at abandoned logging roads). Slope failure along the bedrock bedding planes is prevalent along the Strait of Juan de Fuca and Lake Crescent. Landslides may be triggered by earthquakes or undercutting the toe of the slope.

According to Washington State DNR (2019):

> "*In general landslides can be categorized as shallow or deep-seated and this difference can determine their speed and size. Shallow landslides typically occur during the winter months in western Washington and during the summer months in eastern Washington but are possible any time. Deep-seated landslides can also occur at any time. Many of the landslide areas in Washington are a mixture of different landslide types.*"

Location

The following are particular areas of County-wide concern for landslides (STARR 2013):

- Along major roadways, including Highway 101 and SR 112
- Areas along major rivers, including the Quillayute River
- Lower Elwha roads are vulnerable to landslides
- Along the Port Angeles marine bluff
- The Olympic Discovery Trail
- Bluff area along Sequim Bay, Johnson Creek and Bell Creek

Landslide

Previous Occurrence/History

Historically, the damages with the highest consequence, either related to the value of the repair or by the impact on human activities, include slides that have closed U.S. Highway 101 and slides in Port Angeles (one of which caused a fatality in 1998) (Clallam County 2010).

Bluff erosion and/or ravine erosion has damaged or threatens residences in developments located in Clallam Bay-Sekiu, Port Angeles, and in the county east of Port Angeles. Drainage was rerouted to the base of the bluff at Diamond Point, where several houses at the base of a bluff were damaged or destroyed by a bluff failure in the late 1990s. Since the County's critical areas codes that affect new building require provisions for building setbacks and drainage (including roof drainage and septic issues), new structures have not been damaged. Historically, smaller, residential lots platted years ago near bluffs in Clallam County have had the most problems with bluff failure (Clallam County 2010).

The Presidentially declared storm event of October 2003 also caused landslide and erosion hazards in Clallam County. Near the Makah Reservation in the northwest portion of the County, both lanes of Highway 112 closed after a sinkhole one hundred and fifty feet wide and forty feet deep washed out the highway (Clallam County 2010). A mudslide at Lake Crescent blocked Highway 101. The mudslide pushed a log truck into the lake and the driver escaped by swimming to shore (Clallam County 2010).

During the 2008 disaster, the City of Forks became isolated after a landslide blocked Highway 101 to the north and south. In response, gasoline was rationed, and propane was on the verge of being rationed due in part to hospital requests for the increasingly scarce fuel. The highway was partially reopened after three days but portions of the community continued to be isolated for an extended period (Clallam County 2010).

A landslide obstructed the Olympic Discovery Trail in 2014 (Peninsula Daily News 2014).

Potential Impacts from Future Climate Conditions

- Increased intense precipitation events leading to increased water content on hillsides
- Increased drought and fire risk combined with intense precipitation to lead to slope instability

Landslide

Extent and Probability

The following is excerpted from the hazard assessment conducted by Clallam County Emergency Management Division (EMD) as part of the 2016 Cascadia Rising Exercise:

"It is very difficult to make quantitative predictions of the likelihood or the size of a future landslide event. An accurate understanding of the landslide hazard for a given facility requires a detailed landslide hazard evaluation by a geotechnical engineer. Such site-specific studies evaluate the slop, soil/rock and groundwater characteristics. Such assessments may require drilling to determine subsurface soil/rock characteristics. In some cases, landslide hazard assessments by more than one geotechnical engineer may reach confliction opinions.

Landslides in Clallam County frequently cover or undermine Highway 112 between Mileposts 1 and 9 and Mileposts 32 and 39. Highway 101 and East Beach Road are subject to debris flows and rockfalls along Lake Crescent. Piedmont Road, Joyce Access Road, and Waterline Road are all at risk of landslides as are residences around Lake Sutherland and Lake Crescent. Highway 101 may be subject to landslides in Indian Valley between Lake Crescent and the Elwha River during major destructive earthquakes. There is concern that neighborhoods in Port Angeles downhill from Peninsula College may be subject to block or creep slides during an earthquake." (Buck 2016)

Due to the geology and likelihood of landslide-triggering storms in Clallam County, the probability of future occurrence of landslides is high.

Future Probability Trend – Based on potential increases in drought and wildfires, as well as potentially higher intensity precipitation events, the County may be impacted by an **increase** in the probability of future landslides. In addition, as the County increases its land ownership and development, landslides may pose a greater risk on disturbed soils.

Cascading Impacts

- Tsunami
- Utility failure
- Economic loss
- Water quality impacts
- Transportation accidents

Landslide

Vulnerability

The landslides and erosion in upper watersheds and forest lands are causing damage and disruption to important County roadways. Sedimentation from these areas is accumulating in the rivers and streams, causing flooding and habitat degradation. It is uncertain what the precise causes of mass wasting are; whether the roads form a conduit, the failures originate from side cast, or a combination of factors is involved.

Vulnerability posed by landslides to Clallam County is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of this plan, the following County-wide infrastructure types are classified as being susceptible to landslides:

- Electric systems (1 structure)
- Government buildings (2 structures)
- Hazardous Materials Storage (3 structures)
- Medical Facilities (1 structure)
- Shelters (13 structures)
- Water systems (9 structures)

Since the 2010 plan, the County's vulnerability to landslides is **unchanged**.

See Appendix B for full Risk Exposure Tables and Appendix C for additional maps.

4.5.10 Flooding

Flooding

Magnitude	Onset	Duration	Frequency
1.67	3.33	2.42	3.25

Average	Rank
2.67	12

Hazard Description

A flood is the temporary inundation of land that is normally dry. It is a natural event for rivers and streams to overflow from river channels into adjacent floodplains. Floodplains are lowlands areas adjacent to rivers and lakes that are subject to regular flooding. Most floodplains are mapped by FEMA for their Flood Insurance Rate Maps (FIRMs) as part of the National Flood Insurance Program (NFIP). FEMA defines several types of floodplains:

- A 100-year flood zone is an area that is subject to a 1% chance of flooding annually, whereas
- A 500-year flood zone has a 0.2% chance of flooding annually.

Floods may result from a variety of sources, including natural causes such as high intensity or long duration of rain or snow, rapid spring snowmelt, or ice jams inhibiting a river's flow. Man-made hazards such as dam failures are also a concern in the County. Various types of floods can have different risk levels associated with them. The highest risk flood event is a flash flood because of the low predictability, rapid development, and high-water flow rates associated with them. These floods are often associated with intense weather such as unexpected large rainstorms, and large thunderstorms. However, historically, flash floods pose a low likelihood within the region.

Location

The primary riverine hazards are associated with the following rivers and streams, general from west to east: Quillayute River, Bogachiel River, Calawah River, Sol Duc River, East Dickey Creek, Sekiu River, Hoko River, Clallam River, Reed Creek, Elwha River, Morse Creek and Dungeness River. Riverine hazards extend across the County but are primarily located near the mouths of the rivers in the northern portion of the County, and in the central and western portions of the County, along the extent of Highways 101, 110, and 110 Spur. Data from the *Dungeness River Comprehensive Flood Hazard Management Plan* (Clallam County 2009b) indicate a trend of increasing peak flows for the Dungeness and Elwha Rivers in Clallam County between 1924 and 2002 (Clallam County 2010).

Ediz Hook and parts of Port Angeles, and the Gibbon and Travis spits in the mouth of Sequim Bay may become inundated with high tides and storm surges. Much of the Clallam, Elwha and Dungeness tidal areas may be impacted by high tides and river flooding. Strong winds on Lake Crescent can cause flooding of the lake shorelines (Clallam County 2010).

Kinkade Island is highly vulnerable to flooding and erosion during high flows as it is in the flood plain and meander hazard zone. Houses were built on the island in the years before Clallam County issued building permits. Several flow paths throughout Kinkade Island receive flow from groundwater and surface water. During the 2001-2002 seasons, a Kinkade Island home and its access bridge were washed away in two separate flood events (Clallam County 2010).

Flooding

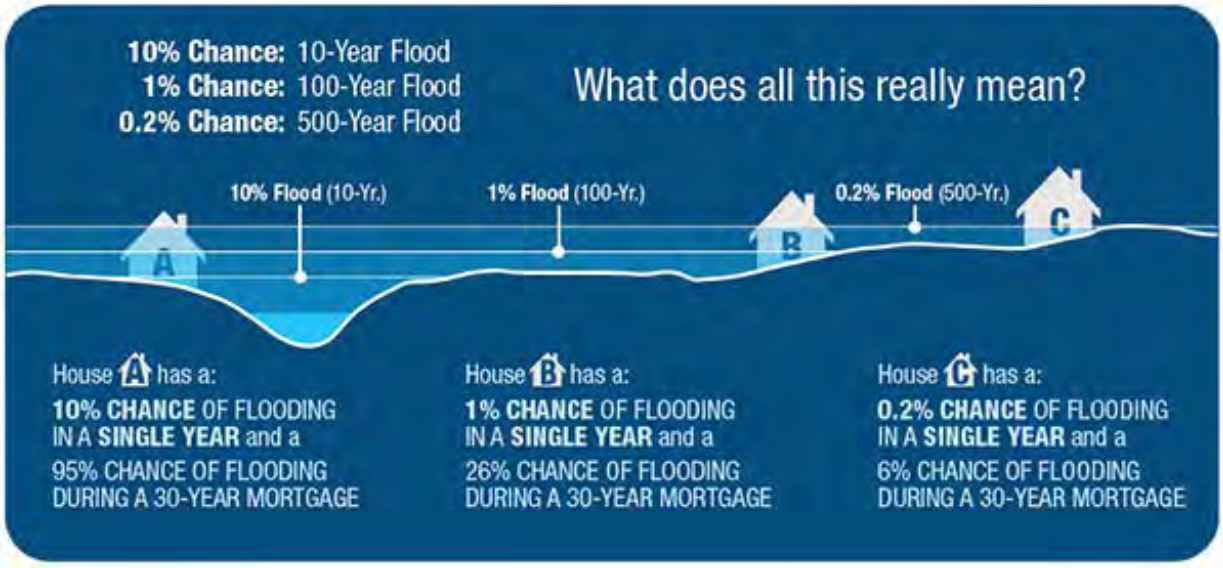
Previous Occurrence/History

Flood damages with the highest consequence, either related to the cost to repair or by the impact on human activities, were incurred during the 1979, 1990, 1996/1997 and 2008/2009 flood and severe storm events. Historically, the most damage to life or property has occurred from flooding of the Bogachiel River, and flooding of the Kinkade Island and River's End segments of the Dungeness River.

Jimmycomelateley Creek and the lower Sequim delta was also an area of historic flooding. The Jamestown S'Klallam Tribe, the Clallam Conservation District, Clallam County, and other stakeholders completed a restoration project to return the functionality of the creek's floodplain and to improve fish passage. As of 2009, flooding has largely been remedied (Jamestown S'Klallam 2011).

Potential Impacts from Future Climate Conditions

- Increased high-intensity precipitation events in winter months
- Increased intensity of winter storms
- Changing flood regimes and return patterns



Source: https://www.bulldogadjusters.com/types-of-claims/water-damage/floods/

Flooding

Extent and Probability

Severe floods may result in serious injuries and fatalities as well as damage to public facilities and private property. Extent of flooding can be determined by the height of river flows in comparison to flood stages determined by United State Geological Survey (USGS) stream gauges located throughout the area. It can also be measured by past damages of flooding.

The region experiences some flooding twice a year at minimum, while larger floods occur once a decade and major flood events occurring every 30-50 years.

The County has an extensive network of flood management solutions that have evolved as attitudes toward flood management have changed in Washington State. As part of the *Dungeness River Comprehensive Flood Management Plan* (2009), the County and partners conducted an inventory of levees and dikes on the lower Dungeness River to ascertain whether hard armoring could be removed without resulting in damage to private property. The Upper and Lower Elwha Dams on the Elwha River were removed in 2014 as part of an effort to restore the floodplain to its historic condition and revitalize wildlife habitat along the river (Lower Elwha Klallam Tribe 2019).

Future Probability Trend – Based on potential increase in high-intensity precipitation events and increased development trends (resulting in additional impervious surfaces and stormwater runoff), the County may be impacted by an **increase** in the probability of future floods.

Cascading Impacts

- Landslides, washouts, and erosion
- Degraded water quality due to flooding of water treatment facilities
- Damage to fisheries
- Increase in traffic accidents
- Communications disruptions

Flooding

Vulnerability

As part of the County's most recent Biennial Report submitted to the FEMA, it was estimated there were 700 lots in Clallam County containing residential or accessory structures that either: 1) contain 95% or more flood hazard areas; or 2) contain less than 0.5 acres of land outside of flood hazard areas. It is estimated that some or all the structures on these 700 lots are located within or in proximity to flood hazard areas depicted on the FIRMs (Clallam County 2010).

Clallam County, local jurisdictions, and Tribes do not currently participate in the NFIP Community Rating System (CRS) (the Lower Elwha/Klallam Tribe has rescinded participation). In Clallam County's first Hazard Mitigation Plan accepted in 2004, Clallam County identified participation in the CRS under NFIP as a project area. In 2005, the County undertook an evaluation into the potential benefits of participating in CRS. It was concluded that CRS would offer benefit to a small percentage of County landowners. This benefit was not enough to offset CRS program costs to County in terms of CRS enrollment requirements and long-term costs and staff resources associated with CRS administration (e.g., reporting, documentation) and implementation (Clallam County 2010).

Vulnerability posed by flooding to Clallam County is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of this plan, the following County-wide infrastructure types are classified as being vulnerable to flooding:

- Fire Department (1 structure)
- Government Building (4 structures)
- Hazardous Materials Storage (2 structures)
- Shelter (1 structure)
- Water systems (2 structures)

Since the 2010 plan, the County's vulnerability to nuisance flooding has **increased** as precipitation patterns shift due to climate change. However, the County and partners are taking active steps to mitigate the impacts through floodplain restoration activities.

See Appendix B for full Risk Exposure Tables.

Flood plain restoration and improved fish passage at Jimmycomelately Creek along State Highway 101. (Washington State Department of Transportation 2004: https://www.flickr.com/photos/wsdot/4017841128)

4.5.11 Tsunami

Tsunami

Magnitude	Onset	Duration	Frequency
3.25	4.08	2.17	1.08

Average	Rank
2.65	13

Hazard Description

A tsunami is a succession of giant waves that are generated after a natural event (such as deep-sea tectonic movement, volcanic eruptions, landslides, and even meteorites) triggers underwater movement (FEMA n.d.). The waves radiate in all directions from the area of disturbance. The waves can travel in the open ocean as fast as 500 miles per hour and have a very long wavelength. In other words, in deeper waters, the waves could be indistinguishable from other wave action. However, as the waves approach shallower waters, the waves slow and begin to grow in energy and height as the tops of the waves move faster than their bottoms do, causing them to rise precipitously. Most tsunamis (about 80%) occur within the Pacific Ocean's "Ring of Fire," a geologically active area where tectonic shifts make volcanoes and earthquakes common (National Geographic 2019a).

A key feature of tsunami is the interaction of the wave trough (the low point beneath the wave's crest) and the shoreline. This part of the wave often reaches shore first and produces a vacuum effect that 'sucks' coastal water seaward, exposing harbor and sea floors. It is important to recognize this phenomenon because the wave crest – and a huge volume of water – will typically hit the shore five minutes or so later (National Geographic 2019b).

A tsunami is typically composed of a series of waves, or wave train, so its force is compounded as successive waves reach the shore. It is very important that communities experiencing a tsunami wait until official word has been issued that it is safe to return to vulnerable locations, because danger may not have passed with the first wave.

Location

Tsunami hazard areas in Clallam County are concentrated around Cape Flattery, along the Pacific Coast, and sporadically along the coastline of the Strait of Juan de Fuca, including the Sekiu-Clallam Bay community, the Lower Elwha Klallam Tribal lands, Ediz Hook and downtown Port Angeles, and the low-lying area north of Sequim.

Appendix B contains Washington State DNR mapping of tsunami hazard in Clallam County population centers. The modeling was conducted to demonstrate the flooding scenario associated with a rupture of the Cascadia Subduction Zone (DNR 2017).

Tsunami

Previous Occurrence/History

Based on the geological record and first-hand accounts, tsunami from locations across the Pacific Ocean basin and from the CSZ off the Washington coast have hit Washington State coastal communities at least 7 times in the last 3,500 years. The largest of the nearby triggers, the CSZ, produced the most recent great tsunami in 1700 AD (Lange 2003). Washington State's tsunamis also include a Puget Sound tsunami from the Seattle Fault between 900 AD and 930 AD, a Tacoma Narrows tsunami from a landslide in 1949, and a fatal wave from a rockfall into the Columbia River in 1965 (WA EMD 2012).

- 2006 Kuril Islands, Japan Tsunami (La Push, 0.52 feet; Neah Bay, 0.01 feet; Port Angeles, 0.39; Westport, 0.16 feet)
- 1964 Alaskan Tsunami (Neah Bay, 0.7 feet)
- 1960 Chilean Tsunami (Neah Bay, 1.2 feet)
- 1700 Cascadia Tsunami (Washington Coast, 33 feet)

Potential Impacts from Future Climate Conditions

Future climate conditions are unlikely to have any effect on tsunami magnitude, severity, or probability.

Extent and Probability

Tsunami pose a widespread hazard throughout coastal Clallam County.

The Ring of Fire will continue to generate tectonic triggers. The CSZ has produced earthquakes measuring M8.0 and above at least seven times in the past 3,500 years. The time intervals between these events has varied from 140 to 1,000 years, with the last event occurring just over 300 years ago.

Future Probability Trend – Great earthquakes in the Pacific Ocean basin generate tsunamis that impact Washington's outer coast and the Strait of Juan de Fuca at a rate of about six every 100 years. In the CSZ, there is a 10 to 14% percent chance of a M9.0 earthquake and tsunami in the next 50 years so the likelihood of recurrence would be low.

Cascading Impacts

- Flooding
- Utility failure

Tsunami

Vulnerability

In 2008, the USGS and the Washington Military Department of Emergency Management (DEM) assessed the vulnerability of 24 communities along the Strait of Juan du Fuca and outer coasts (Wood and Soulard 2008). A summary from the Clallam County DEM outlines the following conclusions:

"…the unincorporated areas of Clallam County include 0.5 square miles of developed land in the tsunami hazard zone. This is only 2% of the total amount of developed land, but it is home to 1,126 people, more than a quarter of whom are over the age of 65. Many may need help to prepare for and respond to a tsunami." (Clallam County 2013)

Vulnerability of Unincorporated Areas of Clallam County			
People/Assets	Number or Amount in Tsunami Zone	% of Community Total in Tsunami Zone	% of Those in Tsunami Zone
All residents	1,126	3%	—
Residents under age 5	41	2%	4%
Residents over age 65	321	3%	29%
Renters	123	4%	23%
Employees	66	1%	—
Businesses	30	2%	—
Sales volume	$10,037,000	1%	—

How Vulnerable is Clallam County to Tsunamis? Excerpted table from Clallam County Emergency Management Department Fact Sheet (2013).

Vulnerability posed by tsunami to Clallam County is ultimately measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of this plan, the following County-wide infrastructure types are classified as being vulnerable to tsunami:

- Airport (1 structure)
- Communication Systems (4 structures)
- Electric Systems (2 structures)
- Fire Departments (3 structures)
- Government Buildings (11 structures)
- Hazardous Materials Storage (16 structures)
- Medical Facilities (2 structures)
- Propane (1 structure)
- Schools (2 structures)
- Shelter (18 structures)
- Wastewater System (3 structures)
- Water Systems (2 structures)

Since the 2010 plan, the vulnerability of the County to tsunami hazard has **increased** in certain geographic areas as property development along the coastlines has increased. Of concern are Sequim and Blyn. Some vulnerability posed by tsunami to human life may be offset due to increased public awareness of the hazard itself and improved public warning systems.

4.5.12 Drought

Drought

Magnitude	Onset	Duration	Frequency
1.83	1.58	3.92	2.67

Average	Rank
2.50	14

Hazard Description

Droughts can be characterized by the dominant impact caused by increased demand or decreased supply. Drought is a slow-onset phenomenon that usually takes at least three months to develop and may last for several seasons or years.

In the early 1980s, researchers with the National Drought Mitigation Center and the National Center for Atmospheric Research located more than 150 published definitions of drought. There clearly was a need to categorize the hazard by "type of drought." The following definitions are a response to that need. However, drought cannot always be neatly characterized by the following definitions, and sometimes all four definitions can be used to describe a specific instance of drought (Wilhite and Glanz 2985).

Meteorological: Defined on the basis of the degree of dryness - in comparison to a regional or local definition of normal or average dryness - and the duration of the dry period.

Agricultural: The linkage of meteorological (or hydrological) drought to impacts on agriculture, with focus on precipitation shortages, soil water deficits, reduced groundwater or reservoir levels, differences between actual and potential evapotranspiration, and other factors.

Hydrological: Associated with the effects of periods of precipitation shortfalls (including snowfall) on surface or subsurface water supply (i.e., streamflow, reservoir and lake levels, groundwater). Frequency and severity of hydrological drought may be defined on a watershed or river basin scale. While all droughts originate with a deficiency of precipitation, this definition is associated more closely with how the deficiency impacts the hydrologic system.

Socioeconomic: Associated with the supply and demand of economic goods with elements of the droughts mentioned above. Socioeconomic drought occurs when the demand for economic goods is greater as a result of a weather-related shortfall.

Drought

Clallam County is increasingly vulnerable to the impacts of snow drought - a subset of hydrological drought. Abnormally low snowpack reflects either below-normal cold season precipitation or a lack of snow accumulation, despite near-normal precipitation, resulting from warmer atmospheric temperatures and precipitation falling as rain rather than snow. Snow drought can impact summer water availability, winter water management, outdoor recreation, and ecosystems (NIDIS 2019). Clallam County has a maritime climate characterized by a cool, dry summers and mild, wet winters. Higher elevations are usually covered with snow from November until June, with depths ranging from 10 to 15 feet. The County relies on the snowpack to maintain the natural environment for protection of vegetation, wildlife, and waterways (Clallam County 2010).

Years of low precipitation and snowpack has jeopardized the County source of power and drinking water. Three energy curtailments, during drought periods prior to 1977, caused temporary unemployment (Clallam County 2010).

Location
Drought widely influences the County. The eastern portion of the County historically has low rainfall and is experiencing rapid development and population increase.

Previous Occurrence/History

During the summer of 2007, the Makah Indian Reservation had a declared emergency due to a water shortage and used rationing and a desalination plant on loan from the Navy to weather the crisis. Since that time, they have increased their water storage capacity and have not suffered any further shortage.

Drought animations over time are available at: http://droughtmonitor.unl.edu/Maps/Animations.aspx

Potential Impacts from Future Climate Conditions

- Decreased snowpack
- Wildfires resulting from abnormally low precipitation, including snowfall)
- Longer, hotter, and dryer summers
- Availability of first foods and habitat

Drought

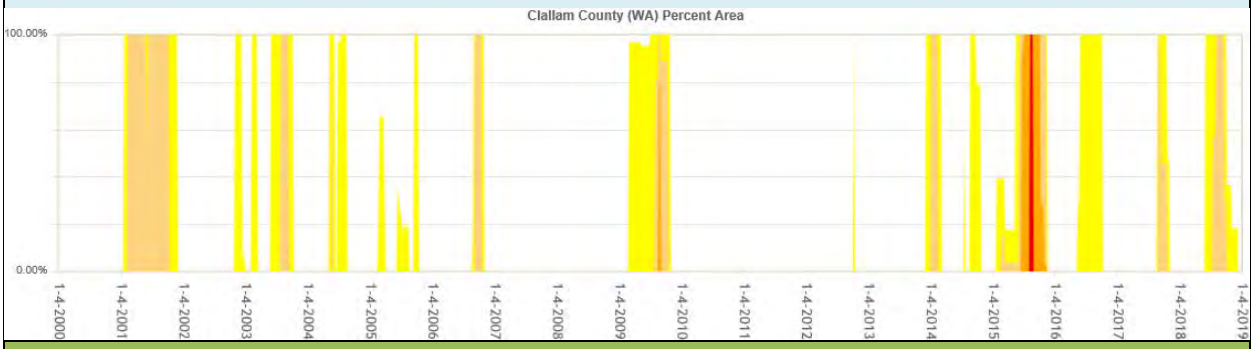
Extent and Probability

Northeast Clallam County, which is in the rainshadow of the Olympic Mountains, is the most vulnerable to the effects of drought (Desisto et al. 2009).

The Dungeness and Elwha watersheds are particularly vulnerable to the impacts of snow drought. Bullman Beach (Neah Bay) water systems are also increasingly vulnerable as winter precipitation patterns change.

As the graph below indicates, there has been one period of extreme drought within Clallam County over the last 17 years (United States Drought Monitor 2019). During a two-month period in 2015, 100% of the County's area was marked by D3 to D4 droughts (the most intense forms of drought). Additionally, in 2001, 2003, 2006, 2009, 2014, 2017, and 2018, areas of the County experienced moderate to extreme drought. As of May 2019, a drought emergency was declared in the Elwha-Dungeness, Lyre-Hoko, and Soleduc watersheds, which encompass the entirety of Clallam County (Governor of Washington 2019).

Future Probability Trend – Based on potential decreases in annual snowpack and increases in the frequency and magnitude of prolonged heat, the County may be impacted by an **increase** in the probability of future droughts.



Cascading Impacts

- Communications disruptions
- Heat-borne diseases
- Water quality impacts
- Crop/wildfire/forestry loss
- Utility failure
- Production loss

Drought

Vulnerability

Droughts impact individuals (farm owners, tenants, and farm laborers), the agricultural industry, and other agriculture-related sectors. Lack of snowpack has forced ski resorts into bankruptcy. There is increased danger of forest and wildland fires. Millions of board feet of timber have been lost. Loss of forests and trees increases erosion causing serious damage to aquatic life, irrigation, and power development by heavy silting of streams, reservoirs, and rivers.

Problems of domestic and municipal water supplies are historically corrected by building another reservoir, a larger pipeline, a new well, or some other facility. Short-term measures, such as using large capacity water tankers to supply domestic potable water, have also been used. Low stream flows have created high temperatures, oxygen depletion, disease, and lack of spawning areas for our fish resources.

The County's vulnerability to drought has **increased** since 2010, as the demand has grown, and historic water supply shifts due to climate change and other factors.

4.6 Vulnerability Assessment

A vulnerability assessment estimates the extent of exposure that may result from specific hazard events of a given intensity in the HMP's planning area. The assessment provides quantitative and qualitative data to identify and prioritize mitigation actions (identified in Chapter 6). According to the DMA 2000, the vulnerability assessment should include:

- A summary of the County's vulnerability to each hazard;
- Identification of types and numbers of properties, buildings, infrastructure, and critical facilities in the identified hazard areas; and
- If available, an estimate of the potential dollar losses to vulnerable structures and the methodology used to provide the estimate.

To improve the readability of the HMP, vulnerability assessments have been incorporated into each hazard profile within Section 4.5 and supported by further documentation in Appendix E.

4.6.1 Identifying Critical Infrastructure

A single listing of facilities that are critical to maintaining the life safety, property, environment and economy of Clallam County was generated initially as part of the 2016 Cascadia Rising Exercise (Buck 2016). During the exercise, the list was submitted to FEMA and Washington EMD for review. Clallam County EMD also provided feedback on the list of critical infrastructure. Each facility was evaluated either in person or using GIS mapping capabilities to ascertain addresses and vulnerability to various hazards.

The critical infrastructure is divided into the following categories:

- Airports and runways
- Electric power systems
- Hazardous materials threats
- Propane systems

- Water supply
- Wastewater and sewer systems
- Refined fuel systems
- Communications systems
- Hospitals and clinics
- Public safety facilities
- Roads and bridges
- Schools
- Local government and law enforcement buildings
- Shelters

Following the completion of the Cascadia Rising Exercise, the list of critical infrastructure was expanded to include a hazard analysis utilizing soil site class, as well as liquefaction, flood, landslide, tsunami, and WUI mapping.

Appendix B-3 and B-4 contain the complete list of critical infrastructure, the vulnerability assessment and associated methodology.

4.6.2 Data Limitations

Due to a lack of data, numerous risk assessments relied on limited and/or qualitative analyses of risk. The risk assessments provided within this section used the best available data and methodologies to estimate risk. However, large gaps exist within the available datasets and that impacted the ability to provide, with full certainty, accurate estimations of several hazard concerns.

The following pertinent gaps may be missing within the available asset inventory:

- **Market Value:** The County lacks a comprehensive database of market values associated with the critical infrastructure identified in the vulnerability assessment. This limits the County's ability to estimate the potential dollar losses associated with vulnerable structures.
- **Additional Hazards:** The vulnerability assessment quantitatively evaluates the threat to critical infrastructure by earthquakes, tsunami, floods, WUIF, and landslides. The analysis also accounts for damage to critical infrastructure during widespread utility failure. However, the vulnerability assessment does not account for other hazards that were prioritized by the HMP, including disease, windstorm, winter storm, active threat, hazardous materials incident, and drought. These hazards were evaluated quantitatively and qualitatively through other means, but not through the same unified approach of assessing the risk posed to specific critical infrastructure types.

4.6.3 Repetitive Loss Properties

FEMA	B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))

A repetitive loss structure is defined as an NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978 (FEMA 2019b).

A severe repetitive loss building is any building that:

- Is covered under a Standard Flood Insurance Policy made available under this name;
- Has incurred flood damage for which:
  - Four or more separate claim payments have been made under a Standard Flood Insurance Policy, with the amount of each claim exceeding $5,000, and with the cumulative amount exceeding $20,000; or
  - At least two separate claims payments have been made under a Standard Flood Insurance Policy, with the cumulative amount of such claim payments exceeding the fair market value of the insured building on the day before each loss. (FEMA 2019b)

Two properties in Clallam County meet the definition of "severe repetitive loss buildings," as of January 31, 2018. Table 4-1 below contains the properties, their location, and the valuation of the total flood claims.

Table 4-5 Severe Repetitive Loss Structures in Clallam County

FEMA ID	City	Occupancy	Flood Zone	Property Value	Building Value	Contents Value	Paid	Date of Payment	Date of First Loss
11317	SEQUIM	SINGLE FMLY	C	100000	101766.51	11820.28	113586.79	01/31/2018	02/04/1991
88393	FORKS	SINGLE FMLY	A	64512	67956.19	58422.94	126379.13	01/31/2018	12/15/1999

Source: FEMA Severe Repetitive Loss Properties, Compiled by the Houston Chronicle (2018). https://data.world/houstonchronicle/severe-repetitive-loss-properties-flood-games

4.6.4 Exposure Assessment

Impacts associated with mappable hazards are indicated in the risk assessments identified in Section 4.5 and Appendix B.

Note: Not all considered hazards can be mapped for vulnerability. Those risk assessments that cannot be mapped have qualitative data associated within their relative section.

4.7 Land Use and Development Trends

FEMA	D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

Clallam County's comprehensive plan was first developed and adopted in 1967. The most recent review of the plan was in 2019, to comply with the periodic review requirement outlined in Washington State's Growth Management Act (Clallam County 2019b). The County has grown approximately 6% since 2010, mainly in the population centers of Sequim and Port Angeles; however, Forks has also increased in population in that time.

No potential developments are actively being considered in known hazard areas. Vulnerability changes have been measured by accounting for shifts in land use and public awareness since the adoption of the 2010 County HMP. Each measure has been identified as having an increased, decreased, or unchanged

vulnerability. Table 4-6 provides a snapshot of how vulnerability has changed since development of the 2010 HMP.

Table 4-6 Vulnerability Changes Since 2010

Hazard	Status
Earthquake	+/-
Disease	+
Utility Failure	+
Wildfire	+/-
Windstorm	+
Winter Storm	+
Active Threat	=
Hazardous Materials Incident	+
Landslide	=
Flooding	+/-
Tsunami	+/-
Drought	+

Key:
+ Increased vulnerability
- Decreased vulnerability
+/- Increased vulnerability, but actions taken to decrease vulnerability
= Unchanged vulnerability

5 CAPABILITY ASSESSMENT

Chapter 5 identifies the County's existing mitigation capabilities. These are the plans and policies, programs, and projects that are currently in place to reduce the County's vulnerability to hazards. It also includes key mitigation accomplishments that have been completed since the last plan update in 2010. As mitigation actions identified in the County's mitigation strategy (Chapter 6) are completed, they become new mitigation capabilities.

FEMA	C1. Does the plan document [Clallam County'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)]

5.1 General

The County will implement its mitigation strategy through several internal and external capabilities. These human, financial, and regulatory capabilities form the baseline for the County's ability to reduce known risks.

Refer to Jurisdictional Annexes for Capability Assessments for each participating jurisdiction.

5.2 Human and Technical Resources

Table 5-1 describes the County's human and technical capabilities to engage in and improve mitigation planning and program implementation.

Table 5-1 Human and Technical Resources Integrated with Hazard Mitigation

Resource	Department	Tasks and Activities Integrated into Mitigation Planning
Board of Commissioners	Commissioners	Oversee the adoption and implementation of the hazard mitigation program.
Director of Emergency Management	Sheriff's Office	Oversee mitigation program and encourage integration of mitigation planning into all County activities
Director of Public Works	Public Works/Roads	Manage operations and maintenance for County-operated wastewater systems, solid waste management systems. The Roads Division builds and maintains the County's motorized and non-motorized transportation system.
Director of Health & Human Services	Health & Human Services	Environmental health, human services, public health.
Director of Information Technology	Information Technology	Maintains and provides public access to the County website and publicly available hazard data.
GIS Manager	Information Technology	Personnel skilled in Geographic Information Systems (GIS).
Land Surveyors	Roads Division	Personnel skilled in surveying County properties.
Grants Management	Emergency Planning	Oversees grants associated with emergency planning and management.
Other		

Table 5-1 Human and Technical Resources Integrated with Hazard Mitigation

Resource	Department	Tasks and Activities Integrated into Mitigation Planning
Planners or engineers	Public Works/Roads	Integrate risk assessments and mitigation tactics into ongoing projects
Risk Management	Risk Management	Staff with education or expertise to assess vulnerability to hazards.
Hazardous Materials Planning	Sheriff's Office and Fire Departments	Develop capacity for local jurisdictions to prepare for and respond to hazardous materials incidents

CAPABILITY HIGHLIGHT

The County's Director of Emergency Management is housed under the Sheriff's Office. The Director of Emergency Management has been tasked with developing a County-wide emergency management program and facilitated the inclusion of emergency management into the workings of all departments. The Director of Emergency Management serves as the lead for the County's hazard mitigation program.

5.3 Financial Resources

The County maintains many fiscal and financial resources to support its mitigation program. Table 5-2 identifies specific resources accessible for use.

Table 5-2 Accessible Financial Resources

Financial Resource	Accessible?
Community Development Block Grants	Yes
Capital Improvement Project Funding	Yes
Insurance	Yes, general liability and business line insurance
User fees for utility services	Yes, through Public Utility District (PUD)
Incur debt	Yes
State-sponsored grant programs	Yes

Table 5-3 identifies current and potential sources of funding to implement identified mitigation actions contained within the HMP.

Table 5-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Federal		
Pre-Disaster Mitigation Program	Federal Emergency Management Agency (FEMA)	Provides funding to develop hazard mitigation plans and implement mitigation actions contained within.
Hazard Mitigation Grant Program	FEMA	Post-disaster funds to hazard reduction projects impacted by recent disasters.
Flood Mitigation Assistance Program	FEMA	Provides funds for flood mitigation on buildings that carry flood insurance and have been damaged by floods.

Table 5-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Community Development Block Grant Program	U.S. Department of Housing and Urban Development	Funds projects that benefit low- and moderate-income communities, prevent or eliminate slums or blight, or meet urgent community development needs posing a serious and immediate threat to community health or welfare.
Emergency Management Performance Grants Program	FEMA/Washington Department of Emergency Management	Provides funding to states for local or tribal planning, operations, acquisition of equipment, training, exercises, and construction and renovation projects.
Flood Mitigation Assistance	FEMA/Washington Department of Emergency Management	Provides funding to support development of the flood hazard portion of state and local mitigation plans and up to 100% of the cost of eligible mitigation activities. This funding is only available to communities participating in the National Flood Insurance Program (NFIP).
Earthquake State Assistance Program	National Earthquake Hazards Reduction Program Interagency Coordinating Committee	Funds activities including seismic mitigation plans; seismic safety inspections of critical structures and lifelines; updates of building codes, zoning codes, and ordinances; and earthquake awareness and education.
National Fire Plan	U.S. Forest Service	Provides funding opportunities for local wildland-urban interface planning, prevention, and mitigation projects, including fuels reduction work, education and prevention projects, community planning, and alternative uses of fuels.
Risk Mapping, Assessing, and Planning	FEMA	Provides funding and technical support for hazard studies, flood mapping products, risk assessment tools, mitigation and planning, and outreach and support.
Strategic Economic and Community Development Grant	United States Department of Agriculture (USDA)	Provides funding in rural areas for multi-jurisdictional plan development and with a community development focus. Available only to rural areas outside of urbanized zone of any city with a population greater than 50,000.
Coastal Ecosystem Resiliency Program	National Oceanic and Atmospheric Administration	Provides funding for ecosystem restoration. Governor must approve project funds prior to award and there is a 2:1 cost-sharing ratio.
State		
Washington State Department of Transportation (WSDOT) Avalanche Forecasting and Control	WSDOT	Avalanche forecasting determines the potential risk along a particular mountain slope. When an avalanche hazard develops, WSDOT uses artillery, or explosives to trigger the avalanche. In addition to active avalanche control, WSDOT also uses passive control methods to control snow slides.
Washington Sea Grant	Washington Sea Grant	Washington Sea Grant provides funding opportunities through State and National competitions, program development services, and sponsorships.
Water Resources Program	Washington Department of Ecology (DEC)	DEC's Water Resources Program provides support in monitoring water supply, managing water supply projects, overseeing water rights, performing streamflow restoration, protecting streamflow, regulating well construction and licensing, and ensuring dam safety.
WSDOT Seismic Retrofit Program	WSDOT	WSDOT provides funding and project support to retrofit bridges at risk of failure due to seismic events.

Table 5-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Washington State Department of Agriculture (WSDA) Livestock Inspection Program	WSDA	Dedicated to providing asset protection for the livestock industry by recording brands, licensing feedlots and public livestock markets by conducting surveillance and inspection of livestock at time of sale and upon out of state movement. The program is funded by fees paid by the livestock industry and receives no general fund dollars.
Washington Local Emergency Planning Committee Program	Washington Emergency Management Division (EMD)	Washington EMD provides funding support to ensure Local Emergency Planning Committees (LEPCs) can be implemented across the state.
Washington Pipeline Safety Program	Washington Utilities and Transportation Commission	The commission is responsible for developing and enforcing safety standards for natural gas and hazardous liquid pipelines located within the state. The commission also inspects the portions of interstate natural gas and hazardous liquid pipelines located within Washington State; the standards and enforcement actions are the responsibility of the federal Pipeline and Hazardous Materials Safety Administration (PHMSA).
State Water Pollution Control Revolving Fund	Washington DEC	This program provides funds to local governments to set up low-interest loan programs to repair or replace failing on-site sewage systems. Property owners unable to qualify for conventional bank loans and marine waterfront property owners can use the program to get loans to fix or replace their systems where failures might directly affect Puget Sound. Both the Clean Water State Revolving Fund and the Centennial Clean Water Program.
Other		
Community Planning Assistance Teams	American Planners Association Foundation	Provides pro bono technical assistance for planning frameworks or community vision plans for communities needing extra assistance. Local governments are responsible for travel costs.
Thriving Resilient Communities	Threshold Foundation	Wide-ranging resiliency project funding.
Kresge Foundation Environmental Grants	Kresge Foundation	Provides funding for climate adaptation and mitigation, as well as sustainable water resources management.

5.4 Legal and Regulatory Resources

Table 5-4 describes the legal and regulatory capabilities, including plans, policies, and programs that have integrated hazard mitigation principles into their operations.

Table 5-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2010-2019)	Hazard Mitigated
Plans	County Comprehensive Emergency Management Plan	Outlines roles and responsibilities of tribal government in mitigating potential hazards.	▪ Incorporation of partners into emergency planning into operations	All

Table 5-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2010-2019)	Hazard Mitigated
	Disaster Recovery Plan	Establishes procedures to mitigate cyber and IT disruptions.	▪ Improved collaboration between IT and Emergency Management	Cyber security, utility failure
	Comprehensive Plan	The County's Comprehensive Plan establishes Urban Growth Areas, natural resource lands, rural lands, and public lands.	▪ Updated zone mapping	All
	Floodplain Management Plan	The County has developed a Dungeness River Comprehensive Flood Hazard Management Plan to study the risk of flooding along the river.	▪ Plan was approved by Washington Department of Ecology in 2010	Flooding
	Stormwater Management Plan (Draft)	The Stormwater Management Plan is established to improve the quality of stormwater runoff, reduce speed and volume of stormwater flows, and raise public awareness of stormwater issues.	▪ Plan updated in 2014 to address new areas of flooding risk ▪ Draft, not adopted	Flooding
	State of Washington Enhanced Hazard Mitigation Plan	Profiles hazards throughout the State, assesses risks, and outlines potential mitigation actions.	▪ Collaboration between State and County	All
	Capital Improvements Plan	Identifies capital improvement projects to be undertaken by the County over the next five-year period.	▪ Inclusion of hazard mitigation and maintenance projects	All
	Continuity of Operations (COOP) Plan	Outlines the County's procedures for establishing continuity of critical services following a disruption.	▪ Update of plan currently in progress – aligns COOP procedures for all County partners	All
Policies	Local Operating Plan/Agreement with Bureau of Land Management (BLM) and U.S. Forest Service	Increased capability and capacity through partnership.	▪ Signed into agreement	Wildfire
	Zoning Ordinance	Provides land use regulation in the unincorporated portions of the County.	▪ Current code through Ordinance 957, passed August 13, 2019	All
	Subdivision Ordinance	Incorporated into zoning ordinance, establishes regulations around subdivision of properties.	▪ Current code through Ordinance 957, passed August 13, 2019	All

Table 5-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2010-2019)	Hazard Mitigated
	Flood Damage Prevention Ordinance	The County's floodplain management ordinance incorporated into the Critical Areas ordinance is designed to protect and conserve the environmental attributes of the County and add to the quality of life for residents.	▪ Inclusion of wetland buffers ▪ Fish and wildlife habitat conservation areas ▪ Identification of frequently flooded areas	Flooding
	National Flood Insurance Program (NFIP)	The National Flood Insurance Program aims to reduce the impact of flooding on private and public structures.	▪ All participating jurisdictions currently participating in NFIP	Flooding
	Building Codes	Building permits are issued by the Department of Community Development and aligned with ICC 2015 building codes.	▪ Adoption of 2015 ICC codes	All

5.5 FEMA Funded Hazard Mitigation Projects

The County has received funding for several hazard mitigation projects to date. Table 5-5 outlines past FEMA funded hazard mitigation projects.

Table 5-5 FEMA Funded Hazard Mitigation Projects

Disaster ID#	Program	Project Title	Sub Grantee
1361	Hazard Mitigation Grant Program (HMGP)	Clallam Hazard Mitigation Plan	Clallam County
1037	HMGP	Bogachiel/La Push Road Bank Stabilization	Clallam County
4056	HMGP	Quileute Tribal Hm Plan - Amend #1	Quileute Indian Reservation
1734	HMGP	Amendment 1 -Jamestown S'Klallam Tribe Hazard Mitigation Plan	Jamestown Reservation
4242	HMGP	QVSD Earthquake and Multi-Hazard Resiliency	Quillayute Valley School District #402
1734	HMGP	Makah Tribe Tribal-Level All Hazard Mitigation Plan - DEOBLIGATION Closeout	Makah Indian Reservation
1682	HMGP	Lower Elwha Klallam Tribal Hazard Mitigation Plan - Closeout and Demobilization	Lower Elwha Indian Reservation
1159	HMGP	Culvert Installation	Agnew Irrigation District
4243	HMGP	Clallam County Hazard Mitigation Plan	Clallam County
	Pre-Disaster Mitigation	Quileute Tribe Management Costs Application FY 18	Quileute Tribe
1079	HMGP	Bourassa Property Acquisition	Lower Elwha Indian Reservation
1963	HMGP	Amend 1: Clallam County - GIS Data Enhancement and HAZUS Analysis	Clallam County

5.6 Continuity of Operations Planning

Continuity of government and continuity of operations (COOP) planning is an integral piece to any mitigation program. Ensuring the County has the ability to operate following an incident immediately mitigates the magnitude of many hazards.

5.7 Coordination with Community Partners

Many of these community partners participated in the HMP update process and collaborate with the County on an ongoing basis.

- **Education**
  - Cape Flattery School District
  - Quillayute Valley School District
  - Crescent School District
  - Port Angeles School District
  - Sequim School District
- **Business and Industry**
  - Local Chambers of Commerce
- **Healthcare**
  - Olympic Medical Center
  - Forks Community Hospital
- **Utilities**
  - Clallam County PUD (Water, Sewer, and Power)
  - Diamond Point Water System
  - Crescent Water Association

5.8 National Flood Insurance Program Participation

FEMA	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)(iii))

Clallam County, Forks, Port Angeles, and Sequim maintain active NFIP policies. The Lower Elwha Klallam Tribe also maintains active policies. The Jamestown S'Klallam Tribe is covered under the Clallam County policies.

Table 5-6 contains a summary of participating jurisdiction's total coverage and losses under the NFIP.

Table 5-6 National Flood Insurance Program Coverage and Losses

Community Name (Number)	Total Coverage (in Thousands)	Total Dollars Paid
CLALLAM COUNTY * (530021)	$97,187	$903,327
FORKS, CITY OF (530022)	$400	$--
LOWER ELWHA KLALLAM TRIBE (530316)	$1,715	$--

Table 5-6 National Flood Insurance Program Coverage and Losses

Community Name (Number)	Total Coverage (in Thousands)	Total Dollars Paid
PORT ANGELES, CITY OF (530023)	$6,001	$75,632
SEQUIM, CITY OF (530301)	$2,148	$55,798

Source: FEMA NFIP Policy and Loss Data by Geography (2019c) https://www.fema.gov/policy-claim-statistics-flood-insurance

5.9 Integration of Mitigation into Existing Planning Mechanisms

Integration of the principles of mitigation into the County's daily operations and ongoing planning activities is a priority of the County's mitigation program. These activities will support:

- Raising awareness of the importance of hazard mitigation for the whole community;
- Facilitating an understanding that hazard mitigation is not just an 'emergency services' function and building ownership of mitigation activities across the organization;
- Reduction in duplication or contradiction between County and jurisdictional plans; and
- Maximization of planning resources through linked or integrated planning efforts.

The County is encouraged to consider integration actions into planning mechanisms including:

- Budget decision-making;
- Building and zoning ordinances and decision-making;
- Emergency planning mechanisms; and
- Economic developing planning and decision-making.

5.9.1 Existing Plans

FEMA	C6. Does the Plan describe a process by which the local government will incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(iii))

The following existing plans provide ongoing opportunity for integration of hazard mitigation and the County will work with plan owners and stakeholders to consider hazard mitigation data and principles when these plans are updated. Table 5-7 contains a summary of the County's existing plans and how each incorporates the hazard mitigation planning.

Table 5-7 Summary of Clallam County Plans

County Plan	Hazard Mitigation Components
Comprehensive Emergency Management Plan (2016)	Outlines hazard mitigation roles and responsibilities.
Disaster Airlift Response Plan (2017)	Response and preparedness associated with hazard mitigation efforts.
Continuity of Operations Plan (Update in Progress)	Prioritizes county duties and responsibilities and establishes procedures for county departments to set up and operate in remote locations in times of emergency.

Comprehensive Plan (2019)	Identifies designated land uses and areas of economic and environmental value.
Floodplain Management Plan (2009)	Outlines strategies that directly or indirectly mitigate the risks posed by flood hazards.
Capital Improvements Program	Identifies large capital projects to reduce risks to key County infrastructure.
Historic Preservation Plan (a component of Critical Areas)	Identifies areas of cultural value that may be vulnerable to hazards.

5.9.2 Future Planning

The County is also determined to integrate mitigation planning into future efforts. One of the County's major endeavors is to continue implementing consistent land use policies for future development. Additional integration of mitigation strategies will vary from project to project, but all future planning will consider the following:

- Develop County-wide COOP Plan with an emphasis on risks and human capabilities to minimize their impacts;
- Consider the implications of future development on hazard risks and risk reduction requirements;
- Integrate risk assessments into tribal decision-making processes;
- Continued community-member input into the decision-making process;
- Incorporate the mitigation actions outlined in the HMP into future planning; and
- Integrate climate action and adaptation plans into future planning.

6 MITIGATION STRATEGY

6.1 General

Chapter 6 describes the County's mitigation strategy which is the primary focus of the County's mitigation planning efforts. This strategy represents the blueprint for the approach chosen by the County to reduce or prevent losses flowing from hazards identified in the Section 4.

The strategy is made up of three main required components: mitigation goals and objectives, mitigation actions, and a mitigation action plan for implementation (see Figure 6-1). These components provide the framework to identify, prioritize, and implement actions to reduce risk from hazards.

Figure 6-1 Mitigation Strategy Process

6.2 Mitigation Goals

FEMA	C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))

Mitigation goals are intended to represent what the County seeks to achieve through mitigation plan implementation. The goals are general guidelines and provide a framework for identifying more detailed objectives and actions. The MPT reviewed the goals and objectives from the 2010 plan update and refined determined the need to significantly reframe them for the 2019 update to improve their ability to implement the mitigation strategy.

MPT Meeting Deliverable

The County has identified the following goals for the 2019 update of the HMP:

- **Goal 1:** Maintain and expand transportation routes across the County, during and after key hazards events.
- **Goal 2:** Maintain emergency services capabilities by providing redundancy.
- **Goal 3:** Maintain key communications to ensure connectivity during and after key hazard events.

- **Goal 4:** Maintain the reliability of utilities (electricity, gas, drinking water, sewer) during and after key hazard events.
- **Goal 5:** Minimize property damage and reduce repetitive losses to property from key hazards.
- **Goal 6:** Increase public participation and responsibility in reducing their risks.

6.3 Mitigation Actions

FEMA	C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for the [Clallam County] being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))

A mitigation action is a specific action, project, activity, or process taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementation of mitigation actions helps achieve the County's mitigation goals and reduce vulnerability to threats and hazards identified in the plan. Mitigation plan regulations require the County to identify and analyze a comprehensive range of specific mitigation actions and projects to reduce the impacts identified in the County's risk assessment.

6.3.1 Review of 2010 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2010 plan were evaluated to determine what the status of the action was and whether any ongoing or incomplete actions should be included as actions in the 2019 plan update. The MPT worked through each previous action in advance of and during MPT Meeting #3 to document steps taken to fulfill the action. The status of the 2010 Mitigation Actions is outlined in Table 6-5.

See Table 6-5 for an overview of the status of all actions from the 2010 plan update.

6.3.2 Identification and Analysis of Mitigation Actions

In order to achieve the mitigation goals identified above, the County has identified a comprehensive series of mitigation objectives and supporting actions that are focused on reducing vulnerability and maximizing loss reduction. The actions can typically be broken out into the following types of activities which are indicated in Table 6-1:

- **Plans and Regulations**: Regulatory actions or planning processes that reduce vulnerability to hazards.
- **Infrastructure/Capital Project**: Actions that involve modification of existing buildings or structures to protect them from a hazard, or removal from the hazard area.
- **Natural Systems Protection**: Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems.
- **Education and Awareness**: Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them.

- Preparedness and Response: Actions that protect people and property during and immediately after a hazard or hazard event.

Table 6-1 2019 Mitigation Actions by Group

Mitigation Group	Related Mitigation Actions
Plans and Regulations	PA05, JSK13, PUD05, LEK06, PC05
Infrastructure/Capital Project	FR02, FR03, PA01, PA02, PA03, PA04, PA06, PA07, PA08, PA09, PA10, SQ01, SQ02, SQ04, SQ05, SQ06, SQ07, SQ09, SQ10, SQ12, SQ13, CC01, CC02, CC05, CC07, CC08, CC13, CC14, CC15, JSK02, JSK04, JSK12, JSK16, JSK17, PUD01, PUD02, PUD03, PUD04, PUD06, LEK01, LEK02, PC01, PC02, PC03, PC04, POPA01, POPA02, POPA03, POPA04, POPA05
Natural System Protection	CC11, CC15, JSK03, JSK06, JSK08, JSK09
Education and Awareness	JSK07, JSK11, JSK14, JSK18, LEK14, SQ14, SQ18
Preparedness and Response	FR01, SQ03, SQ08, SQ11, SQ15, SQ16, SQ17, SQ19, CC03, CC04, CC06, CC09, CC10, CC12, CC16, CC17, JSK01, JSK05, JSK10, JSK15, JSK19, LEK03, LEK04, LEK05, LEK07, LEK08, LEK09, LEK10

All mitigation actions identified in the plan are addressed in the mitigation implementation plan provided in Section 6.5. The actions include both interim- and long-term strategies for reducing vulnerability to hazard and are characterized as such in the 'life of action' column of the implementation plan.

6.3.3 2019 Mitigation Actions by Hazard

All mitigation actions identified in the plan address at least one priority hazard outlined in Chapter 4 of the HMP. Table 6-2 indicates which mitigation actions address which hazards.

Table 6-2 2019 Mitigation Actions by Hazard

Hazard*	Related Mitigation Actions
All Hazards	PA04, PA08, PA09, PA10, SQ09, CC01, CC02, CC03, CC04, CC08, CC10, JSK02, LEK04, LEK07, LEK08, LEK09, LEK10, PC01, PC02, PC03, PC04, PC05, POPA04, SQ11, SQ16, SQ17, SQ18, SQ19
Cascadia Earthquake/Earthquake	PA03, PA07, SQ01, SQ07, SQ12, SQ13, SQ14, CC05, CC07, CC12, JSK01, PUD03, LEK02, LEK03, LEK05, POPA01, POPA02, POPA05, CC13
Disease	
Utility Failure	PA01, PA02, PA04, SQ01, SQ05, SQ06, SQ07, SQ12, POPA03
Wildfire	SQ07, SQ10, SQ15, CC06, JSK18, JSK19, LEK02
Windstorm	FR02, SQ01, JSK11, JSK12, PUD02, PUD06, POPA01, POPA02, POPA05
Winter Storm	FR02, PA06, SQ01, SQ04, SQ08, SQ13, JSK11, JSK12, PUD01, PUD02, PUD06, LEK02, POPA02, POPA03
Active Threat	
Hazardous Materials Incident	
Landslide	FR03, PA01, JSK08, JSK09, PUD04, LEK02, SQ13

Table 6-2 2019 Mitigation Actions by Hazard

Hazard*	Related Mitigation Actions
Flooding	FR01, FR02, FR03, PA01, PA05, PA06, SQ01, SQ04, SQ08, SQ10, SQ13, CC09, CC11. JSK03, JSK04, JSK05, JSK06, JSK07, JSK16, JSK17, PUD01, LEK02, LEK03, LEK06, CC14
Tsunami	SQ01, JSK01, JSK04, JSK14, JSK15, JSK16, JSK17, LEK01, LEK02, LEK03, LEK05, POPA01, POPA02, POPA03, POPA05, CC14
Drought	SQ06, SQ07, SQ10, JSK13, PUD05, POPA01, POPA05, CC15, CC16, C17

6.4 Evaluating and Prioritizing Mitigation Actions

Once mitigation actions were identified, the MPT during MPT Meeting #3, and other key stakeholders went through the exercise of evaluating and prioritizing each action to determine which actions are most suitable for the County to implement. A mitigation action worksheet was developed for each action that included the following information:

Description of the Action	***Specific*** – Target a specific area for improvement. ***Measurable*** – Quantify or at least suggest an indicator of progress. ***Assignable*** – Specify who will do it. ***Realistic*** – State what results can be achieved realistically, given available resources. ***Time-related*** – Specify when the result(s) can be achieved.
Action Status	***New*** – The action is new and will be included for the first time in the 2019 plan update. ***Existing*** – The action was implemented prior to the 2019 plan update but is ongoing and additional or ongoing action is required for completion. ***Complete*** – The action has been completed.
Type of Action	***Plans and Regulations*** ***Infrastructure/Capital Project*** ***Natural Systems Protection*** ***Education and Awareness*** ***Preparedness and Response***
Lead and supporting departments	***County agencies*** ***Local or Tribal agencies*** ***Others***
Timeline for Implementation and Expected Life of the Action	***Less than 1 year*** ***1 to 3 years*** ***3 to 5 years***
Other	Hazards Addressed by the Action Anticipated Cost and Funding Source Mitigation Goals Supported by the Action

A complete mitigation implementation plan is provided in Table 6-5.

See Appendix D-1 for a sample worksheet, Appendix D-2 for worksheet instructions, and Appendix D-3 completed worksheets for all actions identified in the plan.

6.4.1 Maximizing Loss Reduction

The County's mitigation strategy is directed by the mitigation goals identified in Section 6.2. However, equally important, the County seeks to prioritize actions that lead to the greatest return on investment. The ultimate goal of this plan is to maximize loss reduction, and this perspective is baked into the County's mitigation strategy.

6.4.2 STAPLEE Analysis

In addition to the information noted above, each action was self-evaluated using STAPLEE criteria as described in Table 6-3. Evaluators were asked to rate each STAPLEE criteria to come up with a total score that determined the relative suitability of each action.

Table 6-3 STAPLEE Criteria

STAPLEE Criteria	Evaluation Rating
S: Is it Socially acceptable?	Definitely YES = 3 Maybe YES = 2 Probably NO = 1 Definitely NO = 0
T: Is it Technically feasible and potentially successful?	
A: Does the responsible agency/department have the Administrative capacity to execute this action?	
P: Is it Politically acceptable?	
L: Is there Legal authority to implement?	
E: Is it Economically beneficial?	
E: Will the project have either a neutral or positive impact on the natural Environment? (score a 3 if positive impact, 2 if neutral impact)	
Will historic structures or key cultural resources be saved or protected?	
Could it be implemented quickly?	

6.4.3 Mitigation Effectiveness Analysis

In addition to the STAPLEE analysis, MPT members were asked to rate the effectiveness of each action as described in Table 6-4.

Table 6-4 Mitigation Effectiveness Criteria

Mitigation Effectiveness Criteria	Evaluation Rating
Will the implemented action result in lives saved?	High = 5 Medium = 3 Low = 1
Will the implemented action result in a reduction of disaster damage?	High = 5 Medium = 3 Low = 1

6.5 2019-2025 Mitigation Implementation Plan

FEMA	C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by [Clallam County]? (Requirement §201.6(c)(3)(iv); Requirement §201.6(c)(3)(iii))

The mitigation implementation plan lays the groundwork for how the mitigation plan will be incorporated into existing planning mechanisms and how the mitigation actions will be prioritized, implemented, and administered by the County. The implementation plan includes both short-term strategies that focus on planning and assessment activities, and long-term strategies that will result in ongoing capability or structural projects to reduce vulnerability to hazards.

See Appendix D for Mitigation Action Worksheet instructions and completed Mitigation Action Worksheets for each action listed in Table 6-5.

Table 6-5 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
City of Forks													
FR01	City of Forks Culvert Assessment Study/Report	2010 Action - Ongoing	5	Public Works and Planning Departments	2010-2011	$15,000	Yes	Grant funding, Street Department funding	Flooding	20	8	28	1
FR02	Storm-related Roof Damage Mitigation Assessment	2010 Action - Ongoing	5	Planning Department	2010-2011	$15,000	No	FEMA HMA, CDBG, Energy conservation dollars	Flooding, Winter Storms, Wind Storms	18	4	22	2
FR03	Palmer Road Stormwater Detention Pond and Conveyance System	2010 Action – Property has been purchased; preliminary design work was undertaken by the County Road division. Project funding has slowed.	4,5	Utilities Department	1-3 years	UNK	Yes, partial funding.	City of Forks, Clallam County Public Works, FCAAP (DOE)	Flooding, landslides	16	4	20	3
Adopt the Hazard Mitigation Plan	Adopt the Hazard Mitigation Plan	Completed – Re-adopting updated 2019 HMP		Planning Department	1 year	N/A	Yes	N/A	All hazards				
City of Port Angeles													
PA01	Protect/Reinforce Sole Source Water Main from Elwha River against slide failure	2010 Action - Ongoing	4	Public Works	1-3 years	$250,000	Yes	FEMA, CFP	Flooding, Utility Failure, Landslide	18	6	24	4
PA02	Protect/Reinforce Sole Source Water Main from City to Eastern Customers and to PUD's Roundtree Reservoir	2010 Action - Ongoing	4	Public Works	1-3 years	$400,000	Yes	FEMA, CFP	Flooding, Utility Failure, Landslide	18	6	24	5
PA03	Peabody Heights Reservoir Earthen Dam Reinforcement	2010 Action - Ongoing	4,5	Public Works	1-3 years	$175,000	Yes	FEMA, CFP	Earthquake	13	10	23	7
PA04	Sewer Pump Station Power Upgrades	2010 Action - Ongoing	4	Public Works Wastewater	1-3 years	$165,000	Yes	FEMA, CFP	All hazards/Utility Failure	18	6	24	6

Table 6-5 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
PA05	Update Flood Assessment	2010 Action - Ongoing	5	Community & Economic Development Department	1-5 years	UNK	Yes	FEMA/DOE	Flooding	17	6	23	8
PA06	Upgrade to Shorelines	2010 Action - Ongoing	5	Community & Economic Development Department/Public Works and Utilities	1-5 years	$150,000	Yes	FEMA/Department of Natural Resources/Grants/ Private funding	Flooding, winter storms	15	6	21	10
PA07	Tumwater Street Bridge Approach Improvement	2010 Action - Ongoing	1,5	Public Works	1-5 years	$223,000	Yes	FEMA/DOT	Earthquake	20	10	30	1
PA08	Install Backup Power for City Corp Yard	2010 Action - Ongoing	3,4	Public Works Utilities	1-5 years	$150,000	Yes	FEMA, CFP	All hazards, utility failure	19	6	25	2
PA09	Install Backup Power for Light Operations Facility	2010 Action - Ongoing	3,4	Public Works Electric Utility	1-3 years	$150,000	Yes	FEMA, CFP	All hazards, utility failure	19	6	25	3
PA10	Fiber Optic Network Upgrade	2010 Action - Ongoing	3	Public Works Utilities	1-5 years	$315,000	Yes	FEMA, NTIA Grant	All hazards, utility failure	19	4	23	9
Adopt the Hazard Mitigation Plan	Adopt the Hazard Mitigation Plan	Completed – Re-adopting updated 2019 HMP		Department of Community Development, City Council	1 year	N/A	Yes	N/A	All hazards				
City of Sequim													
SQ01	Build fuel station at City Public Works Yard to supply fuel to City departments and all emergency responders.	New	2,4	City Public Works, Police Department	1-3 years	$850,000	Yes	FEMA	Earthquake, Flood, Utility Failure, Winter Storm, Tsunami, Windstorm	19	6	25	10
SQ02	Replace 3-mile 12” water main from Ranney Will (infiltration gallery) beginning near the Dungeness River and ending at the Reservoir Road Reservoirs.	New	4,5	Public Works Department	1 – 3 years	Unknown	Yes	FEMA	Floods, Utility Failure, Winter Storm,	12	6	18	1
SQ03	Purchase a portable water purification system and small tanks. Prepare multiple sites and equipment to operate water purification	New	4,5	Public Works Department	2 years	Unknown	Yes	Drinking Water State Revolving Fund (DWSRF), FEMA	Earthquake, flooding, tsunami	18	6	24	8
SQ04	Locate location for new water reservoir, purchase property, design and construct.	New	4,5	Public Works Department	3-5 years	Unknown	No	City of Sequim general fund, property owners, developers, PUD	Winter storms, flooding	15	8	23	4
SQ05	Reroute/reconfigure electrical supply to the City of Sequim Water Reclamation Facility at	2010 Action - Ongoing	4,5	Public Works Department, PUD	3-5 years	Unknown	No	Drinking Water State Revolving	Utility Failure	19	4	23	5

Table 6-5 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
	247 Schmuck Road by bringing new power source into the facility and using existing supply as backup.							Fund (DWSRF), FEMA					
SQ06	Construct deep water well (>600 feet) to increase resiliency and reliability within water system.	New	4,5	Public Works Department	1-3 years	Unknown	Anticipated	Drinking Water State Revolving Fund (DWSRF), FEMA	Utility Failure, Drought, Water Shortage	17	4	21	2
SQ07	Connect and extend City water mains to improve looping, during water main replacements and developer projects.	New	4,5	Public Works Department	3-5 years	Unknown	Anticipated	Drinking Water State Revolving Fund (DWSRF), Developers	Earthquakes, Excessive Heat, Utility Failure, Water Shortages, Wildfires	17	4	21	3
SQ08	Purchase Additional Heavy Equipment for Use during Severe Storms	2010 Action - Ongoing	2,4	Public Works Department	0-5 years	UNK	Yes	City of Sequim general fund	Winter storms, flooding	19	8	27	15
SQ09	Develop Reliable Backup Program for Critical City Data Entry Post-Disaster	2010 Action - Ongoing	2,3	Finance Department (Information Technology)	2 years	UNK	Yes	City of Sequim general fund	All hazards	19	6	25	11
SQ10	Capture stormwater in the County southwest of Sequim city limits and re-infiltrate using green stormwater infrastructure to benefit the watershed.	New	4,5	City of Sequim Public Works, Clallam County Public Works	<1 year	Capture & Infiltration project ~ $1.23M total. Match of $154k will be 97% met by land acquisition, the rest by staff time.	Anticipated	Application submitted to FEMA Hazard Mitigation Program	Flooding, Drought, Wildfire	18	6	24	9
SQ11	Install an energy storage microgrid for storing solar energy for use in the EOC and Civic Center during power outage emergencies.	New	4.5	Public Works Department	1-3 years	Unknown	No	Washington State Department of Commerce	All hazards	19	4	23	6
SQ12	Replace mid-1900s AC pipe running through the City with earthquake-resistant pipe.	New	4	Public Works Department	3-5 years	$6-8 million	No	City Budget, Grant	Earthquake, Utility Failure	18	8	26	14
SQ13	Protect/reinforce Johnson Creek Trestle for the Olympic Discovery Trail west of Whitefeather Way	New	1,4	Public Works Department	3-5 years	$100,000	No	City Budget, Grant	Earthquake, Flooding, Landslide, Winter Storm	19	4	23	7
SQ14	Train City staff to perform seismic assessments of City properties	New	2,6	Public Works Department	1-3 years	Minimal	Yes	Staff time	Earthquakes	19	8	27	16

Table 6-5 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
SQ15	Conduct wildfire risk assessment for City of Sequim and Fire District 3	New	4,5	Public Works Department and Clallam Co. Fire District 3	1-3 years	$20,000-$40,000	No	Grant	Wildfire	19	6	25	12
SQ16	Implement asset management using GIS for all capital facilities	New	4	Public Works Department	1-3 years	$20,000 per year plus staff time	No	Existing Budget	All Hazards	19	8	27	17
SQ17	Coordinate Emergency Management/Incident Response trainings for North Olympic Peninsula jurisdictions	New	2	Sequim Police Department	<1 year	Negligible	Yes	Existing Budget	All Hazards	19	8	27	18
SQ18	Public education of potential hazards, local agency response, and preparedness	New	6	Sequim Police Department	<1 year	Negligible	Yes	Existing Budget	All Hazards	17	8	25	13
SQ19	Develop risk assessment and response plan for vulnerable populations regarding excessive heat, cold, smoke inhalation – including loss of power and/or ability to transport	New	6	Sequim Police Department	<1 year	$20,000	No	Existing Budget, Grant	All Hazards	19	8	27	19
Adopt the Hazard Mitigation Plan	Adopt the Hazard Mitigation Plan	Completed – Re-adopting updated 2019 HMP		Planning Department	1 year	N/A	Yes	N/A	All hazards				
Clallam County													
CC01	Relocate Public Works/Roads from tsunami zone	New	4,5	EMD, Public Works/Roads	3-5 years	$2,000,000	No	FEMA, Capital Funds	All hazards	17	6	23	15
CC02	Move EOC from seismically unstable area to new location	Ongoing	2,3,6	EMD, PA Fire Department, City Parks, Port of PA	1-3 years	$6 to 8 million approximately	In development	FEMA, Community Fund-matching	All hazards	20	10	30	1
CC03	Identify and organize County hazard GIS data so that it is readily available in the event of a hazard.	New	3	County Information Technology, EMD	<1 year	Minimal	Yes	Existing budget	All hazards	18	4	22	17
CC04	Establish a system of real-time hazard mapping to communicate conditions on the ground to staff and public.	New	3,6	County Information Technology, EMD	Immediate	Minimal	Yes	Existing budget	All hazards	17	6	23	16
CC05	Reinforce/retrofit Fire District 2 facilities for seismic stability.	New	2,5	Clallam Fire District 2, Rescue	3-5 years	$1,000,000	No	FEMA	Earthquake	18	10	28	5
CC06	Hire a consultant to conduct a wildfire risk assessment profile of Fire District 2 facilities.	New	2	Clallam Fire District 2 Rescue	1-3 years	$20,000 - $40,000	No	FEMA, Bond/Levy	Wildfire	19	6	25	7
CC07	Build new Fire District 4 station that is seismically sound.	New	2	Clallam Fire District 4	1-3 years	Approx. $1.6 – $2 million	In development	FEMA, 25% match from FD	Earthquake	18	10	28	6

Table 6-5 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
CC08	Establish back-up link for OPSCAN in Forks.	2010 Action – Ongoing	3	County Sheriff's Office	1-3 years	Minimal	Yes	OPSCAN Operations	All hazards	17	8	25	8
CC09	Inventory dikes, levees, and flood protection structures on Clallam County Rivers	2010 Action – Ongoing. Completed for Lower Dungeness River.	4,5	DCD, Public Works, USACE, WDFW, WSDOT	2-4 years	Unknown	Partial	FEMA	Flooding	21	8	29	2
CC10	Inventory public utilities including water supplies, sewer systems, and solid-waste handling facilities.	2010 Action – Ongoing	4	Sequim, Forks, Port Angeles, and Clallam County Public Works Departments, Environmental Health Division, WSDOH, WDOE.	1-3 years	Unknown	Partial	Grants, Operating budgets	All hazards	21	8	29	3
CC11	Setback of USACE dike located in lower reach of Dungeness River.	2010 Action – Ongoing, funds procured	5	DCD, USACE, Clallam County Public Works	Ongoing over 5 years+	$1.2 million	Yes	Puget Sound Acquisition and Restoration Fund	Flooding	21	8	29	4
CC12	Seismic study of newer portion of Clallam County Courthouse	2010 Action - Ongoing	2,5	Clallam County Public Works Maintenance and Facilities	1-3 years	$20,000 - $40,000	Yes	County capital project funds, FEMA	Earthquakes	19	6	25	9
CC13	Re-locate Fire Station 33, which is currently located in a liquefaction zone.	New	2,5	Clallam County Fire District 3	1-3 years	$3,150,000 or $400 per square foot	No	Grant, Bond/Levy	Earthquakes	16	8	24	10
CC14	Re-locate Fire Station 31, which is currently located in a tsunami hazard zone.	New	2,5	Clallam County Fire District 3	1-3 years	$3,150,000 or $400 per square foot	No	Grant, Bond/Levy	Earthquakes, Flooding, Tsunami	16	8	24	11
CC15	Install off-channel reservoir adjacent to Dungeness River, to store high Dungeness River flows and storm flows for release later for aquifer recharge and irrigation purposes.	New	4,5	Clallam County Department of Community Development	3-5 years	$25-35 million for construction	Partial funding available ($4.1 million of total construction cost)	County funds, FEMA	Drought, Water Shortages	17	8	24	12
CC16	Hire contractor to conduct assessment to identify coastal areas vulnerable to sea level rise. Conduct water quality assessment of wells throughout the County to evaluate saltwater intrusion.	New	4,5	Clallam County Department of Community Development	3-5 years	Phase I of II - $170,000 (Paying for well water analytical samples, sea water intrusion susceptibility maps, and conducting education and	No	County has proposed a Near Term Action to obtain funding to assess sea level rise and storm surge susceptibility along the coast and to monitor groundwater along	Drought, Water Shortages	17	8	24	13

Table 6-5 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
						outreach for landowners).		the coast to assess saltwater intrusion.					
CC17	Investigate alternative water sources in areas where water quantity and quality have declined due to climate change.	New	4,5	Clallam County Department of Community Development	3-5 years	Unknown	TBD	County, FEMA	Drought, Water Shortages	17	8	24	14
Adopt the Hazard Mitigation Plan	Adopt the Hazard Mitigation Plan	Completed – Re-adopting updated 2019 HMP		Planning Department	1 year	N/A	Yes	Loan, private or public fee increases	All hazards				
Jamestown S'Klallam Tribe													
JSK01	Seismic assessment of Tribal facilities	New	3,4,5	Tribe	1-3 years	$10,000 - $20,000	No	FEMA	Tsunami, Earthquakes	19	6	25	11
JSK02	Improve communications in Blyn Basin, including building cellular tower and installing fiber internet.	New	1	Tribe	1 year	$400,000 for cellular tower	Yes	Tribe	All hazards	20	6	26	5
JKS03	Lower Dungeness River Floodplain Restoration, including 3 Crabs Rd.	2015 Action – Ongoing, funding secured, and removal of dikes and levees continues.	5	Tribe, Clallam County, WDFW	5 years	$10 million	Yes	WA Floodplains by Design, Construction funding from ACOE	Flooding	20	8	28	3
JSK04	Structure elevation and/or relocation of Tribal facilities and infrastructure	2015 Action – Ongoing, Tribe is reducing investment in nearshore properties and moving sewers upgradient of flood-prone areas.	5	Tribe	Variable	TBD	Yes	HMGP	Flooding, Tsunami	19	8	27	4
JSK05	Coordinate with County on the implementation of the NFIP Program	2015 Action – Ongoing, Jimmycomelately Creek is still not mapped correctly by FEMA after reconstruction. Buildings are mapped in former floodplain. New Casino expansion may be in new floodplain.	5	FEMA, Tribe, County	Ongoing	Operations costs	Yes	FEMA, Tribe	Flooding	12	8	20	19

Table 6-5 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
JSK06	Encourage native vegetation on shorelines and formation of dunes	2015 Action – Ongoing, Three Crabs area has been revegetated (2018). This is an ongoing focus for future flood plain restoration projects.	5	Tribe	Ongoing	Minimal	Yes	PDM, USDA	Flooding	21	4	25	12
JSK07	Public education around flood mitigation, floodplain functions, emergency service procedures, and potential hazards.	2015 Action – Ongoing. The Tribe is building an educational center, tsunami signage is complete in Blyn. The evacuation plan is unchanged, but some elements will change with the addition of overnight guest facilities at Casino.	6	Tribe	Ongoing	Staff time	Yes	PDM	Flooding	18	6	24	13
JSK08	Limit removal of vegetation in areas prone to ground failure. Plan ground cover where appropriate.	2015 Action – Ongoing.	5	Tribe, County	Variable	Minimal	Yes	Tribe	Landslide	18	4	22	15
JSK09	Encourage residents and landowners to leave natural erosion barriers, such as driftwood logs on the shore, in place to reduce shoreline erosion.	2015 Action – Ongoing.	5,6	Tribe	Variable	Minimal, staff time.	Yes	Tribe	Landslide	18	4	22	16
	StormReady	2015 Action – Complete	5,6	Clallam County, State, Tribe	Ongoing	Staff time, in-kind services	Yes	Tribe	Winter storm, windstorm	20	6	26	6
JSK11	Conduct severe weather awareness activities.	2015 Action – Ongoing. Main objective of creating home emergency kit was completed. Public communication is ongoing.	5,6	Clallam County, Tribe	Ongoing	Staff time, in-kind services	Yes	Tribe	Winter storm, windstorm	20	6	26	7
JSK12	Develop alternate water supplies to provide reserve water sources to be used in	2010/2015 Action – New for this 2019 Plan because of recent rapid	4	Tribe	1-3 years	$1,000,000	Yes	HUD Indian Community Development Grand Program	Winter storm, windstorm, drought	18	4	22	17

Table 6-5 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
	event of drought or water shortage.	population growth in Blyn.											
JSK13	Create and expand water efficiency/conservation programs.	2015 Action – Ongoing and Active.	5,6	Tribe	5 years	Up to $25,000	Yes	Tribe, Grants	Drought	18	4	22	18
JSK14	Continue to participate in TsunamiReady with Clallam County	2015 Action – Ongoing	6	Clallam County, Tribe	Ongoing	Staff or volunteer time, in-kind services	Yes	Minimal	Tsunami	20	6	26	8
JSK15	Develop advanced warning systems	2015 Action – Ongoing, continue to communicate with WEMD, Great Shakeout Official Partners, locations of AHAB have been determined.	3	Clallam County, Tribe	Ongoing	Staff or volunteer time, in-kind services	Yes	Minimal	Tsunami	20	6	26	9
JSK16	Study and implement wellhead protection measures to ensure continued water supply for the Jamestown Beach community in the event of tsunami or extreme flooding.	2015 Action – Ongoing. Accessed funds, hired consultant, and study will be complete in 2019.	4	Tribe	1 year	<$5,000	Partial	CDBG-GP Grand, EPA Grants, USDA Rural Development Loans or Grants	Flooding, Tsunami	20	6	26	10
JSK17	Explore feasibility of incorporating elevated tsunami shelters or vertical evacuation structures in future construction plans in vulnerable zones in Blyn (7 Cedars Resort Casino & Tribal Government).	2015 Action – Not complete, especially with continued development in Blyn and expansion of Casino.	4	Tribe	1-3 years	Unknown	Yes	FEMA	Flooding, Tsunami	20	10	30	1
JSK18	Fuel reduction projects and defensible space around structures	2015 Action – Ongoing	5	Tribe and County	1-5 years	Unknown	Yes	US Forest Service Grants	Wildfire	19	10	29	2
JSK19	Promote FireWise building design for construction in the Vision Master Plan and Housing Programs	2015 Action – Ongoing	5,6	Tribe and County	Ongoing	Staff Time	Yes	ICDBG, US Forest Service, BLM	Wildfire	17	6	23	14
Adopt the Hazard Mitigation Plan		Completed – Re-adopting updated 2019 HMP		Planning Department	1 year	N/A	Yes	N/A	All hazards				
Clallam County Public Utilities District No. 1 (PUD)													
PUD01	Establish Reliable Power Source for Battelle Industries	2010 Action - Ongoing	High	PUD, Battelle	3-5 years	TBD	No	City of Sequim general fund, property owners, developers, PUD	Winter Storms, Flooding	13	6	19	6

Table 6-5 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
PUD02	Move overhead powerlines underground in select areas.	2010 Action – Ongoing. Areas of continued focus are the North Shore of Lake Crescent, South Shore Lake Sutherland, Diamond Point Road, Deer Park Road, and Hoko Ozette Road	4	PUD	1-5 years	TBD	Yes	PUD operating budget	Windstorm, Winter Storms	15	10	25	3
PUD03	Replace Asbestos-Cement Pipe throughout County	2010 Action – Ongoing	4,5	PUD	1-5 years	TBD	Yes	PUD operating budget	Earthquake	18	10	28	1
PUD04	Replace ultra-high-risk water mains in the event of erosion or landslide.	2010 Action – Ongoing. Areas that have been reviewed are: water main from Morse Creek to Treatment Plant to Deer Park; water main from Hoko-Ozette Road to Eagle Point Road; Water Main to Upper Sekiu Reservoir; Replace Buried Creek crossing with bridge crossing in 4 Seasons Park; Replace buried creek crossing in 4 Seasons Ranch and eliminate White Creek crossing to Lower LUD #3 Pump Station.	4,5	PUD	Ongoing	TBD	Yes	PUD operating budget	Landslide	18	8	26	2
PUD05	Fairview – Morse Creek Drought Plan	2010 Action – Ongoing as conditions worsen at Morse Creek.	5	PUD	Ongoing	TBD	Yes	PUD operating budget	Drought	16	6	22	5
PUD06	Additional tree trimming in high risk wind areas to protect overhead lines.	2010 Action - Ongoing	3,4,5	PUD	Ongoing	TBD	Yes	PUD operating budget	Winter storm, Windstorms	17	8	25	4

Table 6-5 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
Adopt the Hazard Mitigation Plan		Completed – Re-adopting updated 2019 HMP		Planning Department	1 year	N/A	Yes	N/A	All hazards				
Lower Elwha Klallam Tribe													
LEK01	Move the tribal center from the tsunami inundation zone where it is currently located.	New	4,5	Lower Elwha Police Department, Emergency Management Division	3-5 years	Unknown	No	FEMA	Tsunami	14	10	24	6
LEK02	Widen and strengthen Lower Elwha Road from Stratton Road to Kacee Way.	New	1	Lower Elwha Police Department, Emergency Management Division	3-5 years	Unknown	No	FEMA	Earthquake, Flood, Landslide, Winter Storm, Tsunami, Wildfire	17	6	23	10
LEK03	Evaluate options to make new hotel in Port Angeles tsunami resistant.	New	4,5	Lower Elwha Police Department, Emergency Management Division	1-3 years	Unknown	No	FEMA	Earthquake, Flood, Tsunami	20	10	30	1
LEK04	Identify Elders and other vulnerable populations to prioritize for mitigation and disaster assistance	2011 Action – Ongoing. Started in 2018 in collaboration with Tribal Council and Elwha Health Clinic	5,6	Lower Elwha Klallam Emergency Management, Tribal Police, Enrollment, Tribal Clinic	1 year	Staff time	Yes	Operating Budgets	All hazards	20	6	26	4
LEK05	Create new, and expand existing Evacuation Routes, including better signage	2011 Action – Ongoing. Kacee Way has been completed and one new Tsunami Evacuation Route sign was added on Lower Elwha Road.	1,6	Lower Elwha Klallam Emergency Management	1 year	Unknown	Yes	FEMA	Tsunami, Earthquake	20	6	26	5
LEK06	Acquire properties in low hazard areas in order to locate new development or relocate existing vulnerable structures and critical facilities	2011 Action – Ongoing. Construction on the new building for the school and Head Start programs began in 2019. The new building is sited on high ground.	5	Lower Elwha Klallam Emergency Management	1 -5 years	Varies depending on property. FEMA Cost Benefit Analysis software will be used to prioritize which structures to relocate.	No	PDM grant, HUD grants, USDA development grants	Flooding	14	10	24	7

Table 6-5 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
LEK07	Continue and expand disaster training programs such as Community Emergency Response Team (CERT) to train Tribal members and the local community to respond to an emergency	2011 Action – Ongoing. The new CERT team has been started; training continues.	2,5	Lower Elwha Klallam Emergency Management	Annual	$10,000-20,000 per year	Yes	EMPG grants, regional homeland security grants, Citizens Corps funding and other sources	All hazards	20	8	28	3
LEK08	Develop and/or improve Emergency Plans such as Evacuation Plans, Tribal Records Protection Plan, Continuity of Operations Plan etc.	2011 Action – Ongoing. The Evacuation Plan is complete. Tribal Records Protection Plan and COOP will be developed.	2,5,5	Tribal Council, Lower Elwha Klallam Emergency Management	1-5 years	Staff time to prepare plans, $30,000 - $80,000	Yes	Emergency Mgt Performance Grants, Dept of Health Grants, Regional Homeland Security funds and other sources	All hazards	19	10	29	2
LEK09	Partner with local jurisdictions and agencies in developing and implementing mitigation and emergency response strategies and actions	2011 Action – Ongoing.	5,6	Lower Elwha Klallam Emergency Management	Ongoing	Staff time	Yes	FEMA, Tribal Operating Budget	All hazards	18	6	24	8
LEK10	Develop a system to protect and maintain historical and archival Tribal records	2011 Action – Ongoing. Work on COOP will commence in 2020.	5,6	Tribal Council	1-3 years	Unknown	Yes	Tribal Operating Budget	All hazards	18	6	24	9
LEK11	Implement Vegetation and other natural resource management practices to reduce landslides and coastal erosion	2011 Action – Status unknown.	5										
Adopt the Hazard Mitigation Plan		Completed – Re-adopting updated 2019 HMP	High	Planning Department	1 year	N/A		N/A	All hazards				
Peninsula College													
PC01	Renovate/Replace N Building, Main Campus	2010 Action – Ongoing	5	Finance and Administration	Ongoing	N/A	N/A	FEMA, Capital Funds	All hazards	17	10	27	1
PC02	Renovate/Replace J Building, Main Campus	2010 Action – Ongoing	5	Finance and Administration	Ongoing	N/A	N/A	FEMA, Capital Funds	All hazards	17	10	27	2
PC03	Renovate/Replace Q Building, Main Campus	2010 Action – Ongoing	5	Finance and Administration	3-5 years Approx.	N/A	N/A	FEMA, Capital Funds	All hazards	17	10	27	3
PC04	Renovate/Replace P Building, Main Campus	2010 Action – Ongoing	5	Finance and Administration	Ongoing	N/A	N/A	FEMA, Capital Funds	All hazards	17	10	27	4
PC05	Incorporate hazard mitigation into Master Plan	2010 Action – Ongoing	5	Finance and Administration	Ongoing	N/A	N/A	FEMA, Capital Funds	All hazards	17	10	27	5

Table 6-5 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
Adopt the Hazard Mitigation Plan		Completed – Re-adopting updated 2019 HMP	High	Planning Department	1 year	N/A		N/A	All hazards				
Port of Port Angeles													
POPA01	Strengthen airport runway to facilitate landing of large emergency aircraft.	New	4,5	Port of Port Angeles	1-3 years	$2,000,000	No	FEMA Grant, Operating Budget (Larger cost savings will be realized by completing this project in conjunction with the 2022 runway rehab project)	Earthquakes, Tsunami, Water Shortages, Windstorm	20	8	28	1
POPA02	Install protective safety glass in the windows of the airport terminal building complex to hold shattered glass in place in the event of a major windstorm or earthquake.	New	4,5	Facilities Maintenance/Airport - Port of Port Angeles	<1 year	$2,500	No	FEMA Grant, Operating Budget	Earthquakes, Winter Storm, Tsunami, Windstorm	19	6	25	3
POPA03	Purchase fuel tanks and build a fuel transfer station at the Port's newly constructed and located shop outside of the tsunami zone.	New	4,5	Facilities Maintenance - Port of Port Angeles	1-3 years	$10,000 - $20,000	Yes	Operating Budget, Grant	Utility Failure, Winter Storm, Tsunami	18	8	26	2
POPA04	Build a portable emergency water supply.	New	4,5	Facilities Maintenance - Port of Port Angeles	1-3 years	$1,500	No	Operating Budget	All Hazards	18	6	24	4
POPA05	Strengthen airport taxiway to increase weightbearing capacities for emergency aircraft.	New	4,5	Port of Port Angeles	1-3 years	$2,000,000	No	FEMA Grant, Operating Budget (Larger cost savings will be realized by completing this project in conjunction with the 2022 runway rehab project)	Earthquakes, Tsunami, Water Shortages, Windstorm	20	8	28	1

7 PROGRAM IMPLEMENTATION

Chapter 7 provides an overview of the overall strategy for plan maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The chapter also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

The HMP is intended to be a "living" document that will help inform all interested parties about the County's multi-jurisdictional hazard mitigation policies and projects. It will be reviewed and updated on a regular basis. The mitigation strategy identified will act as a guide for tribal departments in determining projects for which to seek FEMA assistance and other mitigation funds from outside sources.

7.1 Plan Adoption

FEMA	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))

44 CFR §201.6(c)(5) requires that the HMP be formally adopted by the Board of Commissioners and elected officials from each participating jurisdiction, which formally adopted the 2019 update of the Clallam County Multi-Jurisdictional HMP on [INSERT DATE].

This HMP was approved by FEMA on [INSERT DATE].

See the front matter of this plan for adoption and approval materials. Appendix F contains the Adoption Resolutions for each participating jurisdiction.

7.2 Plan Update and Review

FEMA	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))

7.2.1 Annual Review

The County Emergency Manager is responsible for coordinating annual review of the HMP and making appropriate revisions. On an annual basis, the County Emergency Manager will convene the MPT to conduct a comprehensive review of the plan to ensure that all information is current. The review and update processes are below.

The MPT will meet to consider:

- Progress made on plan recommendations during the previous 12 months;
- Mitigation accomplishments in projects, programs, and policies;

- Actual losses avoided by implementation of mitigation actions;
- Emerging disaster damage trends and repetitive losses;
- Identification of new mitigation needs;
- Cancellation of planned initiatives, and the justification for doing so; and,
- Changes in membership to the MPT.

The County Emergency Manager will request input from other departments and outside entities not represented on the MPT on issues listed above. A special effort will be made to gather information on non-capital projects and programs important to mitigation.

7.2.2 Following a Major Disaster

Within a reasonable period after a major disaster warranting a Presidential Disaster Declaration, and as determined necessary for a smaller event, the County Emergency Manager will convene the MPT. Because recovery is a long process and the full impact of a disaster may not be known for many months, this initial meeting may be followed by additional meetings over time.

The annual update process described above will also be used following a major disaster. However, post-disaster deliberations will also consider the following:

- "Lessons Learned" from the disaster and what new initiatives should be added to the plan to help reduce the likelihood of similar damage in the future;
- Follow-up needed on items relevant to mitigation from any after-action reports produced by the County; and
- Integration of mitigation into the recovery process and coordination with County recovery planning efforts.

7.2.3 Formal Plan Update

Every five years, the plan will be re-submitted for adoption to the Board of County Commissioners and elected officials for each participating jurisdiction. Prior to this, the County Emergency Manager will use the following process to make sure that all relevant parties are involved:

- Conduct regular reviews of the plan as described above and incorporate feedback from those reviews into the planning document;
- Conduct public engagement activities and initiate meetings with identified groups of interested parties and outside organizations to gain input and feedback;
- Integrate relevant feedback and circulate revised plan to MPT for approval;
- Submit plan to the Board of County Commissioners for adoption by resolution;
- Submit the revised plan to FEMA.

It is anticipated that the next full update of this plan will take place in 2024 for the planning period of 2025 through 2029.

7.3 Monitoring Project Implementation

FEMA	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)(ii))

Mitigation projects and project closeouts will be monitored and updated through the use of the quarterly reporting forms for FEMA-funded projects, provided by FEMA Region X. The County's EOC Manager will ensure project reporting is completed within specified timeframes. The Mitigation Project Progress Report will be requested annually by the Emergency Management Director to determine progress made to-date and track final closeout tasks. The County will comply with all applicable federal statutes and regulations in effect with respect to the periods which it receives grant funding, in compliance with 44 CFR 13.11(c).

7.3.1 Grant Management Process

The County's protocols for grant management are outlined in the Grant Management Policy and Procedure 562 to "ensure that County departments are accountable for proper grant documentation, administration, and activities."

The grant management process is outlined in the Procedure as follows:

- All grant contracts will be approved in accordance with the County's contracting policy and procedures.
- Grant applications may be completed, signed, and submitted by County Officials after direction from the Board of Commissioners or County Administrator.
- Prior to application for any new grant or renewal of any existing grant, the requesting department will complete the pre-application questionnaire. Signature of County Official is required.
- The pre-application questionnaire will be maintained by the department and attached to the grant contract with the Board considers the contract for approval.
- County Officials are responsible for compliance with all aspects of grant requirements including monitoring to ensure that grant activities are properly accomplished, grant accounting and tracking, and ensuring that requests for reimbursement are accurate and submitted on time.
- The Budget Analyst will establish revenue accounts. The Budget Analyst will create and maintain revenue numbers that ensure identification of grants, separate direct from indirect costs, and provide for tracking of accruals.
- For grant applications that require the completion and submittal of a signature authorization form, the following signature authorities should be included:
    - Applications/revised applications – County Official
    - Contracts/contract modifications – Chair of a Board of Commissioners and the County Administrator
    - Vouchers – The County Official and his/her designee

- Authorizing authority – Chair of Board of Commissioners

7.3.2 Mitigation Action Status and Tracking Loss Reduction

All departments are tasked with tracking the ongoing status of those mitigation actions for which they are the lead. Departments should track the following:

- Project progress including status of project funding and ongoing needs;
- Actual losses mitigated by project implementation; and
- Project needs that may be addressed in the next mitigation planning cycle.

Refer to Appendix G for a sample Mitigation Action Plan Annual Progress Report.

7.4 Incorporation of Existing Planning Mechanisms

As part of the Director of Emergency Management's day-to-day plan monitoring efforts, they will coordinate with departments that have jurisdiction over mitigation action implementation areas to incorporate the plan into standard policies and procedures as well as long-term planning documents and budgets.

Short-term governmental operation changes that address and consider hazard mitigation may include updates to job descriptions, work plans, site reviews, and staff training. Long-term changes may include revisions to existing comprehensive plans, capital improvement plans, zoning and building codes, permitting, and other planning tools.

The Director of Emergency Management will also work with departments to include mitigation projects in annual budgets, rather than relying solely upon grant programs, and integrate hazard mitigation in future land use and strategic planning.

Refer to Section 5.9 for more information on the incorporation of mitigation planning into existing plans.

7.5 Continued Public Involvement

FEMA	A5. Is there discussion of how the [County] will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))

Public involvement is a key component of the plan implementation and update process. As described above, the County will prepare and make available via the internet a Mitigation Progress Report providing an update on the implementation of the current mitigation plan. This report, along with specific reports for each mitigation measure being implemented and all stakeholder comments received, will be assessed to make improvements in the plan update released every five years.

In addition to the ongoing input collected and compiled throughout implementation of the previous plan, the MPT, as mentioned above, will review aspects of the draft update plan. Comments received from the public will also be considered and incorporated where appropriate into annual updates of the plan.

Community members will also be engaged on an ongoing basis through outreach at public events and activities to ensure participation is incorporated outside of the five-year plan update process.

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JURISDICTIONAL ANNEXES

City of Forks Jurisdiction-Specific Annex – Clallam County Hazard Mitigation Plan

CITY OF FORKS
forkswashington.org

DRAFT – 2019 Plan Update

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

Tables

Figures

1 INTRODUCTION

1.1 City of Forks Hazard Mitigation Program

Throughout the hazard mitigation planning process, City Attorney and Planner Rod Fleck was the point of contact for the City of Forks (referred to herein as 'City' or 'Forks'). Bill Henderson, the Quileute School District Maintenance & Facilities Manager also attended one or more MPT meetings. A public meeting was held in Forks on March 27, 2019.

The City of Forks participated in the 2010 Clallam County Multi-Jurisdictional Hazard Mitigation Plan (HMP).

See Appendix E for the completed Federal Emergency Management Agency (FEMA) Local Plan Mitigation Review Tool for the City of Forks.

2 COMMUNITY PROFILE

2.1 Governance

The City of Forks was incorporated in 1945. The City Council is comprised of elected officials who serve as the governing body alongside an elected mayor. The following is excerpted from the City of Forks 2019 – 2039 Comprehensive Plan:

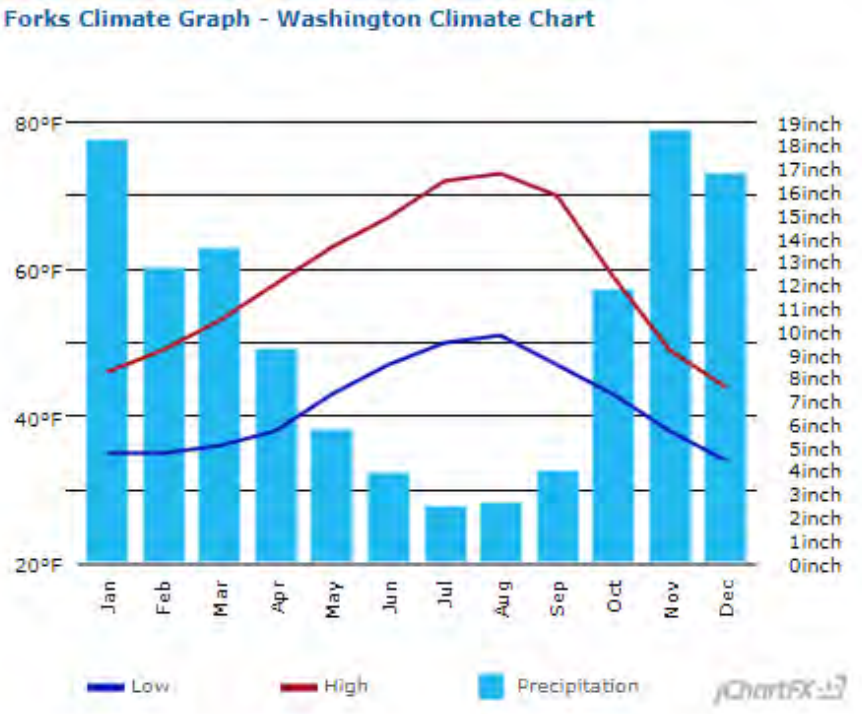
> "Forks utilizes the 'strong mayor' form of government with the Mayor having the supervision of all executive and administrative aspects of the City. Day to day operations are undertaken by the City's department managers in consultation with the Mayor. The elected City Council positions are unpaid and consist of 4-year terms. All council positions are at-large and, along with the major position, require residency within city limits." (City of Forks 2019)

The City departments are as follows:

- City Clerk/Treasurer
- Legal & Planning
- Public Works & Utilities
- Police & Corrections

2.2 Geography and Climate

Forks is located in the western Olympic Peninsula, or "West End," at the base of the flanks of the Olympic Mountains in the relatively flat Forks Prairie (City of Forks 2019). The town lies between the Bogachiel, Sol Duc, and Calawah Rivers before they join to flow west to the Pacific Ocean. The average high annual temperature is 58.6 °F and the average low annual temperature is 41.4°F (U.S. Climate Data 2019). The average annual rainfall is 119.73 inches, with the maximum rainfall occurring in the months of November, December, and January (U.S. Climate Data 2019).



Climate Data for Forks (1981 - 2010 normalized).
Source: www.usclimatedata.com/climate/forks/washington/united-states/uswa0149

2.3 Population and Demographics

As of 2017, the U.S. Census estimated population for Forks was 3,748 individuals, which is a 6% increase from 2010.

As of 2018, the U.S. Census estimated population for Forks was 3,832 individuals, which is an 8.5% increase from 2010 (U.S. Census Bureau 2017). Approximately 7.1% of the City population is younger than 5 years of age. Approximately 20% of the City population is 60 years of age and older (U.S. Census Bureau 2017).

According to Census data, 86.3% of the City's population is white alone, 4.6% of the City is Black or African American, and 4.1% of the City's population is American Indian or Alaska Native. Also, 4% of the City's population is two or more races and 18.2% of the population is Hispanic or Latinx.

2.4 Economy

The following is excerpted from the City of Forks 2019 – 2039 Comprehensive Plan:

> "Forks' traditional economic base of timber harvesting was seriously undermined in the late 1980s as a result of judicial and executive actions concerning the Endangered Species Act (ESA). The Forks Economic Development Steering Committee (FEDSC) proposed creation of industrial park centered around timber products and actively marketing the industrial park to other manufacturers.

> The U.S. Forest Service, Washington State Department of Natural Resources (DNR), Quillayute School District, and the Clallam Bay Correctional Facilities are major employers, employing hundreds of people from the Forks [Urban Growth Area]. The Forest Service, Quillayute School District, and the DNR saw a reduction in staff during the 1990s and 2000s, as a result of declining state and federal budgets. In addition, the continued pressure on state budgets continues to require the community to spend significant political efforts to maintain both services and jobs associated with those state-funded agencies. The Clallam Bay Correctional Facilities, however, has increased staff and believes this trend will continue for the foreseeable future.
>
> Tourism has grown to be a significant, important source of economic growth with numerous small, family-owned businesses being the source of such growth. Concern remains however, about ensuring that the tourism sector is one that does not become entrenched in lower-wage jobs or cyclical employment." (City of Forks 2019)

2.5 Transportation and Commuting

According to the City of Forks Comprehensive Plan, "[the] City of Forks lies on the relatively flat Quillayute Prairie running generally west and east of US-101, which is called South Forks Avenue within Forks city limits. In 1992, the City had 15.3 miles of roadway, with 2.8 miles classified as arterial streets" (City of Forks 2019).

US-101 is the only regional highway with access directly to the City. SR-110/La Push Road runs from US-101 at the northern end of the City to the Quileute Reservation at La Push and the confluence of the Quillayute River (City of Forks 2019).

Figure 2-1 City of Forks

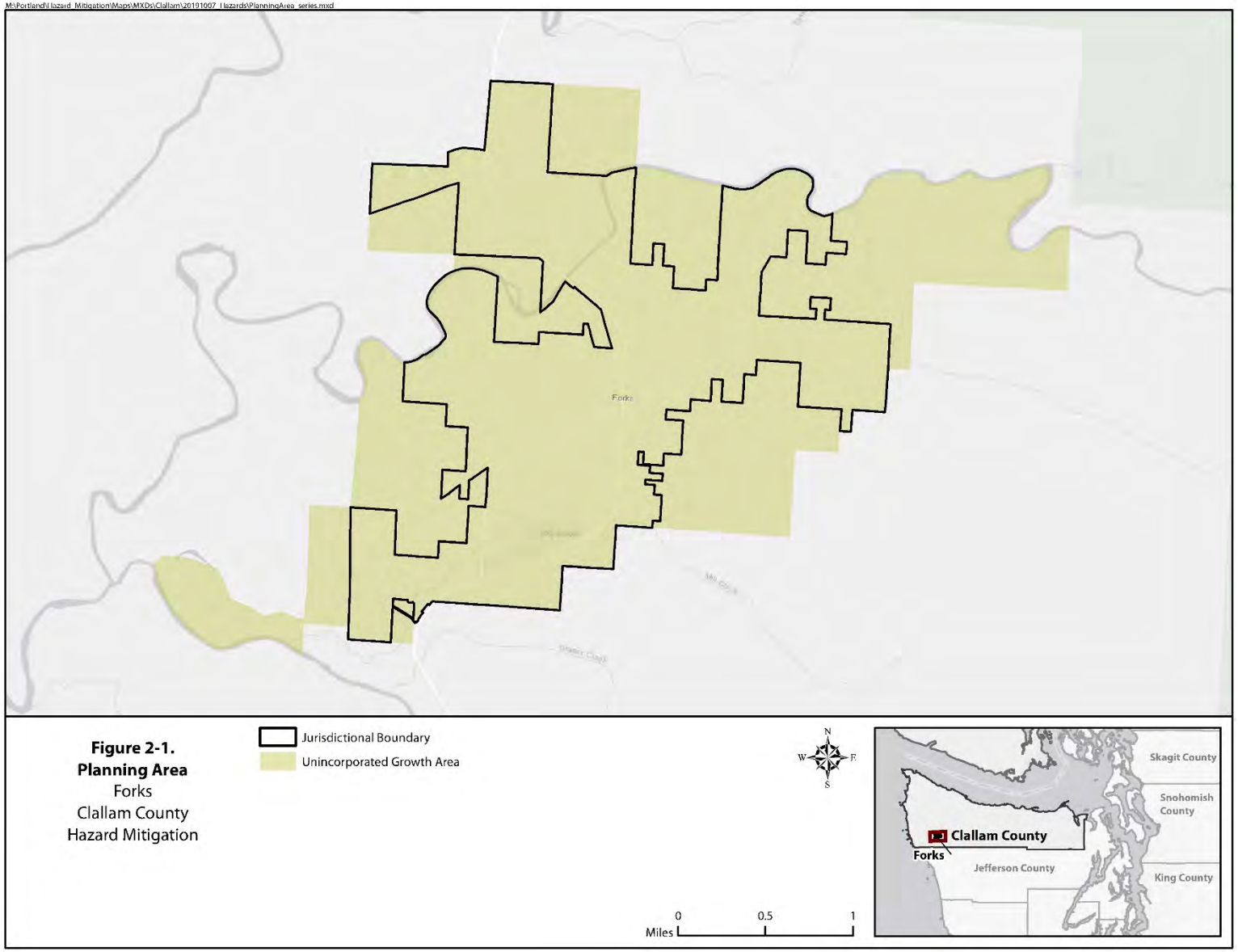


Figure 2-1.
Planning Area
Forks
Clallam County
Hazard Mitigation

3 HAZARD PROFILES AND VULNERABILITY ASSESSMENTS

Chapter 3 contains hazard profiles and vulnerability assessments to determine the potential impact of hazard to the people, economy, and built and natural environments of the City of Forks. They have been streamlined to increase the effectiveness and usability of the HMP.

FEMA	B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect [the City of Forks]? (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 [the City of Forks]? (Requirement §201.6(c)(2)(i)) B3. Does the plan include a description of each identified hazard's impact as well as an overall summary of the vulnerability of the planning area? [44 CFR § 201.6(c)(2)(ii)]

3.1 General

The City has been impacted by many of the County-wide disaster declarations, as shown in Table 3-1.

Table 3-1 Past FEMA Disaster Declarations

DR #	HM Program Declared	Title	Incident Begin Date	Incident End Date
4418	Yes	SEVERE WINTER STORMS, STRAIGHT-LINE WINDS, FLOODING, LANDSLIDES, MUDSLIDES, TORNADO	12/10/2018	12/24/2018
4253	Yes	SEVERE WINTER STORM, STRAIGHT-LINE WINDS, FLOODING, LANDSLIDES, MUDSLIDES, AND A T	12/1/2015	12/14/2015
4249	Yes	SEVERE STORMS, STRAIGHT-LINE WINDS, FLOODING, LANDSLIDES, AND MUDSLIDES	11/12/2015	11/21/2015
4242	Yes	SEVERE WINDSTORM	8/29/2015	8/29/2015
4056	Yes	SEVERE WINTER STORM, FLOODING, LANDSLIDES, AND MUDSLIDES	1/14/2012	1/23/2012
1825	Yes	SEVERE WINTER STORM AND RECORD AND NEAR RECORD SNOW	12/12/2008	1/5/2009
1817	Yes	SEVERE WINTER STORM, LANDSLIDES, MUDSLIDES, AND FLOODING	1/6/2009	1/16/2009
1734	Yes	SEVERE STORMS, FLOODING, LANDSLIDES, AND MUDSLIDES	12/1/2007	12/17/2007
1682	Yes	SEVERE WINTER STORM, LANDSLIDES, AND MUDSLIDES	12/14/2006	12/15/2006
1641	Yes	SEVERE STORMS, FLOODING, TIDAL SURGE, LANDSLIDES, AND MUDSLIDES	1/27/2006	2/4/2006
3227	No	HURRICANE KATRINA EVACUATION	8/29/2005	10/1/2005
1499	Yes	SEVERE STORMS AND FLOODING	10/15/2003	10/23/2003
1361	Yes	EARTHQUAKE	2/28/2001	3/16/2001
1172	No	HEAVY RAINS, SNOW MELT, FLOODING, LAND & MUD SLIDES	3/18/1997	3/28/1997
1159	Yes	SEVERE WINTER STORMS, LAND & MUDS SLIDES, FLOODING	12/26/1996	2/10/1997

Table 3-1 Past FEMA Disaster Declarations

DR #	HM Program Declared	Title	Incident Begin Date	Incident End Date
1079	Yes	SEVERE STORMS, HIGH WIND, AND FLOODING	11/7/1995	12/18/1995
1037	No	THE EL NINO (THE SALMON INDUSTRY)	5/1/1994	10/31/1994
883	Yes	SEVERE STORMS & FLOODING	11/9/1990	12/20/1990
757	Yes	SEVERE STORMS & FLOODING	1/16/1986	1/19/1986
623	Yes	VOLCANIC ERUPTION, MT. ST. HELENS	5/21/1980	5/21/1980
612	No	STORMS, HIGH TIDES, MUDSLIDES & FLOODING	12/31/1979	12/31/1979

3.2 Hazard Ranking Methodology

The hazards identified in the HMP were initially ranked based on Mitigation Planning Team (MPT) feedback during MPT Meeting #1 and #2.

Following the individual hazard ranking activity, the results were added up and aggregated to show an average score for the all City of Forks MPT members and are available in Figure 3-1.

Figure 3-1 City of Forks Hazard Rankings

City of Forks - Local Hazard Rankings

	Magnitude (1=lowest, 5=highest)	*Onset (1=slowest, 5=fastest)*	*Duration (1=shortest, 5=longest)*	*Frequency (1=lowest, 5=highest)*	*Average*	*Rank*
Cascadia Earthquake	5	5	3	1	4	1
Windstorm	1	4	3	4	3	2
Wildfire Smoke	2	3	3	4	3	3
Heat Events	2	3	3	4	3	4
Power Outages	1	1	3	5	3	5
Drought	1	2	3	4	3	6
Storm Surges/Tides	1	1	2	4	2	7
Flooding	2	2	2	1	2	8

3.3 Hazard-Specific Profiles and Risk Assessments

The following section profiles each hazard identified in Section 3.2 and assesses the risk associated with each. Each risk assessment considers the following attributes:

- **Location:** An indication of geographic areas that are most likely to experience the hazard.
- **Past Occurrences/History:** Similar to location, a chronological highlight of recent occurrences of the hazard accompanied by an extent or damage cost, if available.
- **Extent/Probability:** A description of the potential magnitude of the hazard, accompanied by the likelihood of the hazard occurring (or a timeframe of recurrence, if available).
- **Vulnerability:** A description of the potential magnitude of losses associated with the hazard. Vulnerability may be expressed in quantitative or qualitative values depending upon available data. Identifies development trends impact on the City's vulnerability to each hazard since the 2010 plan development (Increased, decreased, unchanged).

Note: Hazard Descriptions, Potential Impacts from Future Climate Conditions, and Cascading Impacts can be found in Chapter 4 of the HMP Basic Plan, as these are not jurisdiction specific.

In addition, the hazards have been organized into three sub-sections (high-, medium-, and low-priority) to illustrate the risk-driven nature of the HMP. Each hazard has been given serious consideration of all attributes discussed within. However, low-priority hazards may be shorter in length and with less quantitative analyses, as a lack of usable data is frequently present when considering low-likelihood or low-magnitude events. The three sub-sections are as follows:

- **High-Priority:** Cascadia Earthquake
- **Medium-Priority:** Windstorm, Fire, Extreme Heat and Drought, Power Outage
- **Low-Priority:** Storm Surge/Tides, Flooding

3.3.1 Cascadia Earthquake

Cascadia Earthquake

	Magnitude	Onset	Duration	Frequency	Average	Rank
Cascadia Earthquake	5	5	3	1	4	1

Location

The Cascadia Subduction Zone (CSZ), where the Juan De Fuca plate slides underneath the North American plate poses a great risk to the City and all communities in the Pacific Northwest. A large earthquake would cause significant impacts to properties with a structure, and liquefaction may pose a risk, specifically along US-101 (the liquefaction risk in the area is graded as moderate to high). The area is at relatively low risk for other crustal earthquakes.

Previous Occurrence/History

While few written or oral histories have been located of the area's experience following the 1700 CSZ earthquake, tribes in the area have illustrated the vast impact the event had on life. Thousands of earthquakes have occurred in Washington, but very few have caused significant damage to the area.

Cascadia Earthquake

The following notable earthquakes impacted the City or would likely have an impact if they were to occur today:

- 1700, CSZ, magnitude (M) 9.0

Extent and Probability

The Washington State DNR Geologic Information Portal estimates that the most intense shaking associated with a CSZ earthquake would be focused on the West End.

A CSZ earthquake has a recurrence interval of 500 to 600 years, with gaps as little as 200 years and as great as 1,000 years. Estimates vary, but some state there is a 17-20% chance of a M 8.0 or greater in the next 50 years.

In the event of a CSZ event, Forks and the West End would experience the greatest shaking intensity (Modified Mercalli Intensity Scale 8) (DNR 2019).

Future Probability Trend – Future weather and development trends play no known role in the probability of future earthquake events. However, both may play a role in the expected vulnerability of earthquake impacts.

Vulnerability

Vulnerability posed by earthquakes to the City of Forks is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of the Base Plan, the following infrastructure types are classified as a high to severe combined earthquake hazard level (including earthquake shaking hazard and liquefaction potential):

- Airports (2 structures)
- Commercial Buildings (1 structure)
- Communication Systems (2 structures)
- Electric Systems (5 structures)
- Fire Departments (3 structures)
- Government Buildings (6 structures)
- Hazardous Materials Storage (2 structures)
- Medical Facilities (6 structures)
- Natural Gas (1 structure)
- Schools (1 structure)
- Shelters (11 structures)
- Wastewater systems (1 structures)

Similar to the County level, the City's awareness to a CSZ earthquake has increased with participation in regional drills and public outreach efforts and more structures are being designed to be resilient earthquakes. However, development has increased in areas on the West End that are particularly vulnerable to a Cascadia event. Given these changes, Forks' vulnerability to earthquakes has remained **unchanged**.

See Appendix C for Hazard Mapping.

1

3.3.2 Windstorm

Windstorm

Magnitude	Onset	Duration	Frequency
1	4	3	4

Average	Rank
3	2

Location
All City properties and structures can be affected by windstorms. Properties with infrastructures, utilities, and tree stands can have more damaging impacts during windstorms, especially in coastal areas where winds speeds can reach speeds of greater than 100 miles per hour (mph) during the winter months.

Previous Occurrence/History

In January 1921, winds with speeds greater than 100 mph hit the West End and flattened approximately 20% of the forest in the Forks area. Another windstorm that resulted in wide-spread destruction hit Forks in 1962. In the spring of 2016, a windstorm with the windspeeds and wind directions similar to a hurricane passed over Forks (City of Forks 2019). Windstorms that result in power outages happen biennial to yearly. These storms happen so often that they go under- and un-reported.

Extent and Probability

The mountainous areas around the City of Forks experience higher winds than other areas. Windstorms can damage buildings, structures, utilities, and tree stands, which can cause millions of dollars' worth of damage.

Future Probability Trend – Future weather conditions have the potential to lead to an increase in severe and extreme weather patterns, leading to an **increase** in the probability of a windstorm. In addition, increased development has the potential to expose more assets to the impacts of windstorms.

Vulnerability

The City's primary vulnerability from severe windstorms are power outages and impairment of transportation. Because nearly all social and economic activity is dependent on transportation, particularly along US-101, damage from windstorms can have a serious impact. Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. Vehicle accidents rise among those who try to drive. Power outages can result from physical damage to electrical infrastructure as a result of downed trees and blown debris. Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe windstorms (Clallam County 2010).

The City's vulnerability to windstorms has **increased** as weather patterns change due to climate change, and as increased development has resulted in more infrastructure that can be exposed to damage during severe weather.

3.3.3 Wildfire Smoke and Wildfire

Wildfire Smoke and Wildfire

	Magnitude	Onset	Duration	Frequency	Average	Rank
Wildfire Smoke	2	3	3	4	3	5
Wildfire	2	3	3	2.5	2.625	8

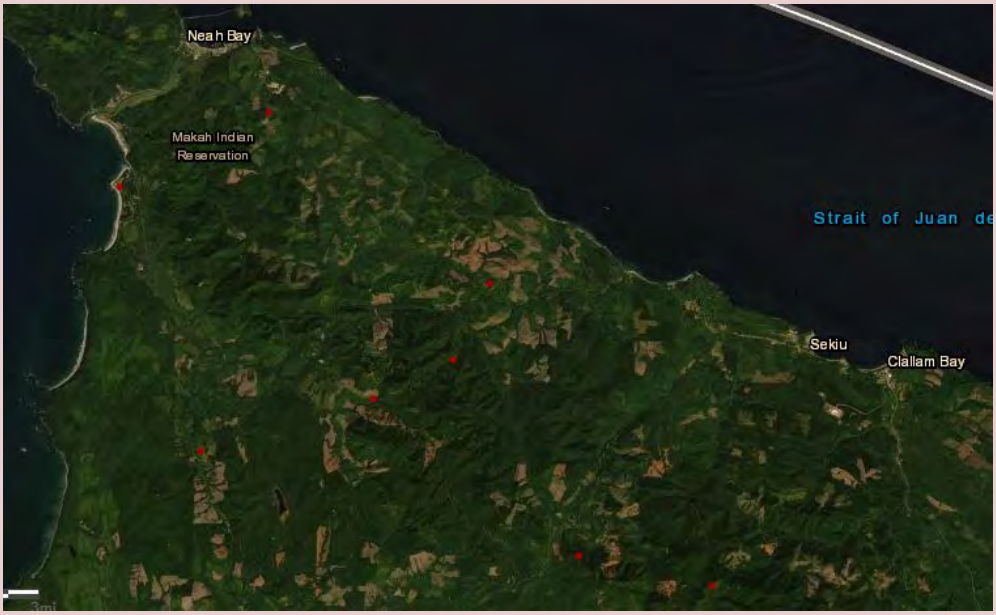
Location

Fires are a high risk in many areas in the vicinity of Forks. The greatest areas for concern are those within the Wildland Urban Interface (WUI), namely the areas outside of Forks, Sekiu, La Push, and Clallam Bay, where many community members live in rural homes, and areas in the Olympic Mountain foothills where there is ongoing logging activity. These locations represent potentially large economic losses following a fire.

The West End may also be impacted by wildfire incidents occurring in Canada and eastern Washington. Air quality impacts result in unhealthy levels of particulate matter and smoke.

Previous Occurrence/History

The image below contains the distribution of wildfires since 2008. The largest of these fires occurred in 2017 and burned a total of 80 acres. Catastrophic fires have occurred on a 300 to 500 year rotation, with the last one happening sometime in the 1600s or 1700s.



Another hazard to the West End has been diminished air quality caused by smoke originating from elsewhere in the Pacific Northwest. In the summer of 2018, Clallam County was impacted by unhealthy levels of particulate matter in the air.

See Appendix C for more hazard mapping.

Wildfire Smoke and Wildfire

Extent and Probability

West End communities are scattered across a large geographic area. These communities are primarily rural with small- to mid-sized population centers near wild lands. The extent wildfire can impact the public is wide and varied. With two droughts in less than five years, the systematic drying out of forests is a concern. Local large timber holdings are significant concerns related to fires. In addition, a fire within the surrounding region would likely have a negative impact on the area's hospitality enterprises.

Weather conditions greatly influence the impact and extent of wildfires. Drought, high temperatures, and wind contribute to a dynamic and changing conditions of wildfires. Fuel load and vegetation contribute to the size and intensity of wildfires.

Wildfires are frequent and inevitable. Within the region, the vast majority of wildfires burn during the June to October time period. The MPT rated the probability of fire and wildfire smoke air quality impacts as some of the most likely hazards to impact the West End, which generally experiences the effects of wildfire every year.

Future Probability Trend – Based on potential decreases in annual snowpack and increases in the frequency and magnitude of drought and heat, the West End may be impacted by an **increase** in the probability of future fires.

Vulnerability

Children, the elderly, and individuals with respiratory illnesses are particularly vulnerable to the negative impacts of smoke and particulate inhalation. As stated previously, approximately 7.1% of the City population is younger than 5 years of age. Approximately 20% of the City population is 60 years of age and older (U.S. Census Bureau 2017).

Vulnerability posed by wildfires (particularly WUI fires) to the City of Forks is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of the Base Plan, the following local infrastructure types are classified as being vulnerable to WUI fires:

- Communication Systems (1 structure)
- Electric Systems (3 structures)
- Fire Department (1 structure)
- Government Buildings (1 structure)
- Hazardous Materials Storage (1 structures)
- Medical Facilities (5 structures)
- Natural Gas (1 structure)
- Shelters (11 structures)

Since the 2010 County HMP, development in Forks has expanded further into the WUI; therefore, the vulnerability has **increased**. Additionally, as the fire season continues to grow in other parts of the Pacific Northwest, the vulnerability to Forks from wildfire smoke has **increased**.

3.3.4 Heat Events and Drought

Extreme Heat & Drought

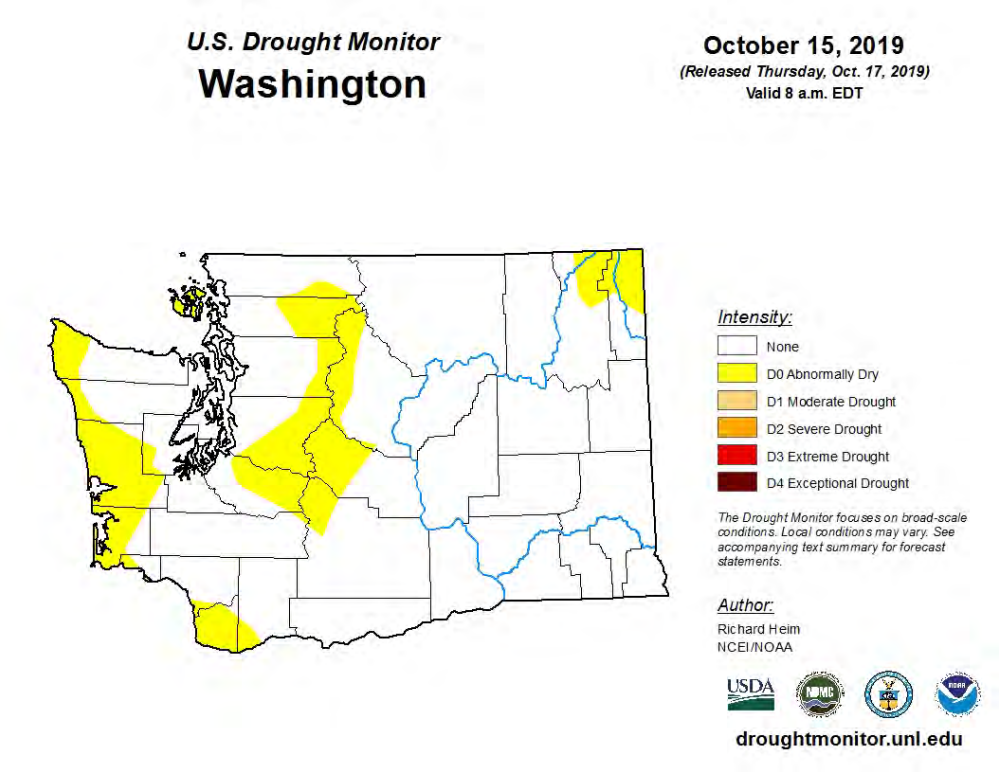
	Magnitude	Onset	Duration	Frequency	Average	Rank
Heat Events	2	3	3	4	3	5
Drought	1	2	3	2	2	14

Location
Drought could impact all West End properties that use water to a certain extent.

Previous Occurrence/History

During the summer of 2007, the Makah Indian Reservation had a declared emergency due to a water shortage and used rationing and a desalination plant on loan from the Navy to weather the crisis. Since that time, they have increased their water storage capacity and have not suffered any further shortage (Clallam County 2010).

In 2015 and 2019, the City experienced state-declared droughts that required the City to access Drought Relief funds. Most recently, drought was declared in Clallam County in May 2019 and western Clallam County remains Abnormally Dry.



Drought status in Washington State as of October 2019 (U.S. Drought Monitor 2019b).

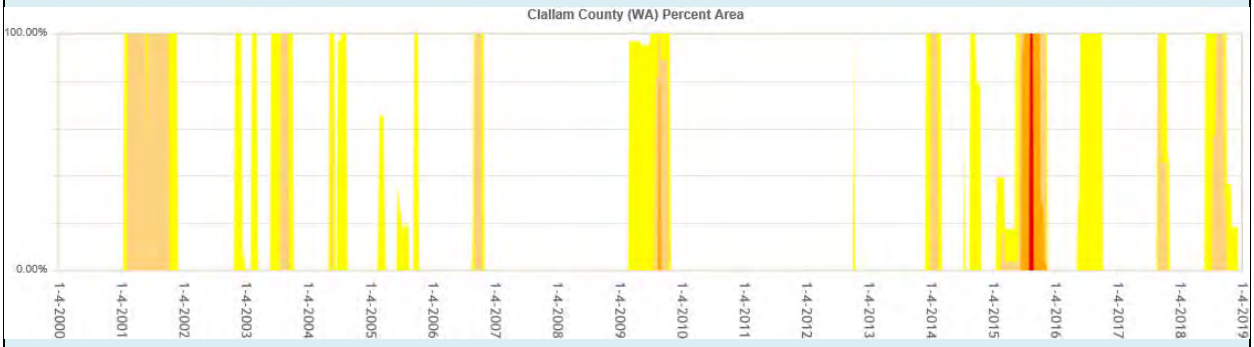
Extreme Heat & Drought

Extent and Probability

Forks and other West End communities are not as vulnerable to extreme heat events and drought as northeast Clallam County due to the proximity of the deciduous rain forest; however, diminishing snowpack in the Olympic Mountains can result in long-term water shortages and has resulted in water shortages in recent years.

As the graph below indicates, there has been one period of extreme drought within Clallam County over the last 17 years (United States Drought Monitor 2019). During a two-month period in 2015, 100% of the County's area was marked by D3 to D4 droughts (the most intense forms of drought – red and orange in the figure below). Additionally, in 2001, 2003, 2006, 2009, 2014, 2017, and 2018, areas of the County experienced moderate to extreme drought. As of May 2019, a drought emergency was declared in the Elwha-Dungeness, Lyre-Hoko, and Soleduc watersheds, which encompass the entirety of Clallam County (Governor of Washington 2019).

Future Probability Trend – Based on potential decreases in annual snowpack and increases in the frequency and magnitude of prolonged heat, the County may be impacted by an **increase** in the probability of future droughts.



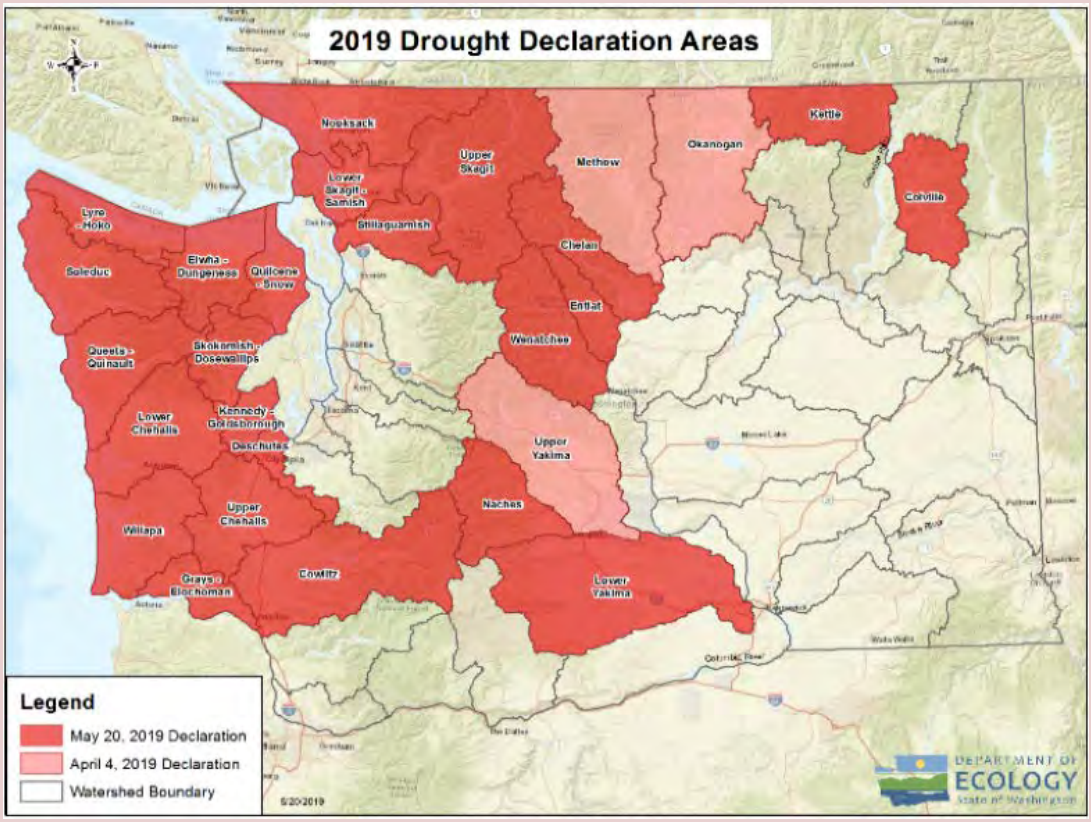
Drought animations over time are available at: http://droughtmonitor.unl.edu/Maps/Animations.aspx (U.S. Drought Monitor 2019a).

Extreme Heat & Drought

Vulnerability

Droughts impact individuals (farm owners, tenants, and farm laborers), the agricultural industry, and other agriculture-related sectors. Lack of snowpack has forced ski resorts into bankruptcy. There is increased danger of forest and wildland fires. Millions of board feet of timber have been lost. Loss of forests and trees increases erosion causing serious damage to aquatic life, irrigation, and power development by heavy silting of streams, reservoirs, and rivers.

Problems of domestic and municipal water supplies are historically corrected by building another reservoir, a larger pipeline, a new well, or some other facility. Short-term measures, such as using large capacity water tankers to supply domestic potable water, have also been used. Low stream flows have created high temperatures, oxygen depletion, disease, and lack of spawning areas for our fish resources (Clallam County 2010).



Washington State 2019 Drought Declaration Areas, Department of Ecology. https://ecology.wa.gov/Water-Shorelines/Water-supply/Water-availability/Statewide-conditions/Drought-2019.

1

2

3.3.5 Utility Failure

Utility Failure

Magnitude	Onset	Duration	Frequency
2	3.5	3	4

Average	Rank
3.125	4

Location
Numerous West End properties are at risk of being affected by utility failures. Housing in the foothills of the Olympics are known to experience power outages during winter and wind storms that can last anywhere from several hours to several weeks. In addition, utility networks, information technology networks, and telecommunications systems are very vulnerable and could be at a risk to exposure of a hazard that could lead to a utility failure.

Previous Occurrence/History

Historically, utility disruptions and failures have been caused by natural disasters and human-caused accidents but have not been recorded in a way that is publicly accessible. Numerous utility failures occur every year, most frequently in the form of electricity outages that may last as short as hours or as long as weeks. Previous utility failures have led to an increase in welfare check-ins and overall community member needs, as well as having negatively impacted the West End's economic interests.

Extent and Probability

It is difficult to predict the impacts of future utility failures, but they have the potential to impact all government and business operations and cause extensive economic losses among other impacts. Due to the sporadic nature of failures, it is also difficult to estimate how frequently such failures will occur or their duration. The West End generally deals with power outages multiple times per year with many of them only lasting a matter of hours. Every several years, a large utility failure is experienced.

Future Probability Trend – Based on potential increases in heat waves and increasing development trends resulting in greater demand, the West End may be impacted by an **increase** in the probability of future utility failure. However, mitigation actions outlined in this HMP are designed to decrease such strain on utility systems.

Vulnerability

Electric Power Systems

Power facilities in Clallam County, and much of Forks, are generally protected from wildland/urban interface fires by defensible space. A limited number are threatened by tsunami, flood, and landslide hazards. All facilities are threatened to varying degrees by destructive earthquakes.

Water Supply

- There are nine water districts and at least two private water systems in Clallam County that supply customers in their areas with water. Many are threatened by tsunami, flood, wildland/urban interface fire and landslides. All of these districts are expected to sustain some type of damage and/or outage immediately following a destructive earthquake.
- Most water service ceases to function if electrical power is unavailable.

Utility Failure

- Service main and line breaks will cause reduced water pressure in affected areas. Pressure reductions could reduce firefighting capability.
- Water utilities will shut down system components to mitigate damage from pressure loss, pipe leaks and breaks inside of buildings.
- To mitigate possible public health threats in both urban and rural areas, public health authorities may issue boil water advisories. Following repair, systems will require quality testing and system flushing to ensure safety.

Wastewater and Sewer Systems

- There are six public and one private wastewater treatment systems in the County. None are subject to floods, wildland/urban fire or landslides. All systems are threatened by destructive earthquake hazards. Most wastewater service ceases to function if electrical power is unavailable.
- Wastewater and sewer system damage will include cracked pipe walls, pipe section collapse, and separation between pipe joints. Liquefaction may push some pipes out of the ground, reducing the downward gradient of the system, causing it to stop flowing and/or backup in some areas. Sewer pump stations and their pressure mains will suffer varying damage. Some will require complete replacement. As a result, it is possible that effluent will flow in streets, ditches, and waterways. This will cause a severe public health hazard.
- Wastewater and sewer breaks will occur near damaged potable water lines putting the potable water systems at risk. Authorities may issue boil water notices to mitigate public health threats.
- Septic systems requiring power will not work. Those and gravity systems may fail due to broken pipes contaminating wells and surface water.

Communications Systems

- Urban facilities with not be subject to tsunami, flood, wildland/urban interface fires, or landslides. Rural facilities may be subject wildland/urban interface fires and landslides to the facility sites or access roads. All facilities are subject to damage from major earthquakes.
- All primary and secondary forms of communication will be intermittent and unreliable due to power failure. Systems affected include cell phones, land lines, internet via fiber lines, cable television, and amplitude modulation/frequency modulation (AM/FM) radio stations. Power to transmit will have to be supplied by backup generators.

Source: Buck 2016

With the expansion of utilities systems with new development in recent years, the City's vulnerability to utility failure has **increased**.

1

3.3.6 Storm Surge and Tides

Storm Surge and Tides

Magnitude	Onset	Duration	Frequency
1	1	2	4

Average	Rank
2	14

Location
The low-lying rocky coastlines of La Push, Neah Bay, Sekiu, and Clallam Bay are vulnerable to the impacts of tidally influenced storm surges.

Previous Occurrence/History

Storm surges and extreme tides are a relatively common occurrence near the Forks, although these hazards tend to impact coastal communities more directly. As recently as January 2018, coastal Washington experienced flooding and giant waves.

Extent and Probability

West End coastal communities are particularly vulnerable to tidally influenced storm surges, particularly Neah Bay, Clallam Bay, La Push, and Sekiu.

Future Probability Trend – Sea level rise presents an ongoing threat to the West End coastal communities that are in low-lying areas. According to the Washington State Enhanced HMP, "in addition to inundating low-lying coastal areas, rising sea level will **increase** coastal flooding caused by storm surges, tsunamis and extreme astronomic tides. Likewise, episodic storm surges of a given height will likely experience shortened recurrence intervals" (WA EMD 2018).

Vulnerability

For the purposes of this vulnerability assessment, it was assumed that critical infrastructure that are vulnerable to tsunami will likely also be vulnerable to storm surges and extreme tides. Based on the methodology outlined in Section 4.6 of the Base Plan, the following infrastructure types in Forks are vulnerable to tsunami and storm surges/tides:

- Government Buildings (1 structures)
- Hazardous Materials Storage (1 structure)

Since the 2010 plan, the vulnerability of the City to storm surges and tides is **unchanged**. Property development along certain shorelines has increased, while the vulnerability may be offset due to increased public awareness of the hazard itself and the improved public warning systems. One big issue would be the City providing support to respond, rescue, recover and reconstruct from any significant storm surge/tidal event.

3.3.7 Flooding

Flooding

Magnitude	Onset	Duration	Frequency
1.5	3	2	3

Average	Rank
2.375	10

Location
The Forks Prairie is a low-lying feature containing three major rivers and, as a result, sections of Forks will flood regularly during winter storms. The flooding on the prairie is predominately from creeks that cross the prairie and merge with the rivers. The practice fields east of Forks High School and Russell Road to the south of Bogachiel Way are problem areas (City of Forks 2019).

Previous Occurrence/History

Comprehensive historical flooding on local properties is unknown. Most of the flooding in the area of Forks is persistent, nuisance flooding associated with waterways in the Forks Prairie. Historically, the most damage to property in Forks has occurred from flooding of the Bogachiel River. These occurrences are seasonal and tied to winter storm events.

Extent and Probability

Severe floods may result in serious injuries and fatalities as well as damage to public facilities and private property (more likely). Extent of flooding can be determined by the height of river flows in comparison to flood stages determined by U.S. Geological Survey stream gauges located throughout the area. It can also be measured by past damages of flooding.

Future Probability Trend – Due to the implementation of a County-wide Comprehensive Floodplain Management Plan and associated flood mitigation actions, the City expects to experience a **decrease** in flooding, even as precipitation may increase as a result of climate change.

Vulnerability

County-wide, the damages with the highest consequence, either related to the cost to repair or by the impact on human activities, were incurred during the 1979, 1990, 1996/1997, and 2008/2009 flood and severe storm events.

Vulnerability posed by flooding to the City of Forks is measured by accounting for the critical infrastructure that are at risk. Flood events can affect the transit center, the elementary school and parts of Russell Road. Based on the methodology outlined in Section 4.6 of the Base Plan, the following infrastructure types are classified as vulnerable to flood hazard:

- Government Building (1 structure)

Flooding frequency and intensity is changing as the climate changes; however, the City is making more effort to manage floodplains. Therefore, the vulnerability of Forks to flood hazards is **unchanged** since 2010.

3.4 Vulnerability Assessment

3.4.1 Identifying Critical Infrastructure and Asset Inventory

Critical infrastructure was identified for the City of Forks following the methodology outlined in Section 4.6 of the Base Plan.

Appendix B contains the complete vulnerability assessment and associated methodology.

3.4.2 Repetitive Loss Properties

As outlined in the Base Plan, a single National Flood Insurance Program (NFIP)-identified repetitive loss structure is in the City of Forks (Table 3-2).

Table 3-2 NFIP Severe Repetitive Loss Properties

FEMA ID	City	Occupancy	Flood Zone	Property Value	Building Value	Contents Value	Paid	Date Of Payment	Date Of First Loss
88393	FORKS	SINGLE FMLY	A	64512	67956.19	58422.94	126379.13	01/31/2018	12/15/1999

Source: FEMA Severe Repetitive Loss Properties, Compiled by the Houston Chronicle (2019). https://data.world/houstonchronicle/severe-repetitive-loss-properties-flood-games

3.4.3 Exposure Assessment

Table 3-3 contains a summary of the critical infrastructure associated with Forks (Buck 2016). The vulnerability of each structure to earthquake, tsunami, flooding, WUI fires, and landslides is assessed.

Table 3-3 Forks Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ Shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami Hazard	Floods	WUI Fires	Landslides
Quillayute Airport	500 East Division St	Forks	Airport	80%	C	Low/Mod	Low	Very High	NO	NO	NO	NO
City of Forks	S Forks Ave	Forks	Airport	80%	C	Low/Mod	Low	Very High	NO	NO	NO	NO
Forks Office	31 Spartan Ave	Forks	Electric System	80%	B	Low	Low	High	NO	NO	NO	NO
Forks Warehouse	441 W E St	Forks	Electric System	80%	B	Low	Low	High	NO	NO	NO	NO
Calawah Substation	513 Calawah Way	Forks	Electric System	80%	C	Mod	Low	High	NO	NO	YES	NO
Forks Substation 1	441 w East St	Forks	Electric System	80%	B	Low	Low	High	NO	NO	YES	NO
Forks Substation 2	441 w East St	Forks	Electric System	80%	B	Low	Low	High	NO	NO	YES	NO
Port of La Push	71 Main St.	Forks	Hazardous Materials Storage	80%	D/E	Very	Very	Very	Yes	NO	YES	NO
Masco Petroleum	231 Industrial Ctr.	Forks	Hazardous Materials Storage	80%	C/D	High	Low	High	NO	NO	NO	NO
Ferrell gas	451 N Forks Ave	Forks	Natural Gas	80%	B	High	Low	Very	NO	NO	YES	NO
Treatment Plant	Confidential	Forks	Wastewater System	80%	B	High	Very Low	High	NO	NO	NO	NO
KFKB Radio 1490 (KBDB FM 96.7)	260 Cedar St, Forks	Forks	Communications System	80%	B	High	High	High	NO	NO	YES	NO
City of Forks	500 E Division St	Forks	Communications System	80%	B	High	High	High	NO	NO	NO	NO
Bogachiel Clinic	530 Bogachiel Way	Forks	Medical Facility	80%	C	High	Low	High	NO	NO	YES	NO

Table 3-3 Forks Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ Shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami Hazard	Floods	WUI Fires	Landslides
Calawah Medical Clinic	5th Ave	Forks	Medical Facility	80%	C	High	Low	High	NO	NO	YES	NO
Forks Women's Clinic	231 Lupine Ave	Forks	Medical Facility	80%	C	High	Low	High	NO	NO	YES	NO
Family Medical Center	461 G St	Forks	Medical Facility	80%	C	High	Low	High	NO	NO	YES	NO
West End Outreach Services	530 Bogachiel Way	Forks	Medical Facility	80%	C	High	Low	High	NO	NO	YES	NO
Forks	11 Spartan Ave	Forks	Fire Department	80%	C	High	Low	High	NO	NO	YES	NO
Mora	7810 La Push Rd	Forks	Fire Department	80%	C	High	Low	High	NO	NO	YES	NO
DNR HQ, Forks	411 Tillicum Ln, Forks	Forks	Fire Department	80%	C	High	Low	High	NO	NO	NO	NO
Forks Elementary & HS	261 Spartan Ave	Forks	School	80%	C	High	Low	High	NO	NO	NO	NO
Office Building and Jail	500 E Division Street	Forks	Government Building	80%	C	High	Low	High	NO	NO	NO	NO
Tilicum Park	1411 S Forks Ave	Forks	Government Building	80%	C	High	Low	High	NO	NO	NO	NO
Maintenance	500 E Division Street	Forks	Government Building	80%	C	High	Low	High	NO	NO	NO	NO
HOH Administrative Center	2269 Lower Hoh Rd	Forks	Government Building	80%	E	Very High	Very High	Very High				
Mora ranger Station	Mora Road	Forks	Government Building	80%	D/F	Very High	Very High	Very High	YES	YES	YES	NO
Forks Police Department	500 E Division St	Forks	Government Building	80%	C	High	Low	High	NO	NO	NO	NO
Forks Jail	500 E Division St	Forks	Government Building	80%	C	High	Low	High	NO	NO	NO	NO

Table 3-3 Forks Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ Shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami Hazard	Floods	WUI Fires	Landslides
Assembly Of God, Forks	81 Huckleberry Lane	Forks	Shelter	80%	C	High	Low	High	NO	NO	YES	NO
Baptist	651 S Forks Ave	Forks	Shelter	80%	C	High	Low	High	NO	NO	YES	NO
Forks Elementary & HS	301 S Elderberry	Forks	Shelter	80%	C	High	Low	High	NO	NO	YES	NO
Forks Motel	351 Forks Ave S	Forks	Shelter	80%	C	High	Low	High	NO	NO	YES	NO
Grange - Forks Prairie		Forks	Shelter	80%	C	High	Low	High	NO	NO	YES	NO
Latter Day Saints - Forks	1301 Calawah Way	Forks	Shelter	80%	C	High	Low	High	NO	NO	YES	NO
Olson's Vacation Cabin	2423 Mora Rd	Forks	Shelter	80%	C	High	Low	High	NO	NO	YES	NO
Olympic Natural Resource Center	1455 S Forks Ave	Forks	Shelter	80%	C	High	Low	High	NO	NO	YES	NO
Olympic Suites Motel	800 Olympic View Dr	Forks	Shelter	80%	C	High	Low	High	NO	NO	YES	NO
Pacific Inn Motel	Forks Ave & C	Forks	Shelter	80%	C	High	Low	High	NO	NO	YES	NO
Seventh Day Adventist - Forks	E Division	Forks	Shelter	80%	C	High	Low	High	NO	NO	YES	NO
Grocery & Hardware, Ace	950 S Forks Ave	Forks	Commercial	80%	C	High	Low	High	NO	NO	NO	NO

Key:
EQ = Earthquake
PGA = Peak Ground Acceleration
WUIF = Wildland Urban Interface Fire

3.5 Land Use and Development Trends

FEMA	D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

The City of Forks recently reviewed and update their Comprehensive Plan to comply with the periodic review requirement outlined in Washington State's Growth Management Act (City of Forks 2019). The City has seen a 6% population growth since 2010, and the City's land use has reflected these changes as development expands.

No potential developments are actively being considered in known hazard areas. Vulnerability changes have been measured by accounting for shifts in land use and public awareness since the adoption of the 2010 County HMP. Each measure has been identified as having an increased, decreased, or unchanged vulnerability. Table 3-4 provides a snapshot of how vulnerability has changed since development of the 2010 HMP.

Table 3-4 Vulnerability Changes Since 2010

Hazard	Status
Cascadia Earthquake	+/-
Windstorm	+
Wildfire Smoke and Wildfire	+
Extreme Heat and Drought	+
Utility Failure	+
Storm Surges and Tides	=
Flooding	+/-

Key:
+ Increased vulnerability
- Decreased vulnerability
+/- Increased vulnerability, but actions taken to decrease vulnerability
= Unchanged vulnerability

4 CAPABILITY ASSESSMENT

FEMA	C1. Does the plan document [the City of Forks'] existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? [Requirement §201.6(c)(3)]

4.1 Human and Technical Resources

Table 4-1 describes the City's human and technical capabilities to engage in and improve mitigation planning and program implementation.

Table 4-1 Human and Technical Resources Integrated with Hazard Mitigation

Resource	Department	Tasks and Activities Integrated into Mitigation Planning
Public Works Director	Public Works & Utilities	Planners with knowledge of land development and land management practices
Building Inspector	Buildings & Permits Department	Engineers or professionals trained in construction practices relate to buildings and/or infrastructure
City Attorney/Planner	Legal & Planning Department	Ongoing participation in hazard mitigation planning process.

4.2 Financial Resources

The City maintains many fiscal and financial resources to support its mitigation program. Table 4-2 identifies specific resources accessible for use.

Table 4-2 Accessible Financial Resources

Financial Resource	Accessible?
Community Development Block Grants	Yes
Capital Improvement Project Funding	Yes
Insurance	Yes
User fees for utility services	Yes, Water & Sewer inside the Forks Urban Growth Area
Incur debt	Yes
State-sponsored grant programs	Yes

Table 4-3 identifies current and potential sources of funding to implement identified mitigation actions contained within the HMP.

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Federal		
Pre-Disaster Mitigation Program	Federal Emergency Management Agency (FEMA)	Provides funding to develop hazard mitigation plans (HMPs) and implement mitigation actions contained within.

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Hazard Mitigation Grant Program	FEMA	Post-disaster funds to hazard reduction projects impacted by recent disasters.
Flood Mitigation Assistance Program	FEMA	Provides funds for flood mitigation on buildings that carry flood insurance and have been damaged by floods.
Community Development Block Grant Program	U.S. Department of Housing and Urban Development	Funds projects that benefit low- and moderate-income communities, prevent or eliminate slums or blight, or meet urgent community development needs posing a serious and immediate threat to community health or welfare.
Emergency Management Performance Grants Program	FEMA/Washington Department of Emergency Management	Provides funding to states for local or tribal planning, operations, acquisition of equipment, training, exercises, and construction and renovation projects.
Flood Mitigation Assistance	FEMA/Washington Department of Emergency Management	Provides funding to support development of the flood hazard portion of state and local mitigation plans and up to 100% of the cost of eligible mitigation activities. This funding is only available to communities participating in the National Flood Insurance Program (NFIP).
Earthquake State Assistance Program	National Earthquake Hazards Reduction Program Interagency Coordinating Committee	Funds activities including seismic mitigation plans; seismic safety inspections of critical structures and lifelines; updates of building codes, zoning codes, and ordinances; and earthquake awareness and education.
National Fire Plan	U.S. Forest Service	Provides funding opportunities for local wildland-urban interface planning, prevention, and mitigation projects, including fuels reduction work, education and prevention projects, community planning, and alternative uses of fuels.
Risk Mapping, Assessing, and Planning	FEMA	Provides funding and technical support for hazard studies, flood mapping products, risk assessment tools, mitigation and planning, and outreach and support.
Strategic Economic and Community Development Grant	U.S. Department of Agriculture	Provides funding in rural areas for multi-jurisdictional plan development and with a community development focus. Available only to rural areas outside of urbanized zone of any city with a population greater than 50,000.
Coastal Ecosystem Resiliency Program	National Oceanic and Atmospheric Administration	Provides funding for ecosystem restoration. Governor must approve project funds prior to award and there is a 2:1 cost-sharing ratio.
State		
Washington State Department of Transportation (WSDOT) Avalanche Forecasting and Control	WSDOT	Avalanche forecasting determines the potential risk along a particular mountain slope. When an avalanche hazard develops, WSDOT uses artillery, or explosives to trigger the avalanche. In addition to active avalanche control, WSDOT also uses passive control methods to control snow slides.
Washington Sea Grant	Washington Sea Grant	Washington Sea Grant provides funding opportunities through State and National competitions, program development services, and sponsorships.
Ecology Water Resources Program	Washington Department of Ecology (DEC)	DEC's Water Resources Program provides support in monitoring water supply, managing water supply projects, overseeing water rights, performing streamflow restoration, protecting streamflow,

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
		regulating well construction and licensing, and ensuring dam safety.
WSDOT Seismic Retrofit Program	WSDOT	WSDOT provides funding and project support to retrofit bridges at risk of failure due to seismic events.
Washington State Department of Agriculture (WSDA) Livestock Inspection Program	WSDA	Dedicated to providing asset protection for the livestock industry by recording brands, licensing feedlots and public livestock markets by conducting surveillance and inspection of livestock at time of sale and upon out of state movement. The program is funded by fees paid by the livestock industry and receives no general fund dollars.
Washington Local Emergency Planning Committee Program	Washington Emergency Management Division (EMD)	WA EMD provides funding support to ensure Local Emergency Planning Committees (LEPCs) can be implemented across the state.
Washington Pipeline Safety Program	Washington Utilities and Transportation Commission	The commission is responsible for developing and enforcing safety standards for natural gas and hazardous liquid pipelines located within the state. The commission also inspects the portions of interstate natural gas and hazardous liquid pipelines located within Washington State; the standards and enforcement actions are the responsibility of the federal Pipeline and Hazardous Materials Safety Administration (PHMSA).
State Water Pollution Control Revolving Fund	Washington DEC	This program provides funds to local governments to set up low-interest loan programs to repair or replace failing on-site sewage systems. Property owners unable to qualify for conventional bank loans and marine waterfront property owners can use the program to get loans to fix or replace their systems where failures might directly affect Puget Sound. Both the Clean Water State Revolving Fund and the Centennial Clean Water Program.
Other		
Community Planning Assistance Teams	American Planners Association Foundation	Provides pro bono technical assistance for planning frameworks or community vision plans for communities needing extra assistance. Local governments are responsible for travel costs.
Thriving Resilient Communities	Threshold Foundation	Wide-ranging resiliency project funding.
Kresge Foundation Environmental Grants	Kresge Foundation	Provides funding for climate adaptation and mitigation, as well as sustainable water resources management.

4.3 Legal and Regulatory Resources

Table 4-4 describes the legal and regulatory capabilities, including plans, policies, and programs that have integrated hazard mitigation principles into their operations.

Table 4-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2010-2019)	Hazard Mitigated
Plans	City of Forks Capital Improvement Plan (2020 – 2026)	Identifies capital improvement projects to be undertaken by the City over the next seven-year period. Includes water systems, sewer treatment systems, flood management, city structures, parks & recreation, airports, technology center, transit center, collaboration with other agencies.	▪ Updated plan for 2020 – 2026, including flood management projects.	Flooding
	2019 – 2039 Forks Comprehensive Plan	The City's Comprehensive Plan establishes Urban Growth Areas, natural resource lands, rural lands, and public lands.	▪ Updated plan for 2019 - 2039	N/A
	Transportation Improvement Plan (Six-Year Street Plan 2020 – 2025)	Lists transportation projects for a six-year period.	▪ Updated for 2020 to 2025.	N/A
	Forks Comprehensive Flood Management Program	Conducted in tandem with capital improvements planning	▪ N/A	Flooding
Policies	Forks Municipal Code	Title 14 and 15 relate to Environment (including flood management) and Buildings and Construction (fire district).	▪ Current through Ordinance 643, passed June 24, 2019.	Flood, fire
	Local Operating Plan/Agreement with Bureau of Land Management (BLM) and U.S. Forest Service	Increased capability and capacity through partnership.	▪ Signed into agreement	Wildfire
	Zoning Ordinance	Provides land use regulation in the unincorporated portions of the County.	▪ Current code through Ordinance 957, passed August 13, 2019	All
	National Flood Insurance Program (NFIP)	NFIP aims to reduce the impact of flooding on private and public structures.	▪ All participating jurisdictions currently participating in NFIP	Flooding

4.4 Coordination with Community Partners

The City works alongside their community partners to address issues pertaining to emergency management and hazard mitigation. Many of these community partners participated in the HMP update process and collaborate with the City on an ongoing basis.

- **Education**

- Forks School District
- Peninsula College – Forks Branch

- **Business and Industry**
  - Local Chambers of Commerce
- **Healthcare**
  - Forks Community Hospital
  - Washington State Department of Social and Health Services – Forks Branch
- **Utilities**
  - Clallam Public Utility District
- **Transportation**
  - Washington Department of Transportation
  - Clallam Transit

4.5 Integration of Mitigation into Existing Planning Mechanisms

Integration of the principles of mitigation into the City's daily operations and ongoing planning activities is a priority of the City's mitigation program. These activities will support:

- Raising awareness of the importance of hazard mitigation for the whole community;
- Facilitating an understanding that hazard mitigation is not just an 'emergency services' function and building ownership of mitigation activities across the organization; and
- Maximizing planning resources through linked or integrated planning efforts.

The City is encouraged to consider integration actions into planning mechanisms including:

- Budget decision-making;
- Building and zoning ordinances and decision-making;
- Emergency planning mechanisms; and
- Economic developing planning and decision-making.

4.5.1 Existing Plans

FEMA	C6. Does the Plan describe a process by which the local government will incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(iii))

The following existing plans provide ongoing opportunity for integration of hazard mitigation and the City will work with plan owners and stakeholders to consider hazard mitigation data and principles when these plans are updated. Table 4-5 contains a summary of the County's existing plans and how each incorporates the hazard mitigation planning.

Table 4-5 Summary of Clallam County Plans

County Plan	Hazard Mitigation Components
Comprehensive Emergency Management Plan (2016)	Outlines hazard mitigation roles and responsibilities.

Table 4-5 Summary of Clallam County Plans

County Plan	Hazard Mitigation Components
Continuity of Operations Plan	In development through County
Comprehensive Land Use Plan	Identifies designated land uses and areas of economic and environmental value.
Floodplain Management Plan	Outlines strategies that directly or indirectly mitigate the risks posed by flood hazards.
Capital Improvements Plan	Identifies large capital projects to reduce risks to key County infrastructure.
Historic Preservation Plan (a component of Critical Areas)	Identifies areas of cultural value that may be vulnerable to hazards.

1

5 MITIGATION STRATEGY

FEMA	C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for the [City of Forks] being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))

5.1 Review of 2010 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2010 plan were evaluated to determine what the status of the action was and whether any ongoing or incomplete actions should be included as actions in the 2019 plan update. The MPT worked through each previous action during MPT Meeting #1 to document steps taken to fulfill the action.

See Table 5-1 for an overview of the status of all actions from the 2010 plan update.

Table 5-1 Status of 2010 Mitigation Actions

Action No.	Mitigation Action	Action Status	Timeline	Lead Department	Priority
1	Russel Road Culvert Replacement	Completed	2009-2010	Public Works Department	Extremely High
2	Culvert Assessment Study/Report	2010 Action - Ongoing	2010-2011	Public Works and Planning Departments	Medium
3	Storm-related Roof Damage Mitigation Assessment	2010 Action - Ongoing	2010-2011	Planning Department	Medium
4	Palmer Road Stormwater Detention Pond and Conveyance System	2010 Action – Property has been purchased; preliminary design work was undertaken by the County Road division. Project funding has slowed.	2013	Utilities Department	Medium
5	Adopt 2010 Hazard Mitigation Plan	Completed	2010	Planning Department	High

5.2 Identification and Analysis of New Mitigation Actions

In order to achieve the County-wide mitigation goals, the City has identified a comprehensive series of mitigation objectives and supporting actions that are focused on reducing vulnerability and maximizing loss reduction. The actions can typically be broken out into the following types of activities, which are indicated in Table 5-2.

Table 5-2 2019 Mitigation Actions by Group

Mitigation Group	Related Mitigation Actions
Plans and Regulations	FR02, FR03
Infrastructure/Capital Project	FR01, FR04
Natural System Protection	
Education and Awareness	
Preparedness and Response	

All mitigation actions identified in the plan are addressed in the mitigation implementation plan provided in Section 5.3. The actions include both interim- and long-term strategies for reducing vulnerability to hazard and are characterized as such in the 'life of action' column of the implementation plan.

5.2.1 2019 Mitigation Actions by Hazard

All mitigation actions identified in the plan address at least one priority hazard outlined in Chapter 3 of the HMP. Table 5-3 indicates which mitigation actions address which hazards.

Table 5-3 2019 Mitigation Actions by Hazard

Hazard	Related Mitigation Actions
All Hazards	
Cascadia Earthquake	
Windstorm	FR03
Wildfire Smoke and Wildfire	
Extreme Heat and Drought	
Utility Failure	
Storm Surge and Tides	
Flooding	FR01, FR02, FR03, FR04

5.3 2019-2025 Mitigation Implementation Plan

FEMA	C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by [the City of Forks]? (Requirement §201.6(c)(3)(iii))

The mitigation implementation plan lays the groundwork for how the mitigation plan will be incorporated into existing planning mechanisms and how the mitigation actions will be prioritized, implemented, and administered by the City. The implementation plan includes both short-term strategies that focus on planning and assessment activities and long-term strategies that will result in ongoing capability or structural projects to reduce vulnerability to hazards. The STAPLEE Score and Mitigation Effectiveness Score methodologies are outlined in Section 6 of the Base Plan.

See Appendix D for Mitigation Action Worksheet instructions and completed Mitigation Action Worksheets for each action listed in Table 5-4.

Table 5-4 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
City of Forks													
FR01	City of Forks Culvert Assessment Study/Report	2010 Action – Ongoing	5	Public Works and Planning Departments	2010-2011	$15,000	Yes	Grant funding, Street Department funding	Flooding	20	8	28	1
FR02	Storm-related Roof Damage Mitigation Assessment	2010 Action – Ongoing	5	Planning Department	2010-2011	$15,000	No	FEMA HMA, CDBG, Energy conservation dollars	Flooding, Winter Storms, Windstorms	18	4	22	2
FR03	Palmer Road Stormwater Detention Pond and Conveyance System	2010 Action – Property has been purchased; preliminary design work was undertaken by the County Road division. Project funding has slowed.	4,5	Utilities Department	1-3 years	UNK	Yes, partial funding.	City of Forks, Clallam County Public Works, FCAAP (Ecology)	Flooding	16	4	20	3
Adopt the Hazard Mitigation Plan (HMP)	Adopt the HMP	Completed – Re-adopting updated 2019 HMP		Planning Department	1 year	N/A	Yes	N/A	All hazards				

Key:
CDBG - Community Development Block Grants
FCAAP (Ecology) - Flood Control Assistance Account Program (Washington State Department of Ecology)
HMA - Hazard Mitigation Assistance
STAPLEE - Strategy and Prioritization Methodology

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City of Port Angeles Jurisdiction-Specific Annex – Clallam County Hazard Mitigation Plan

DRAFT – 2019 Plan Update

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

Tables

Figures

1 INTRODUCTION

1.1 City of Port Angeles Hazard Mitigation Program

Throughout the hazard mitigation planning process, the following representatives from the City of Port Angeles (referred to herein as 'City' or 'Port Angeles') were present at one or more Mitigation Planning Team (MPT) meeting:

- James Burke, Utilities and Public Works Director, Former
- Ken Dubuc, Fire Chief

A public meeting was held in Port Angeles on January 29, 2019.

The City of Port Angeles participated in the 2010 Clallam County Multi-Jurisdictional Hazard Mitigation Plan (HMP).

See Appendix E for the completed Federal Emergency Management Agency (FEMA) Local Plan Mitigation Review Tool for the City of Port Angeles.

2 COMMUNITY PROFILE

2.1 Governance

Port Angeles is governed by a seven-member City Council, the membership of which includes the mayor, deputy mayor, and five councilmembers. The City Council holds regular meetings on the first and third Tuesday of each month in the City Council Chambers. The City departments are as follows:

- City Clerk
- City Manager
- Community & Economic Development
- Finance
- Fire Department
- Human Resources
- Legal Department
- Parks & Recreation
- Peninsula Communications
- Police Department
- Public Works & Utilities

2.2 General

The City of Port Angeles is in Clallam County on the northern coast of Washington's Olympic Peninsula. It is less than a three-hour drive (including a ferry ride) from Seattle Olympia. Immediately to the north is the coastal marine environment of the Port Angeles Harbor, one of the deepest naturally protected harbors on the West Coast, and the Strait of Juan de Fuca. To the south are the alpine wilderness areas of the Olympic National Park, to the east is the semi-arid climate of the Sequim-Dungeness Valley, and a two-hour drive to the west is the Hoh Rain Forests and the Pacific Coast (City of Port Angeles 2019).

Port Angeles is located in the leeward side of the Olympic Mountains, which is also known as a "rainshadow." As a result, metrological conditions in Port Angeles are relatively mile year-round, with dramatically less precipitation than interior Clallam County, or in areas along the western coast of the Olympic Peninsula. The average precipitation and temperature trends over the time period from 1933 to 2008 in Port Angeles are displayed in the table below (WRCC 2008):

Table 2-1 Average Precipitation and Temperatures (1933-2008)

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Annual
Precip. (in)	3.91	2.69	2.11	1.26	0.97	0.86	0.53	0.75	1.09	2.51	4.01	4.34	25
MAX (deg.)	45	47	50	55	60	64	68	68	65	57	50	46	56
MIN (deg.)	34	35	37	40	45	49	52	52	49	43	38	36	43

Port Angeles is in the Port Angeles Watershed, which drains 65,000 acres. A gradually descending slope from the Olympic Mountains north to the Strait of Juan de Fuca characterizes the topography of the immediate Port Angeles area. The region is bisected by streams, which flow form the mountains towards the Strait and have eroded V-shaped ravines that are much lower in elevation than the surrounding areas (City of Port Angeles 2019).

2.3 Population and Demographics

As of 2018, the U.S. Census estimated population for Port Angeles was 19,370 individuals, which is a 5.4% increase from 2010 (U.S. Census Bureau 2018). Data from the 2017 American Community Survey (ACS) 5-year estimates indicate that 6.7% of the City's population is younger than 5 years of age and 21.6% of the City's population is younger than 18 years of age. Approximately 20% of the City's population is 65 years of age and older (U.S. Census Bureau 2018).

According to the ACS, 2.3% of the City's population is black or African American alone; 2.1% of the City's population is American Indian or Alaska Native alone; 2.6% of the City's population is Asian alone, and 5.4% is Hispanic or Latinx. Approximately 88% of the City's population is white alone and 4.6% is two or more races (U.S. Census Bureau 2018).

In 2017, an estimated 23% of the City's population lived in poverty and the median population income was $41,297. An estimated 14.6% of the population under age 65 live with a disability.

2.4 Economy

Overall, the Port Angeles economy employs 7,700 individuals (DataUSA 2019). According to the U.S. Census, the largest industries in Port Angeles are retail/trade, healthcare and social assistance, and accommodations and food services. Advanced composites manufacturing has been established in Port Angeles area, supplying manufactured parts to the aerospace and marine industries.

The Port of Port Angeles, the Olympic Peninsula's only deep-water port, provides support for Clallam County industry and employs administrative and trades staff. The Port operates a 16.1-acre marina, with approximately 375 boat slips and 3,000 feet of dock for tie-ups, as well as a marine terminal and trades area, a log yard, and rental properties. The Boat Haven Marina was upgraded in 2007-2008. The Port also operates the William R. Fairchild International Airport. The Port also currently houses a composites training institute (WA ESD 2019).

Peninsula College offers programs including advanced manufacturing, community education and worker retraining. It has three campus locations in Port Angeles, Port Townsend, and Forks (ESD 2018). As of the 2017-2018 school year, between the three campuses, the College supports 4,454 enrolled students with 51 full-time teaching faculty (Peninsula College 2019).

BUSINESS HIGHLIGHT

The Port fuels the North Olympic Peninsula's economy by supporting job creation in industry and commerce. The Port's strategic position on the Strait of Juan de Fuca, its location on a deep-water harbor, the industrial facilities that support marine and air transportation, and accesses to natural resources all contribute to unique and robust economic engine (Port of PA 2019).

https://www.portofpa.com/92/About-Us

2.5 Land Use

Appendix A of the 2019 Comprehensive Plan provides an overview of historic and present-day land use trends and challenges:

> "Patterned after the plan of Cincinnati, Ohio (substituting the Harbor for the Ohio River), the streets are arranged and named the same: Front, First, Second, etc.; at right angles to these are Tumwater, Cedar, Pine, Valley, Cherry, Oak, Laurel, Vine, and Race Street.
>
> While the City has benefited greatly from that original planning with its grid-pattern street layout, various challenges were also created such as utility service provision and circulatory problems, due to the topography of the land. Six different streams, with associated ravines, travel through the community flowing north from the foothills of the Olympic Mountains as they quickly make their way to the Strait of Juan de Fuca. They are: Dry Creek, Tumwater Creek, Valley Creek, Peabody Creek, Ennis Creek, White's Creek, with Lee's Creek, and Morse Creek located within the City's Urban Growth Areas." (City of Port Angeles 2019)

The City contains 10.7 square miles of land area. The following are the designated land uses defined in the 2019 Comprehensive Plan:

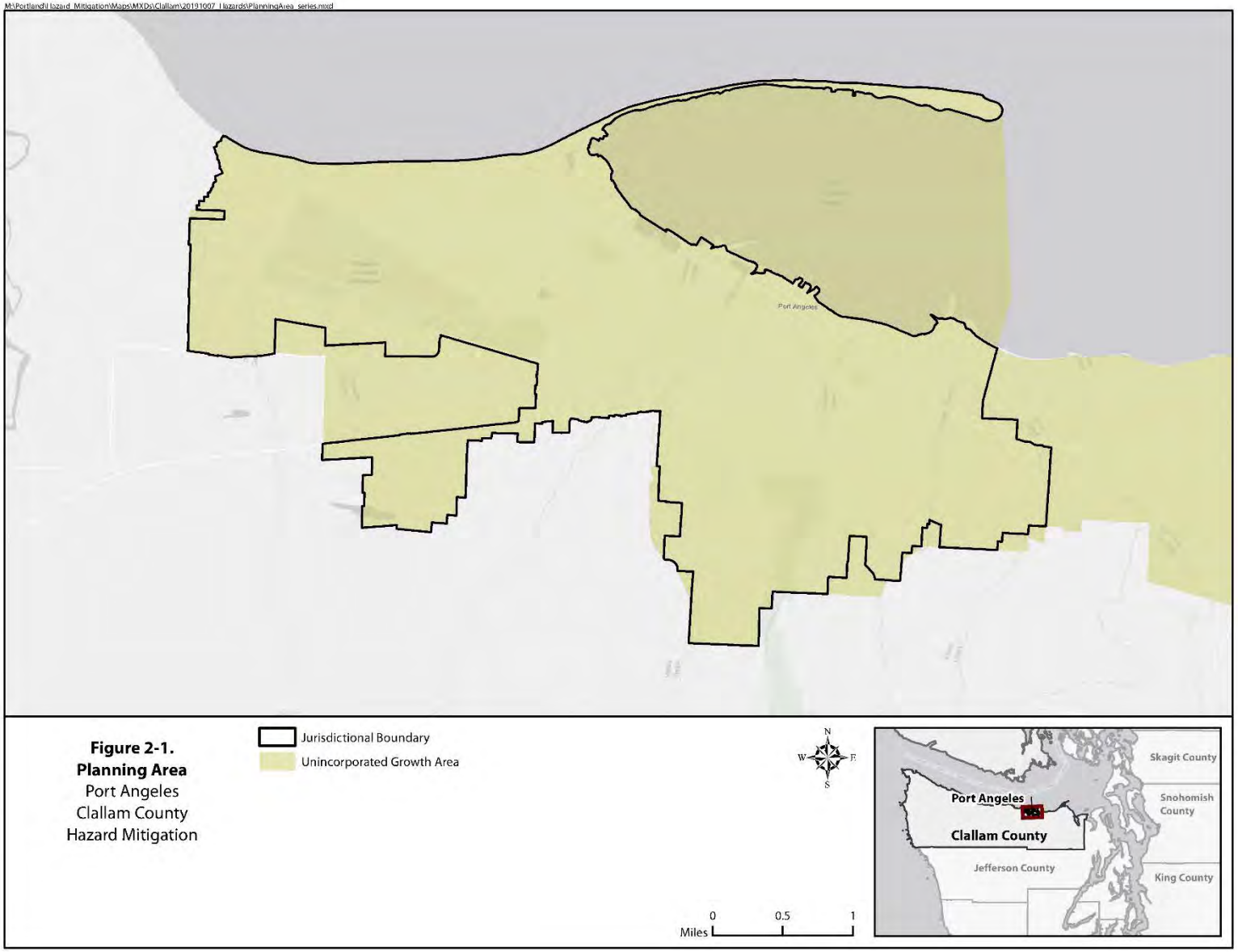
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Industrial
- Open Space

2.6 Transportation and Commuting

The 2019 Comprehensive Plan provides the following profile regarding transportation trends in the City of Port Angeles:

> "The road network in the City of Port Angeles is characterized by a gridded street pattern that is oriented east to west (parallel to the waterfront) and north to south. This pattern shifts slightly south of Lauridsen Boulevard, where the street orientation shifts to match the platting pattern established by the County before City boundaries were expanded. The regular geometry of this pattern is generally retained, except where topography of the foothills, deep ravines or bluffs along the Strait of Juan de Fuca force road realignment. Some areas located in the western portion of the City also diverge from the grid pattern, forming a more curvilinear, suburban-style pattern.
>
> Street grades are moderate in most areas, adapting to area topography – which rises from the waterfront and gently undulates as the foothills flatten to meet the Strait of Juan de Fuca. The most unique characteristic of the City's street network is the way it is interrupted by several deep ravines, which bisect east-west street connectivity and results in a limited number of streets that run continuously from one end of the City to the other…
>
> There are five Highways of Regional Significance through the City, including:
>
> - US-101
> - State Route 117 Tumwater Truck Route
> - Race Street leading to the Olympic Park Visitor Center and Hurricane Ridge
> - The First/Front Street couplet Marine Drive from US-101 to SR 117
> - Lincoln/Laurel/Oak Streets connecting US-101 with the Coho Ferry landing on Railroad Avenue
>
> …The City of Port Angeles is served by Clallam Transit System (CTS), the Public Transportation Benefit Area (PTBA) that serves Clallam County with a combination of fixed-route, paratransit, and vanpool services…. Paratransit service is provided to all locations within the City for those who qualify. Vanpools extend the reach of the transit network and are frequently used by those commuting to locations which are difficult to serve with fixed-route service…" (City of Port Angeles 2019)

Figure 2-1 City of Port Angeles



3 HAZARD PROFILES AND VULNERABILITY ASSESSMENTS

Chapter 3 contains hazard profiles and vulnerability assessments to determine the potential impact of hazards to the people, economy, and build and natural environments of the City of Port Angeles. They have been streamlined to increase the effectiveness and usability of the HMP.

FEMA	B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect [the City of Port Angeles]? (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 [the City of Port Angeles]? (Requirement §201.6(c)(2)(i)) B3. Does the plan include a description of each identified hazard's impact as well as an overall summary of the vulnerability of the planning area? [44 CFR § 201.6(c)(2)(ii)]

3.1 General

Clallam County has encountered several major disaster declarations that have affected the City of Port Angeles. In total, the County has experienced 21 disaster declarations since 1953. Table 3-1 identifies the disaster declarations since 2010.

Table 3-1 Clallam County FEMA Disaster Declarations

Disaster ID	Date of Declaration	Disaster Type	Incident Period
DR-1956	05-Mar-12	Severe Winter Storms, Flooding, Landslides, and Mudslides	14-Jan-12 to 23-Jan-12
DR-4242	15-Oct-15	Severe Windstorm	29-Aug-15
DR-4249	1-Jan-16	Severe Storms, Straight-line Winds, Flooding, Landslides, and Mudslides	12-Nov-15 to 21-Nov-16
DR-4253	2-Feb-16	Severe Winter Storm, Straight-line Winds, Flooding, Landslides, Mudslides, and a Tornado	1-Dec-15 to 14-Dec-15
DR-4418	4-Mar-19	Severe Winter Storms, Straight-line Winds, Flooding, Landslides, Mudslides, Tornado	10-Dec-18 to 24-Dec-18

Source: FEMA, Washington Disaster History, Major Disaster Declarations (https://www.fema.gov/data-visualization-disaster-declarations-states-and-counties)

The hazard profiles and vulnerability assessments contained in this chapter represent a considerable amount of work performed by the MPT. MPT members ranked hazards using several key considerations, followed up by activities to validate hazard analysis results and identify specific areas of risk. Table 3-2 displays the hazards that MPT selected for further assessment.

Table 3-2 Hazards Addressed in Plan

Hazard Type	Hazard Name
Natural Hazards	Earthquake Disease Winter Storm Windstorm Heat Events Drought Tsunami Wildfire Flooding Landslide
Technological Hazards	Utility Failure

3.2 Hazard Ranking Methodology

The hazards identified in the HMP were initially ranked based on MPT feedback during MPT Meeting #1 and #2.

Following the individual hazard ranking activity, the results were added up and aggregated to show an average score for the all City of Port Angeles MPT members and are available in Figure 3-1.

Figure 3-1 City of Port Angeles Hazard Rankings

City of Port Angeles Hazard Ranking

	Magnitude (1=lowest, 5=highest)	Onset (1=slowest, 5=fastest)	Duration (1=shortest, 5=longest)	Frequency (1=lowest, 5=highest)		Average	Rank
Utility Failure	2	5	4	5		4	1
Disease	4	4.5	5	2		4	2
Earthquake	4	5	4.5	1		4	3
Cascadia Earthquake	5	5	3	1		4	4
Winter Storm	1.5	3.5	3	5		3	5
Windstorm	1.5	3.5	2.5	5		3	6
Wildfire Smoke	2	3	3	4		3	7
Heat Events	2	3	3	4		3	8
Tsunami	3	4	3.5	1		3	9
Wildfire	1.5	4	3.5	2.5		3	10
Flooding	2	3	3	2		3	13
Landslide	1.5	4.5	1.5	1		2	14
Drought	1.5	1	3	2.5		2	15

3.3 Hazard-Specific Profiles and Risk Assessments

The following section profiles each hazard identified in Section 3.2 and assesses the risk associated with each. Each risk assessment considers the following attributes:

- **Location:** An indication of geographic areas that are most likely to experience the hazard.
- **Past Occurrences/History:** Like location, a chronological highlight of recent occurrences of the hazard accompanied by an extent or damage cost, if available.
- **Extent/Probability:** A description of the potential magnitude of the hazard, accompanied by the likelihood of the hazard occurring (or a timeframe of recurrence, if available).
- **Vulnerability:** A description of the potential magnitude of losses associated with the hazard. Vulnerability may be expressed in quantitative or qualitative values depending upon available data. Identifies development trends impact on the City's vulnerability to each hazard since the 2010 plan development (increased, decreased, unchanged).

Note: Hazard Descriptions, Potential Impacts from Future Climate Conditions, and Cascading Impacts can be found in Section 4 of the HMP Base Plan, as these are not place-specific.

In addition, the hazards have been organized into three sub-sections (high-, medium-, and low-priority) to illustrate the risk-driven nature of the HMP. Each hazard has been given serious consideration of all attributes discussed within. However, low-priority hazards may be shorter in length and with less quantitative analyses, as a lack of usable data is frequently present when considering low-likelihood or low-magnitude events. The three sub-sections are as follows:

- **High-Priority:** Cascadia Earthquake, Earthquake, Utility Failure, Disease
- **Medium-Priority:** Winter Storm, Wildfire Smoke, Windstorm, Heat Events, Tsunami, Wildfire, Flooding
- **Low-Priority:** Drought, Landslide

3.3.1 Utility Failure

Utility Failure

Magnitude	Onset	Duration	Frequency	Average	Rank
2	5	4	5	4	1

Location
Numerous City properties are at risk of being affected by power outages/utility failures. Rural and populated areas alike are known to experience power outages during winter and windstorms that can last anywhere from several hours to several weeks. In addition, the Clallam County Public Utility District (PUD) operates extensive utility and information technology networks that could be at a risk to exposure of a hazard that could lead to a utility failure.

Previous Occurrence/History

Historically, utility disruptions and failures have been caused by natural disasters and human-caused accidents but have not been recorded in a way that is publicly accessible. Numerous utility failures occur every year, most frequently in the form of electricity outages that may last as short as hours or as long as weeks.

Extent and Probability

It is difficult to predict the impacts of future utility failures, but they have the potential to impact all government and business operations and cause extensive economic losses among other impacts. Due to the sporadic nature of failures, it is also difficult to estimate how frequently such failures will occur or their duration. The City generally deals with power outages multiple times per year with many of them only lasting a matter of hours. Every several years, a large utility failure is experienced.

Future Probability Trend – Based on potential increases in severe winter storms, heat waves and increasing development trends resulting in greater demand, the City may be impacted by an **increase** in the probability of future utility failure. However, mitigation actions outlined in this HMP are designed to decrease such strain on utility systems.

Vulnerability

Port Angeles City Light operates 11 electrical facilities within the City that are vulnerable to failure due to an array of hazards. Additionally, there is one natural gas facility, 3 water system facilities, and 2 wastewater systems that are vulnerable to hazards.

Power facilities in Clallam County are generally protected from wildland/urban interface fire by defensible space. A limited number are threatened by tsunami, flood and landslide hazards. All facilities are threatened to varying degrees by destructive earthquakes.

Since the 2010 County HMP, development in Port Angeles has expanded further into the Wildland-Urban Interface (WUI); therefore, the vulnerability has **increased**.

3.3.2 Disease

Disease

Magnitude	Onset	Duration	Frequency
4	4.5	5	2

Average	Rank
4	2

Location

The City has multiple medical clinics and one primary hospital, the Olympic Medical Center.

The Clallam County Public Health Services administers public health awareness programs to provide information on diseases influencing the County population. The following facilities are communicable disease testing sites:

- Private healthcare provider offices
- Clinicare Walk-In Clinic
- Volunteers in Medicine of the Olympics Clinic for uninsured/low income
- Planned Parenthood for sexually transmitted diseases (STDs), human immunodeficiency virus (HIV), & Hepatitis C
- Clallam County Public Health Section on a limited, case by case basis.

Previous Occurrence/History

- February 2015: A kindergartner was diagnosed with measles in the City; a total of 5 people in Clallam County were diagnosed with measles; 1 fatality (Seattle Times 2015).

Extent and Probability

Although it is impossible to predict the next infectious disease outbreak, history shows that outbreaks are not uncommon and can devastate communities. Infectious diseases can affect the City and County's entire population. Diseases may also infect livestock herds and can potentially be communicated from animal vectors to humans. Recent medical advancements increase our ability to counteract such outbreaks and limit their extent, but additional concerns related to diseases building resistance to drugs is an ongoing concern.

Future Probability Trend – Based on potential changing weather patterns, the City may be impacted by an **increase** in the probability of emerging infectious disease.

Vulnerability

Epidemic and pandemic diseases have been known to spread quickly throughout communities. Many diseases spread through close contact, meaning that highly populated areas are more prone to widespread outbreaks; a lot of public activities are centered out of the Port Angeles area. However, compared to a metropolitan area, the smaller relative population density of the City decreases the likelihood of a widespread outbreak in comparison to a more densely populated area.

Port Angeles is a relatively small city, with just under 20,000 individuals. Vulnerable populations include the 6.7% that is 5 years of age and younger and 20% that is 65 years of age and older (U.S. Census Bureau 2018). An estimated 23% of the City's population lived in poverty, and an estimated 14.6% of the population under the age of 65 live with a disability. These vulnerability factors may indicate an increased probability for infection and outbreaks.

Disease

The rural nature of the City also presents a key vulnerability: healthcare resources and hospitals are in short supply and would likely become overburdened immediately following a disease outbreak.

Given the expansion of population centers such as Port Angeles and Sequim, the vulnerability of the County to disease has **increased**.

3.3.3 Earthquake & Tsunami

Earthquake & Tsunami

	Magnitude	Onset	Duration	Frequency	Average	Rank
Earthquake	4	5	4.5	1	4	3
Cascadia Earthquake	5	5	3	1	4	4
Tsunami	3	4	3.5	1	3	9

Location

The Cascadia Subduction Zone (CSZ), where the Juan De Fuca plate slides underneath the North American plate poses a great risk to the City and all communities in the Pacific Northwest. A large earthquake would cause significant impacts to all City properties with a structure, and liquefaction may pose a risk to properties without a structure (though the liquefaction risk in the area is graded as moderate). The region is also subject to smaller, crustal quakes near the Port Angeles/Sequim area associated with the Lake Creek Fault.

Only 3% of Port Angeles is in the tsunami hazard zone, mainly along the waterfront and the Ediz Hook.

Previous Occurrence/History

The most recent earthquake that damaged Clallam County was the 2001 Nisqually Earthquake. Small earthquakes occur regularly throughout the region and go unnoticed by residents. Over the last 135 years, there have been nine earthquakes with a magnitude (M) greater than 6.0 in the area that we consider the Northwest. Five of those large quakes (including the Nisqually earthquake) directly impacted the Olympic Peninsula, according to eyewitness accounts.

- 1700, CSZ Earthquake, M 9.0
- 1909, San Juan Island, M 6.0
- 1939, Vashon Island, M 6.1
- 1949, Olympia, M 7.1
- 1965, Seattle – Tacoma, M 6.5
- 2001, Nisqually, M 6.8

The most recent tsunami in Port Angeles area as follows:

- 2006 Kuril Islands, Japan Tsunami (Port Angeles, 0.39 feet)
- 1700 Cascadia Tsunami (Washington Coast, 33 feet)

Extent and Probability

Earthquakes pose a widespread hazard throughout Clallam County, including Port Angeles. Tsunami post a widespread hazard throughout the coastal area. The cascading impacts of earthquakes, such as

Earthquake & Tsunami

tsunami and liquefaction, are dependent on geography and soil type, as detailed above.

The Ring of Fire will continue to generate tectonic triggers. The CSZ has produced earthquakes measuring M 8.0 and above at least seven times in the past 3,500 years. The time intervals between these events has varied from 140 to 1,000 years, with the last event occurring just over 300 years ago.

There is evidence of two earthquakes on the Lake Creek Fault between 2,000 and 700 years ago. An earthquake of M 6.8 along the Lake Creek Fault would produce the greatest intensity shaking in the vicinity of Port Angeles and Sequim.

Future Probability Trend – Future weather and development trends play no known role in the probability of future earthquake events. However, both may play a role in the magnitude of earthquake impacts. Great earthquakes in the Pacific Ocean basin generate tsunamis that impact Washington's outer coast and the Strait of Juan de Fuca at a rate of about six every 100 years. In the CSZ, there is a 10 to 14% chance of a M 9.0 earthquake and tsunami in the next 50 years so the likelihood of recurrence would be low.

Vulnerability

Vulnerability posed by earthquakes to the City of Port Angeles is measured by accounting for the critical infrastructure that are at risk. The following infrastructure types are at high to very high risk from earthquake shaking:

- Commercial (1 building)
- Communication System (2 buildings)
- Electric System (1 building)
- Fire Stations (1 building)
- Government Structures (3 buildings)
- Hazardous Materials Storage (11 buildings)
- Medical Facilities (1 building)
- Natural Gas Facilities (1 building)
- Schools (1 building)
- Shelters (7 buildings)
- Wastewater Systems (2 buildings)
- Water Systems (3 buildings)

The following infrastructure types are at high to very high risk from liquefaction:

- Commercial (1 buildings)
- Communication Systems (2 buildings)
- Electric Systems (3 buildings)
- Fire Stations (1 building)
- Government Structures (2 buildings)
- Hazardous Materials Storage (11 buildings)
- Medical Facilities (1 building)
- Natural Gas Facilities (1 building)
- Schools (2 buildings)
- Shelters (1 building)
- Wastewater Systems (2 buildings)

Earthquake & Tsunami

The following infrastructure types are at a high risk for tsunami damage:

- Airport (U.S. Coast Guard [USCG])
- Electric Systems (1 building)
- Government Structures (1 building)
- Hazardous Materials Storage (11 buildings)
- Natural Gas Facilities (1 building)
- Shelters (2 buildings)

Awareness of the City's vulnerability to earthquakes or tsunamis has increased with participation in regional drills and public outreach efforts. More structures are being designed to be resilient to tectonic activity. Given these changes, the vulnerability of Port Angeles to earthquakes and tsunami is **unchanged**.

3.3.4 Winter Storm

Winter Storm

Magnitude	Onset	Duration	Frequency
1.5	3.5	3	5

Average	Rank
3	5

Location

While much of the County can be affected by winter storms, the western coastal areas are exposed to the more damaging impacts of winter storms. Furthermore, many of the communities along the western and northern coast of Clallam County, including the City, are very remote and have limited road infrastructure that can quickly become compromised during a winter storm.

Previous Occurrence/History

Recent winter storms occurring in Port Angeles resulting in major damage include (snowstorms listed below; see Section 4.5.5, Windstorms, for other types of winter weather):

- 17 March 2014 – Sequim/Port Angeles Blizzard
- 27 December 1996 – Christmas Snowstorm

Extent and Probability

Winter storm weather is common in the winter, but typically lasts a short time; ice storms (sleet and freezing rain) likewise are typically brief events.

Winter storms may be more extreme during La Niña weather years, such as the 1996 flooding associated with the 1996-1997 La Niña pattern.

Future Probability Trend – The impact of changing weather patterns may have an impact on the probability of future winter storm events. Based on potential decreases in annual snowpack and increases in the frequency and magnitude of drought and heat, it would seem the City may be impacted by a **decrease** in the probability of future winter storms. However, it is also possible that changing weather patterns could result in an increased likelihood of precipitation during sub-zero temperatures, resulting in an **increase** in the probability of winter storms.

Winter Storm

Vulnerability

The City's primary vulnerability from severe weather is from power outages and impairment of transportation. Because nearly all social and economic activity is dependent on transportation, snow can have a serious impact. Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. Vehicle accidents rise among those who try to drive. Power outages can result from physical damage to electrical infrastructure as a result of ice or snow or increases in demand beyond the capacity of the electrical system.

Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe winter weather events. Persons who are older, are isolated or have disabilities may be more vulnerable, especially those that may be trapped in their homes from power failures, heavy snow and ice, and debris from falling trees and power lines. Power losses during winter storms have resulted in deaths from carbon monoxide poisoning if people attempt to keep warm by lighting charcoal fires or operating backup generators indoors.

Snowstorms also slow the local economy, but there is a debate about whether these slowdowns cause permanent revenue losses. Productivity and sales may decline but often accelerate after a storm. Some permanent effects may occur if some areas in the region are accessible and some are not. For workers, snow can be a hardship, especially for those who lack benefits and vacation time. For local governments, responding to snowstorms can be a major unbudgeted expense. Some have even had to issue emergency bonds to cover snowstorm recovery costs.

Since the 2010 plan, the City vulnerability to winter storms has **increased** as weather patterns change due to climate change and as increased development has resulted in more infrastructure that can be exposed to damage during severe weather.

3.3.5 Windstorm

Windstorm

Magnitude	Onset	Duration	Frequency
1.5	3.5	2.5	5

Average	Rank
3	6

Location
All County and City properties and structures can be affected by windstorms. Properties with infrastructures, utilities, and tree stands can have more damaging impacts during windstorms, especially in coastal areas where winds speeds can reach 40 to 60 miles per hour (mph) during the winter months.

Previous Occurrence/History

Recent windstorms occurring in Clallam County resulting in major damage include:

- 17 December 2018 – Clallam and East Jefferson Counties Windstorm
- 15-16 October 2016 – Typhoon Songda
- 14 December 2006 – "Hanukkah Eve" Windstorm
- 20 January 1993 – "Inaugural Day" Storm

These windstorms have caused damage to County structures and housing; extensive utilities damage; restricted access to public lands; and required increased strain on the government's operations.

Extent and Probability

Coastal areas of Clallam County, including the north side of Port Angeles, experience higher winds than other areas. Windstorms can damage buildings, structures, utilities, and tree stands, causing millions of dollars' worth of damage.

Future Probability Trend – Future weather conditions have the potential to lead to an increase in severe and extreme weather patterns, leading to an **increase** in the probability of a windstorm. In addition, increased development has the potential to expose more assets to the impacts of windstorms.

Vulnerability

The City's vulnerability to severe windstorms are related to power outages and debris blocking land-based transportation routes. Because nearly all social and economic activity is dependent on transportation, damage from windstorms can have a serious impact.

Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. Vehicle accidents rise among those who try to drive during windstorms (U.S. Department of Transportation 2018).

Power outages can result from physical damage to electrical infrastructure as a result of downed trees and blown debris. Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe windstorms. Additionally, persons with electric-based health support systems are vulnerable to power outages everywhere.

Windstorm

Since the 2010 plan, the City's vulnerability to windstorms has **increased** as weather patterns change due to climate change, and as increased development has resulted in more infrastructure that can be exposed to damage during severe weather.

3.3.6 Fire

Fire

	Magnitude	Onset	Duration	Frequency
Wildfire Smoke	2	3	3	4
Wildfire	1.5	4	3.5	2.5

Average	Rank
3	7
3	10

Location

According to the *Clallam County Community Wildfire Protection Plan* (CWPP), large fires in western Washington typically occur on steep south-facing slopes, and often result from a combination of circumstances including a source of ignition in areas of dry, heavy fuels, an extended period of drought, and dry east winds (Clallam County 2009). Forest fires in this area usually occur during the dry summer months of July, August, and early September, but they can occur anytime between April and October given the right conditions. Fire hazard increases in the late summer and early fall when hot, dry east winds (subsidence winds) occur more frequently and the area has experienced the low point of the annual precipitation cycle. The portion of the Peninsula with the highest potential for major fires is the area between Port Angeles and Hood Canal, though as residents of Forks can attest, large forest can occur anywhere on the Peninsula (Clallam County 2010).

Many of the older structures in the County, such as in Port Angeles, may be vulnerable to urban fires because of their construction prior to modern fire codes and fire resistive materials, including electrical wiring. The Port Angeles Fire Department indicated many of the fire damages represent commercial structures, with a large portion in any year representing a single large fire (Clallam County 2010).

Previous Occurrence/History

In December 2003, the City of Port Angeles experienced a significant fire at the Elks Naval lodge, one of the City's largest structures located in the downtown core (Clallam County 2010).

Extent and Probability

Weather conditions greatly influence the impact and extent of wildfires. Drought, high temperatures, and wind contribute to a dynamic and changing conditions of wildfires. Fuel load and vegetation contribute to the size and intensity of wildfires.

Wildfires are frequent and inevitable. Within the region, most wildfires burn during the June to October time period.

Future Probability Trend – Based on potential decreases in annual snowpack and increases in the frequency and magnitude of drought and heat, the City may be impacted by an **increase** in the probability of future fires.

Fire

Vulnerability

Wildfires in Clallam County generally occur in the lower-lying WUI areas.

Due to the limited number of land-based evacuation routes, the City may become isolated during a wildfire—limiting access to healthcare facilities, shelters, and other resources. Other critical infrastructures vulnerable to wildfires include water systems, refined fuel systems, and communications systems.

Vulnerability posed by wildfires (particularly WUI fires) to Port Angeles is measured by accounting for the critical infrastructure that are at risk:

- Hazardous Materials Storage (2 structures)
- Shelter (1 structure)

Since the 2010 County HMP, development in Port Angeles has expanded further into the WUI; therefore, the vulnerability has **increased**.

See Appendix B for full Risk Exposure Tables and Appendix C for additional maps.

3.3.7 Heat Events and Drought

Heat Events and Drought

	Magnitude	Onset	Duration	Frequency	Average	Rank
Heat Events	2	3	3	4	3	8
Drought	1.5	1	3	2.5	2	15

Location
Drought widely influences the County. The City is located within the rainshadow of the Olympic Mountains.

Previous Occurrence/History

There has been one period of extreme drought within Clallam County over the last 17 years. During a two-month period in 2015, 100% of the County's area was marked by D3 to D4 droughts (the most intense forms of drought). Additionally, in 2001, 2003, 2006, 2009, 2014, 2017, and 2018, areas of the County experienced moderate to extreme drought. As of May 2019, a drought emergency was declared in the Elwha-Dungeness watershed which encompass the entirety of Clallam County.

The U.S. Drought Monitor classified the Olympic Peninsula region's 2019 drought as severe due to low precipitation levels (LaBrie 2019).

Drought animations over time are available at: http://droughtmonitor.unl.edu/Maps/Animations.aspx (U.S. Drought Monitor 2019).

Heat Events and Drought

Extent and Probability

Northeast Clallam County, which is in the rainshadow of the Olympic Mountains, is the most vulnerable to the effects of drought (Desisto et al. 2009).

Future Probability Trend – Based on potential decreases in annual snowpack and increases in the frequency and magnitude of prolonged heat, the City may be impacted by an **increase** in the probability of future droughts.

Vulnerability

Droughts impact individuals and industries. There is increased danger of forest and wildland fires. Millions of board feet of timber have been lost. Loss of forests and trees increases erosion causing serious damage to aquatic life, irrigation, and power development by heavy silting of streams, reservoirs, and rivers.

Problems of domestic and municipal water supplies are historically corrected by building another reservoir, a larger pipeline, a new well, or some other facility. Short-term measures, such as using large capacity water tankers to supply domestic potable water, have also been used. Low stream flows have created high temperatures, oxygen depletion, disease, and lack of spawning areas for our fish resources.

The City's vulnerability to drought has increased since 2010, as the demand has grown, and historic water supply shifts due to climate change and other factors.

3.3.8 Flooding

Flooding

Magnitude	Onset	Duration	Frequency
2	3	3	2

Average	Rank
3	13

Location

The primary riverine hazards are associated with the Elwha River and Morse Creek. Secondary riverine hazards are associated with Valley Creek, Tumwater Creek, Dry Creek, Chickamin Creek, Peabody Creek, White Creek, Ennis Creek, Lees Creek, Bagley Creek, and Siebert Creek.

Ediz Hook and parts of Port Angeles (mainly along the waterfront) and may become inundated with high tides and storm surges. (Clallam County 2010).

Previous Occurrence/History

Flood damages with the highest consequence, either related to the cost to repair or by the impact on human activities, were incurred during the 1979, 1990, 1996/1997 and 2008/2009 flood and severe storm events.

Flooding

Extent and Probability

Severe floods may result in serious injuries and fatalities as well as damage to public facilities and private property. Extent of flooding can be determined by the height of river flows in comparison to flood stages determined by U.S. Geological Survey (USGS) stream gauges located throughout the area. It can also be measured by past damages of flooding.

The region experiences some flooding twice a year at minimum, while larger floods occur once a decade and major flood events occurring every 30-50 years.

Future Probability Trend – Based on potential increase in high-intensity precipitation events and increased development trends (resulting in additional impervious surfaces and stormwater runoff), the City may be impacted by an **increase** in the probability of future floods.

Vulnerability

Clallam County, local jurisdictions, and Tribes do not currently participate in the NFIP Community Rating System (CRS) (the Lower Elwha/Klallam Tribe has rescinded participation).

Vulnerability posed by flooding to Port Angeles is measured by accounting for the critical infrastructure that are at risk. The following City infrastructure types are classified as being vulnerable to flooding:

- Government Building (1 structure)
- Hazardous Materials Storage (2 structures)
- Shelter (1 structure)

Since the 2010 plan, the City's vulnerability to nuisance flooding has **increased** as precipitation patterns shift due to climate change. However, the City and partners are taking active steps to mitigate the impacts through floodplain restoration activities.

3.3.9 Landslide

Landslide

Magnitude	Onset	Duration	Frequency
1.5	4.5	1.5	1

Average	Rank
2	14

Location

The following are particular areas of City concern for landslides (FEMA 2013):

- Along major roadways, including US-101
- Along the Port Angeles marine bluff
- The Olympic Discovery Trail

Landslide

Previous Occurrence/History

Historically, the damages with the highest consequence, either related to the value of the repair or by the impact on human activities, include slides that have closed US-101 and slides in Port Angeles (one of which caused a fatality in 1998) (Clallam County 2010).

Bluff erosion and/or ravine erosion has damaged or threatens residences in developments located in Port Angeles. Since the County's critical areas codes that affect new building require provisions for building setbacks and drainage (including roof drainage and septic issues), new structures have not been damaged. Historically, smaller, residential lots platted years ago near bluffs have had the most problems with bluff failure (Clallam County 2010).

See Appendix C for additional detail.

Extent and Probability

The following is excerpted from the hazard assessment conducted by Clallam County Emergency Management Division (EMD) as part of the 2016 Cascadia Rising Exercise:

> "Highway 101 and East Beach Road are subject to debris flows and rockfalls along Lake Crescent. There is concern that neighborhoods in Port Angeles downhill from Peninsula College may be subject to block or creep slides during an earthquake." (Buck 2016)

Due to the geology and likelihood of landslide-triggering storms in Port Angeles, the probability of future occurrence of landslides is medium to low.

Future Probability Trend – Based on potential increases in drought and wildfires, as well as potentially higher intensity precipitation events, the City may be impacted by an **increase** in the probability of future landslides. In addition, as the City increases its land ownership and development, landslides may pose a greater risk on disturbed soils.

Vulnerability

Vulnerability posed by landslides to Port Angeles is measured by accounting for the critical infrastructure that are at risk. The following City infrastructure types are classified as being susceptible to landslides:

- Government buildings (1 structure)
- Hazardous Materials Storage (2 structures)
- Shelters (2 structures)

Since the 2010 plan, the City's vulnerability to landslides is **unchanged**.

3.4 Vulnerability Assessment

3.4.1 Identifying Critical Infrastructure and Asset Inventory

Critical infrastructure was identified for the City of Port Angeles following the methodology outlined in Section 4.6 of the Base Plan.

Appendix B contains the complete vulnerability assessment and associated methodology.

3.4.2 Repetitive Loss Properties

No properties within the City of Port Angeles meet the criteria for a severe repetitive loss.

3.4.3 Exposure Assessment

Table 3-3 contains a summary of the critical infrastructure associated with Port Angeles (Buck 2016). The vulnerability of each structure to earthquake, tsunami, flooding, WUI fires, and landslides is assessed.

Table 3-3 Port Angeles Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami	Floods	WUIF	Landslides
William F. Fairchild Intl	1402 Fairchild Airport Rd.	Port Angeles	Airport	80%	C	Low/Mod	Low	Very High	NO	NO	NO	NO
Port Angeles Coast Guard	1 Ediz Hook Rd	Port Angeles	Airport	80%	D	Mod/Hi	Mod/Hi	Severe	YES	NO	NO	NO
Olympic Medical Center Helipad	939 Caroline St	Port Angeles	Airport	80%	D	Mod	Low	Very High	NO	NO	NO	NO
City Electric Utility Main Office	1734 W Highway 101	Port Angeles	Electric System	60%	C	Mod	Low	Mod	NO	NO	NO	NO
Pole Yard, Transformer & Maint Ctr	1707 A St	Port Angeles	Electric System	60%	C	Mod	Low	Mod	NO	NO	NO	NO
A St Substation	1616 A St	Port Angeles	Electric System	60%	C	Mod	Low	Mod	NO	NO	NO	NO

Table 3-3 Port Angeles Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami	Floods	WUIF	Landslides
College Substation	1306 E Park	Port Angeles	Electric System	60%	C	Mod	Low	High	NO	NO	NO	NO
F St Substation	1604 F St	Port Angeles	Electric System	80%	C	Mod	Low	High	NO	NO	NO	NO
7th St Substation	1538 W 7th St	Port Angeles	Electric System	80%	C	Mod	Low	High	NO	NO	NO	NO
Laurel Substation	110 E 14th St	Port Angeles	Electric System	60%	C	Mod	Low	High	NO	NO	NO	NO
Washington Substation	224 S Washington St	Port Angeles	Electric System	60%	C	Mod	High	High	NO	NO	NO	NO
Valley Substation	206 S Valley St	Port Angeles	Electric System	80%	E	High	Very high	Very High	YES	NO	NO	NO
McKinley Paper	1902 Marine Dr	Port Angeles	Hazardous Materials Storage	80%	E	Very	Very	Very	YES	NO	NO	NO
Tesoro Fuel Facility	Ediz Hook Rd	Port Angeles	Hazardous Materials Storage	80%	E	Very	Very	Very	YES	NO	NO	NO

Table 3-3 Port Angeles Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami	Floods	WUIF	Landslides
Port of Port Angeles	Port	Port Angeles	Hazardous Materials Storage	80%	E	Very	Very	Very	YES	NO	NO	NO
Westport Shipyard	637 Marine View Dr	Port Angeles	Hazardous Materials Storage	80%	E	Very	Very	Very	YES	NO	NO	NO
Platypus Marine	102 N Cedar St	Port Angeles	Hazardous Materials Storage	80%	E	Very	Very	Very	YES	NO	NO	NO
Port Angeles Boat Haven	W Boat-haven Drive	Port Angeles	Hazardous Materials Storage	80%	E	Very	Very	Very	YES	NO	NO	NO
Port Angeles Coast Guard	1 Ediz Hook Rd	Port Angeles	Hazardous Materials Storage	80%	E	Very	Very	Very	YES	NO	NO	NO
Chevron	402 Marine Drive	Port Angeles	Hazardous Materials Storage	80%	E	Very	Very	Very	YES	NO	NO	NO
Texaco	210 E 1st St	Port Angeles	Hazardous Materials Storage	80%	E	Very	Very	Very	YES	NO	NO	NO
Masco Petroleum	516 Tumwater Truck Route	Port Angeles	Hazardous Materials Storage	80%	E	Very	Very	Very	YES	YES	YES	YES

Table 3-3 Port Angeles Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami	Floods	WUIF	Landslides
Pacific Pride	Tumwater Truck Route	Port Angeles	Hazardous Materials Storage	80%	E	Very	Very	Very	YES	YES	YES	YES
Ferrell gas	704 Marine View Drive	Port Angeles	Natural Gas	80%	E	High	Very	Very	YES	NO	NO	NO
Water Treatment Plant	3501 W 18th	Port Angeles	Water Systems	80%	C	High	Low	High	NO	NO	NO	NO
McDougal St Pump Station	3500 McDougal St	Port Angeles	Water Systems	80%	C	High	Low	High	NO	NO	NO	NO
Wastewater Treatment	1509 Columbia St	Port Angeles	Wastewater System	80%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Pumping Station 6	933 Church Ave	Port Angeles	Wastewater System	80%	C	High	High	High	NO	NO	NO	NO
KONP Radio (KONP FM 101.7)	721 East 1st St	Port Angeles	Communications System	80%	C/D	High	High	High	NO	NO	NO	NO
Clallam Transit	830 W Lauridsen Blvd	Port Angeles	Communications System	80%	C	High	High	High	NO	NO	NO	NO

Table 3-3 Port Angeles Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami	Floods	WUIF	Landslides
Clinicare	621 Front	Port Angeles	Medical Facility	80%	C/D	High	High	High	NO	NO	NO	NO
Port Angeles	102 E 5th St	Port Angeles	Fire Department	60%	C/D	High	High	High	NO	NO	NO	NO
Clallam County Courthouse	223 E 4th St	Port Angeles	Government Building	80%	C/D	High	High	High	NO	NO	NO	YES
Port Angeles Maintenance Facility	Lauridsen Blvd	Port Angeles	Government Building	80%	C/D	High	Low	High	NO	NO	NO	NO
Port of Port Angeles Office Building	1st St	Port Angeles	Government Building	80%	E	Very High	Very High	Very High	YES	YES	NO	NO
US Customs and Border Patrol	110 S Penn	Port Angeles	Shelter	80%	D/E	High	Low	High	NO	NO	NO	YES
Jessie Webster Park	609 E 3rd St	Port Angeles	Shelter	80%	D/E	High	Low	High				
Red Lion Inn	221 N Lincoln St	Port Angeles	Shelter	80%	D/E	Very High	Very High	Very High	YES	NO	NO	NO
Grocery, Safeway 101	110 E 3rd St	Port Angeles	Commercial	80%	C	High	High	High	NO	NO	NO	NO

Key:
EQ = Earthquake
PGA = Peak Ground Acceleration
WUIF = Wildland Urban Interface Fire

1

3.5 Land Use and Development Trends

FEMA	D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

The City of Port Angeles reviewed and updated their Comprehensive Plan in June of 2019 to comply with the periodic review requirement outlined in Washington State's Growth Management Act (City of Port Angeles 2019). The City has seen a 5% population growth since 2010, and the City's land use has reflected these changes as development expands.

Vulnerability changes have been measured by accounting for shifts in land use and public awareness since the adoption of the 2010 County HMP. Each measure has been identified as having an increased, decreased, or unchanged vulnerability. Table 3-4 provides a snapshot of how vulnerability has changed since development of the 2010 HMP.

Table 3-4 Vulnerability Changes Since 2010

Hazard	Status
Utility Failure	+
Disease	+
Earthquake & Tsunami	=
Winter Storm	+
Windstorm	+
Fire	+
Heat Events and Drought	+
Flooding	+/-
Landslide	=

Key:
+ Increased vulnerability
- Decreased vulnerability
+/- Increased vulnerability, but actions taken to decrease vulnerability
= Unchanged vulnerability

4 CAPABILITY ASSESSMENT

FEMA	C1. Does the plan document [the City of Port Angeles'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)]

4.1 Human and Technical Resources

Table 4-1 describes the City's human and technical capabilities to engage in and improve mitigation planning and program implementation.

Table 4-1 Human and Technical Resources Integrated with Hazard Mitigation

Resource	Department	Tasks and Activities Integrated into Mitigation Planning
Planning Manager	Department of Community & Economic Development (DCED)	Planners with knowledge of land development and land management practices
Planning Manager	DCED and Fire Marshal	Engineers or professionals trained in construction practices relate to buildings and/or infrastructure
Planning Manager	DCED	Planners or engineers with an understanding of natural and/or human-caused hazards
Fire Chief	Fire Department	Emergency Manager
Planning Manager	DCED	Floodplain Manager
GIS Analyst	Public Works	Personnel skilled in Geographic Information Systems (GIS)
Planning Manager	DCED	Resource development staff or grant writers
Public Works Director	Public Works	Ongoing participation in hazard mitigation planning process

4.2 Financial Resources

The City maintains many fiscal and financial resources to support its mitigation program. Table 4-2 identifies specific resources accessible for use.

Table 4-2 Accessible Financial Resources

Financial Resource	Accessible?
Community Development Block Grants	Yes
Capital Improvement Project Funding	Yes
Insurance	Yes
User fees for utility services	Yes
Incur debt	Yes
State-sponsored grant programs	Yes
Partnering arrangements/intergovernmental agreements	Yes

Table 4-3 identifies current and potential sources of funding to implement identified mitigation actions contained within the HMP.

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Federal		
Pre-Disaster Mitigation Program	Federal Emergency Management Agency (FEMA)	Provides funding to develop hazard mitigation plans (HMPs) and implement mitigation actions contained within.
Hazard Mitigation Grant Program	FEMA	Post-disaster funds to hazard reduction projects impacted by recent disasters.
Flood Mitigation Assistance Program	FEMA	Provides funds for flood mitigation on buildings that carry flood insurance and have been damaged by floods.
Community Development Block Grant Program	U.S. Department of Housing and Urban Development	Funds projects that benefit low- and moderate-income communities, prevent or eliminate slums or blight, or meet urgent community development needs posing a serious and immediate threat to community health or welfare.
Emergency Management Performance Grants Program	FEMA/Washington Department of Emergency Management	Provides funding to states for local or tribal planning, operations, acquisition of equipment, training, exercises, and construction and renovation projects.
Flood Mitigation Assistance	FEMA/Washington Department of Emergency Management	Provides funding to support development of the flood hazard portion of state and local mitigation plans and up to 100% of the cost of eligible mitigation activities. This funding is only available to communities participating in the National Flood Insurance Program (NFIP).
Earthquake State Assistance Program	National Earthquake Hazards Reduction Program Interagency Coordinating Committee	Funds activities including seismic mitigation plans; seismic safety inspections of critical structures and lifelines; updates of building codes, zoning codes, and ordinances; and earthquake awareness and education.
National Fire Plan	U.S. Forest Service	Provides funding opportunities for local wildland-urban interface planning, prevention, and mitigation projects, including fuels reduction work, education and prevention projects, community planning, and alternative uses of fuels.
Risk Mapping, Assessing, and Planning	FEMA	Provides funding and technical support for hazard studies, flood mapping products, risk assessment tools, mitigation and planning, and outreach and support.
Strategic Economic and Community Development Grant	U.S. Department of Agriculture	Provides funding in rural areas for multi-jurisdictional plan development and with a community development focus. Available only to rural areas outside of urbanized zone of any city with a population greater than 50,000.
Coastal Ecosystem Resiliency Program	National Oceanic and Atmospheric Administration	Provides funding for ecosystem restoration. Governor must approve project funds prior to award and there is a 2:1 cost-sharing ratio.
State		
Washington State Department of Transportation (WSDOT) Avalanche Forecasting and Control	WSDOT	Avalanche forecasting determines the potential risk along a particular mountain slope. When an avalanche hazard develops, WSDOT uses artillery, or explosives to trigger the avalanche. In addition to active avalanche control, WSDOT also uses passive control methods to control snow slides.

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Washington Sea Grant	Washington Sea Grant	Washington Sea Grant provides funding opportunities through State and National competitions, program development services, and sponsorships.
Ecology Water Resources Program	Washington Department of Ecology (DEC)	DEC's Water Resources Program provides support in monitoring water supply, managing water supply projects, overseeing water rights, performing streamflow restoration, protecting streamflow, regulating well construction and licensing, and ensuring dam safety.
WSDOT Seismic Retrofit Program	WSDOT	WSDOT provides funding and project support to retrofit bridges at risk of failure due to seismic events.
Washington State Department of Agriculture (WSDA) Livestock Inspection Program	WSDA	Dedicated to providing asset protection for the livestock industry by recording brands, licensing feedlots and public livestock markets by conducting surveillance and inspection of livestock at time of sale and upon out of state movement. The program is funded by fees paid by the livestock industry and receives no general fund dollars.
Washington Local Emergency Planning Committee Program	Washington Emergency Management Division (EMD)	WA EMD provides funding support to ensure Local Emergency Planning Committees (LEPCs) can be implemented across the state.
Washington Pipeline Safety Program	Washington Utilities and Transportation Commission	The commission is responsible for developing and enforcing safety standards for natural gas and hazardous liquid pipelines located within the state. The commission also inspects the portions of interstate natural gas and hazardous liquid pipelines located within Washington State; the standards and enforcement actions are the responsibility of the federal Pipeline and Hazardous Materials Safety Administration (PHMSA).
State Water Pollution Control Revolving Fund	Washington DEC	This program provides funds to local governments to set up low-interest loan programs to repair or replace failing on-site sewage systems. Property owners unable to qualify for conventional bank loans and marine waterfront property owners can use the program to get loans to fix or replace their systems where failures might directly affect Puget Sound. Both the Clean Water State Revolving Fund and the Centennial Clean Water Program.
Other		
Community Planning Assistance Teams	American Planners Association Foundation	Provides pro bono technical assistance for planning frameworks or community vision plans for communities needing extra assistance. Local governments are responsible for travel costs.
Thriving Resilient Communities	Threshold Foundation	Wide-ranging resiliency project funding.
Kresge Foundation Environmental Grants	Kresge Foundation	Provides funding for climate adaptation and mitigation, as well as sustainable water resources management.

4.3 Legal and Regulatory Resources

Table 4-4 describes the legal and regulatory capabilities, including plans, policies, and programs that have integrated hazard mitigation principles into their operations.

Table 4-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2010-2019)	Hazard Mitigated
Plans	County Comprehensive Emergency Management Plan	Outlines roles and responsibilities of government in mitigating potential hazards.	▪ Incorporation of partners into emergency planning into operations	All
	2016 – 2036 Comprehensive Plan	The City's Comprehensive Plan establishes Urban Growth Areas, natural resource lands, rural lands, and public lands.	▪ Completion of Housing Action Plan	All
	Harbor Resource Management Plan	Provides guidance by providing a coordinated plan for the future utilization of the Port Angeles Harbor.	▪ Approval of this plan provided a framework and baseline for the SMP	Flooding
	Port Angeles School District Hazard Mitigation Plan	The plan focuses on the hazards that pose the greatest threats to the District's facilities and people: Earthquake, flood, wildlife and urban interface fire and landslide.	▪ Plan development (2015) ▪ Issuance for public comment and adoption (2016)	Earthquake, flood, WUI fire, landslide
	Shoreline Master Program	Influences uses and future development in shoreline areas and ensures protection of waterfront habitat.	▪ Adoption of the plan on October 21, 2014	Flooding, Hazardous Materials
	2020-2025 Capital Facilities Plan & Transportation Improvement Plan	Identifies capital improvement projects to be undertaken by the City over the next five-year period.	▪ Inclusion of hazard mitigation and maintenance projects	All
	State of Washington Enhanced Hazard Mitigation Plan	Profiles hazards throughout the State, assesses risks, and outlines potential mitigation actions.	▪ Collaboration between State and County	All
Policies	Zoning Ordinance	Provides land use regulation in the unincorporated portions of the City.	▪ Current code through Ordinance 3619, passed February 19, 2019	All
	Subdivision Ordinance	Incorporated into zoning ordinance, establishes regulations around subdivision of properties.	▪ Current code through Ordinance 3619, passed February 19, 2019	All

Table 4-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2010-2019)	Hazard Mitigated
	Flood Damage Prevention Ordinance	The City floodplain management ordinance incorporated into the Critical Areas ordinance is designed to protect and conserve the environmental attributes of the City and add to the quality of life for residents.	▪ Defines areas of special flood hazard ▪ Requirements for development within an area of special flood hazard	Flooding
	Critical and Environmentally Sensitive Areas Protection	Define and protect critical areas as required by the Growth Management Act.	Defines areas of geological hazard that are of special concern to the City.	Landslide, Earthquake, Flooding
	National Flood Insurance Program (NFIP)	NFIP aims to reduce the impact of flooding on private and public structures.	▪ All participating jurisdictions currently participating in NFIP	Flooding
	Building Codes	Building permits are issued by the Department of Community and Economic Development and aligned with ICC 2015 building codes.	▪ Adoption of 2015 ICC codes	All

4.4 Continuity of Operations Planning

The City has recognized a need for a Continuity of Operations Plan (COOP). In the City of Port Angeles 2018 Community Work Plan, an objective for developing a COOP is identified.

4.5 Coordination with Community Partners

The City works alongside their community partners to address issues pertaining to emergency management and hazard mitigation. Many of these community partners participated in the HMP update process and collaborate with the City on an ongoing basis.

- **Education**
  - Port Angeles School District
  - Peninsula College
- **Business and Industry**
  - Local Chambers of Commerce
- **Healthcare**
  - Olympic Medical Center
- **Utilities**
  - City of Port Angeles
- **Transportation**
  - Port of Port Angeles
  - Washington Department of Transportation

- Clallam Transit

4.6 Integration of Mitigation into Existing Planning Mechanisms

Integration of the principles of mitigation into the City's daily operations and ongoing planning activities is a priority of the City's mitigation program. These activities will support:

- Raising awareness of the importance of hazard mitigation for the whole community;
- Facilitating an understanding that hazard mitigation is not just an 'emergency services' function and building ownership of mitigation activities across the organization; and
- Maximizing planning resources through linked or integrated planning efforts.

The City is encouraged to consider integration actions into planning mechanisms including:

- Budget decision-making;
- Building and zoning ordinances and decision-making;
- Emergency planning mechanisms; and
- Economic developing planning and decision-making.

4.6.1 Existing Plans

FEMA	C6. Does the Plan describe a process by which the local government will incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(iii))

The following existing plans provide ongoing opportunity for integration of hazard mitigation and the City will work with plan owners and stakeholders to consider hazard mitigation data and principles when these plans are updated. Table 4-5 contains a summary of the County's existing plans and how each incorporates the hazard mitigation planning.

Table 4-5 Summary of Clallam County Plans

County Plan	Hazard Mitigation Components
Comprehensive Emergency Management Plan (2016)	Outlines hazard mitigation roles and responsibilities.
Continuity of Operations Plan	In development through County
Comprehensive Land Use Plan	Identifies designated land uses and areas of economic and environmental value.
Floodplain Management Plan	Outlines strategies that directly or indirectly mitigate the risks posed by flood hazards.
Capital Improvements Plan	Identifies large capital projects to reduce risks to key County infrastructure.
Historic Preservation Plan (a component of Critical Areas)	Identifies areas of cultural value that may be vulnerable to hazards.

5 MITIGATION STRATEGY

FEMA	C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for the [City of Port Angeles] being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))

5.1 Review of 2010 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2010 plan were evaluated to determine what the status of the action was and whether any ongoing or incomplete actions should be included as actions in the 2019 plan update. The MPT worked through each previous action during MPT Meeting #1 to document steps taken to fulfill the action.

See Table 5-1 for an overview of the status of all actions from the 2010 plan update.

Table 5-1 Status of 2010 Mitigation Actions

Action No.	Mitigation Action	Action Status	Timeline	Lead Department	Priority
1	Tumwater Street Bridge Approach Improvement	2010 Action - Ongoing	1-5 Years	Public Works Department	High
2	Nippon Log-pond Bridge	Complete	10-15 Years	Public Works and Engineering	High
3	Upgrade Backup Power to City Hall	Complete	1-5 Years	Public Works Utility, Information Services	High
4	Install Backup Power for City Corp Yard	2010 Action - Ongoing	1-5 Years	Public Works Department	High
5	Install Backup Power for Light Operations Facility	2010 Action - Ongoing	1-3 Years	Public Works Department	High
6	Upgrade Transformer at A-Street Substation for backup to Valley Substation	Complete	1-5 Years	Public Works Department	High
7	Install Second Electric Utility Supply to Olympic Medical Center	Complete	1-5 Years	Public Works Department	High
8	Install Second Electric Utility Supply to Fairchild Airport Terminal	2010 Action – No Longer Required	1-5 Years	Public Works Department	High
9	Protect/Reinforce Sole Source Water Main from Elwha River against slide failure	2010 Action - Ongoing	1-3 Years	Public Works Department	High

Table 5-1 Status of 2010 Mitigation Actions

Action No.	Mitigation Action	Action Status	Timeline	Lead Department	Priority
10	Protect/Reinforce Sole Source Water Main from City to Eastern Customers and to PUD's Roundtree Reservoir	2010 Action - Ongoing	1-3 Years	Public Works Department	High
11	Sewer Pump Station Power Upgrades	2010 Action - Ongoing	1-3 Years	Public Works Department	High
12	Peabody Heights Reservoir Earthen Dam Reinforcement	2010 Action - Ongoing	1-3 Years	Public Works Department	Medium
13	Update Flood Assessment	2010 Action - Ongoing	1-5 Years	Community & Economic Development Department	Medium
14	Fiber Optic Network Upgrade	2010 Action - Ongoing	1-5 Years	Public Works Department	Medium
15	Upgrade to Shorelines	2010 Action - Ongoing	1-5 Years	Community & Economic Development Department/Public Works Department	Medium
16	Underground Power to Ediz Hook and USCG	2010 Action – Not Feasible, Cancelled	1-5 Years	Public Works Department	Low
17	Adopt the Hazard Mitigation Plan	Completed – Re-adopting updated 2019 HMP	1 Year	Department of Community Development, City Council	High

5.2 Identification and Analysis of New Mitigation Actions

In order to achieve the mitigation goals identified above, the City has identified a comprehensive series of mitigation objectives and supporting actions that are focused on reducing vulnerability and maximizing loss reduction. The actions can typically be broken out into the following types of activities, which are indicated in Table 5-2.

Table 5-2 2019 Mitigation Actions by Group

Mitigation Group	Related Mitigation Actions
Plans and Regulations	PA05, PA06
Infrastructure/Capital Project	CC02, PA01, PA02, PA03, PA04, PA07, PA08, PA09, PA10

Mitigation Group	Related Mitigation Actions
Natural System Protection	PA06
Education and Awareness	
Preparedness and Response	CC02

All mitigation actions identified in the plan are addressed in the mitigation implementation plan provided in Section 5.3. The actions include both interim- and long-term strategies for reducing vulnerability to hazard and are characterized as such in the 'life of action' column of the implementation plan.

5.2.1 2019 Mitigation Actions by Hazard

All mitigation actions identified in the plan address at least one priority hazard outlined in Chapter 4 of the HMP. Table 5-3 indicates which mitigation actions address which hazards.

Table 5-3 2019 Mitigation Actions by Hazard

Hazard	Related Mitigation Actions
All Hazards	CC02, PA04, PA08, PA09, PA10
Drought & Heat Events	
Earthquakes	PA03, PA07
Disease	
Fires	
Flooding	PA01, PA02, PA05, PA06
Landslides	PA01
Winter Storm	PA06
Utility Failure	PA01, PA02, PA04, PA08, PA09, PA10
Windstorms	

A complete mitigation implementation plan is provided in Table 5-4.

5.3 2019-2025 Mitigation Implementation Plan

FEMA	C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by [the City of Port Angeles]? (Requirement §201.6(c)(3)(iii))

The mitigation implementation plan lays the groundwork for how the mitigation plan will be incorporated into existing planning mechanisms and how the mitigation actions will be prioritized, implemented, and administered by the City. The implementation plan includes both short-term strategies that focus on planning and assessment activities, and long-term strategies that will result in ongoing capability or structural projects to reduce vulnerability to hazards.

See Appendix D for Mitigation Action Worksheet instructions and completed Mitigation Action Worksheets for each 2019 action listed in Table 5-4.

Table 5-4 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
City of Port Angeles													
CC02	Move EOC from seismically unstable area to new location	Ongoing	2,3,6	EMD, PA Fire Department, City Parks, Port of PA	1-3 years	$6 to 8 million approximately	In development	FEMA, Community Fund-matching	All hazards	20	10	30	(1)
PA01	Protect/Reinforce Sole Source Water Main from Elwha River against slide failure	2010 Action - Ongoing	4	Public Works	1-3 years	$250,000	Yes	FEMA, CFP	Flooding, Utility Failure, Landslide	18	6	24	4
PA02	Protect/Reinforce Sole Source Water Main from City to Eastern Customers and to PUD's Roundtree Reservoir	2010 Action – Ongoing	4	Public Works	1-3 years	$400,000	Yes	FEMA, CFP	Flooding, Utility Failure, Landslide	18	6	24	5
PA03	Peabody Heights Reservoir Earthen Dam Reinforcement	2010 Action – Ongoing	4,5	Public Works	1-3 years	$175,000	Yes	FEMA, CFP	Earthquake	13	10	23	7
PA04	Sewer Pump Station Power Upgrades	2010 Action – Ongoing	4	Public Works Wastewater	1-3 years	$165,000	Yes	FEMA, CFP	All hazards/Utility Failure	18	6	24	6
PA05	Update Flood Assessment	2010 Action – Ongoing	5	Community & Economic Development Department	1-5 years	UNK	Yes	FEMA/Ecology	Flooding	17	6	23	8
PA06	Upgrade to Shorelines	2010 Action – Ongoing	5	Community & Economic Development Department/Public Works and Utilities	1-5 years	$150,000	Yes	FEMA/Department of Natural Resources/Grants/ Private funding	Flooding, winter storms	15	6	21	10
PA07	Tumwater Street Bridge Approach Improvement	2010 Action - Ongoing	1,5	Public Works	1-5 years	$223,000	Yes	FEMA/ Department of Transportation	Earthquake	20	10	30	1
PA08	Install Backup Power for City Corp Yard	2010 Action – Ongoing	3,4	Public Works Utilities	1-5 years	$150,000	Yes	FEMA, CFP	All hazards, utility failure	19	6	25	2
PA09	Install Backup Power for Light Operations Facility	2010 Action – Ongoing	3,4	Public Works Electric Utility	1-3 years	$150,000	Yes	FEMA, CFP	All hazards, utility failure	19	6	25	3
PA10	Fiber Optic Network Upgrade	2010 Action – Ongoing	3	Public Works Utilities	1-5 years	$315,000	Yes	FEMA, National Telecommunications	All hazards, utility failure	19	4	23	9

Table 5-4 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
								and Information Administration Grant					
Adopt the Hazard Mitigation Plan (HMP)	Adopt the HMP	Completed – Re-adopting updated 2019 HMP		Department of Community Development, City Council	1 year	N/A	Yes	N/A	All hazards				

Key:
STAPLEE - Strategy and Prioritization Methodology

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City of Sequim Jurisdiction-Specific Annex – Clallam County Hazard Mitigation Plan

SEQUIM
WASHINGTON

DRAFT – 2019 Plan Update

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

Tables

Figures

1 INTRODUCTION

1.1 City of Sequim Hazard Mitigation Program

Throughout the hazard mitigation planning process, the following representatives from the City of Sequim (referred to herein as 'City' or 'Sequim') were present at one or more Mitigation Planning Team (MPT) meetings:

- Sheri Crain, Chief of Police
- David Garlington, Public Works Director
- Ann Soule, Resource Manager
- Peter Tjemsland, Utilities Manager

A public meeting was held in Sequim on July 17, 2019.

The City of Sequim participated in the 2010 Clallam County Multi-Jurisdictional Hazard Mitigation Plan (HMP).

See Appendix E for the completed Federal Emergency Management Agency (FEMA) Local Plan Mitigation Review Tool for the City of Sequim.

2 COMMUNITY PROFILE

2.1 Governance

The City of Sequim was incorporated in 1913. In 1995, the city residents voted to adopt the council-manager form of government. The City Council is comprised of elected officials who serve as the governing body. The city manager is appointed by the City Council and is responsible for directing staff in the accomplishment of the City Council goals and the efficient and effective operation of city government (City of Sequim 2019a).

The City departments are as follows:

- Administrative Services
- Boards, Commissions & Committees
- City Clerk
- City Council
- City Manager
- Communications & Marketing
- Community Development
- Human Resources
- Legal Department
- Police
- Public Works

2.2 Geography and Climate

Sequim is located in the leeward side of the Olympic Mountains, which is also known as a "rainshadow." As a result, metrological conditions in Sequim are relatively mild year-round, with dramatically less precipitation than interior Clallam County, or in areas along the western coast of the Olympic Peninsula. The average precipitation and temperature trends over the time period from 1980 to 2016 are displayed in the Table 2-1.

Table 2-1 Average Precipitation and Temperature Trends (1980-2016)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Max. Temp. (F°)	46.6	48.4	51.9	55.8	61.1	65.3	69.7	70.4	66	58	50.6	45.8	57.5
Avg. Min. Temp. (F°)	31.4	31.3	33.8	36.8	42.6	47.5	50.1	49.5	44.7	38.7	34	30.9	39.3
Avg. Total Precip. (inches)	2.11	1.26	1.35	1.08	1.29	0.98	0.56	0.58	0.78	1.4	2.73	2.09	16.21
Avg. Total Snowfall (inches)	0.2	0.3	0.2	0	0	0	0	0	0	0	0	0.9	1.5

Source: WRCC 2016.

2.3 Population and Demographics

As of 2018, the U.S. Census estimated population for Sequim was 7,481 individuals, which is a 13.4% increase from 2010 (U.S. Census Bureau 2018). Data from the 2017 American Community Survey (ACS)

five-year estimates indicate that 5.2% of the City's population is younger than 5 years of age and 16.3% of the City's population is younger than 18 years of age. Approximately 40.2% of the City's population is 65 years of age and older (U.S. Census Bureau 2018).

According to the ACS, 1.7% of the City's population is black or African American alone; 1.0% of the City's population is American Indian or Alaska Native alone; 3.3% of the City's population is Asian alone; and 8.9% is Hispanic or Latinx. Approximately 85.4% of the City's population is white alone and 3.7% is two or more races (U.S. Census Bureau 2018).

In 2017, an estimated 14.4% of the City's population lived in poverty and the median population income was $38,485. An estimated 15.6% of the population under age 65 live with a disability.

2.4 Economy

The following is excerpted from the City of Sequim 2015 – 2035 Comprehensive Plan:

> "One of the City's biggest strengths is its location along State Route 101 which is a primary means of access to the Olympic National Park and to Victoria, British Columbia. Annually, approximately 1,000,000 visitors drive north-bound through Sequim to visit the variety of Olympic National Park sites or to embark on the M/V Coho in Port Angeles to travel to Victoria. In the summer, high numbers of tourists drive to Sequim to partake in Lavender and agro-tourism related activities, including but not limited to the Sequim Lavender Weekend. In addition to its adjacency to tourist destinations, Sequim itself has a beautiful setting and quaint downtown which appeals to tourists as a side trip or a base from which they enjoy recreation in the surrounding areas." (City of Sequim 2018)

2.5 Land Use and Ownership

The following is excerpted from Chapter 3 of the City of Sequim's 2015 – 2035 Comprehensive Plan:

> "Over 100 years ago, before Sequim was officially a city, a traditional urban pattern of development was already emerging. As the community grew from setting the first travel paths and property lines over the next half-century, the urban form followed the invisible lines of township, range and section – the intersection of Washington Street and Sequim Avenue is the exact corners of quarter-sections. Subdivision of land maintained the formality of the geographic grid with north-south streets following lines of longitude and east-west streets running parallel to latitude.
>
> Since 1980, Sequim has grown as a 'community of subdivisions' rather than a community of neighborhoods. None of the residential subdivisions in the past 35 years has followed the design principles that create real neighborhoods: new developments lack the features that promote safe walking, they have insufficient points of connection to adjacent districts, and they hinder emergency access and multi-modal circulation by limiting route options. Some of these "modern" subdivisions are created on terrain that is not easily developed as a grid – streets are windy, cul-de-sacs are common, and blocks

are long – but even most of these are deliberately designed not to connect to the next subdivision." (City of Sequim 2018)

2.6 Transportation and Commuting

While the City's population stands at 7,481, the population of the surrounding area is approximately 28,000. In addition, the Sequim School District serves a population of approximately 26,000 residents. The presence of so many residents near the City places greater demands on services and industries than may be expected for a similarly sized city.

US-101 is the main transportation corridor through Sequim. Clallam Transit provides public bus service throughout Clallam County, including service to and from the Bainbridge Island ferry terminal with a stop in Sequim (City of Sequim 2019b).

Sequim is also accessible by private airplane through the Sequim Valley Airport with a 3500-foot runway and fueling station. The John Wayne Marina, operated by the Port of Port Angeles, is located on the western shore of Sequim Bay. It is a full-service marina with a restaurant and 22 transient slips

Figure 2-1 City of Sequim

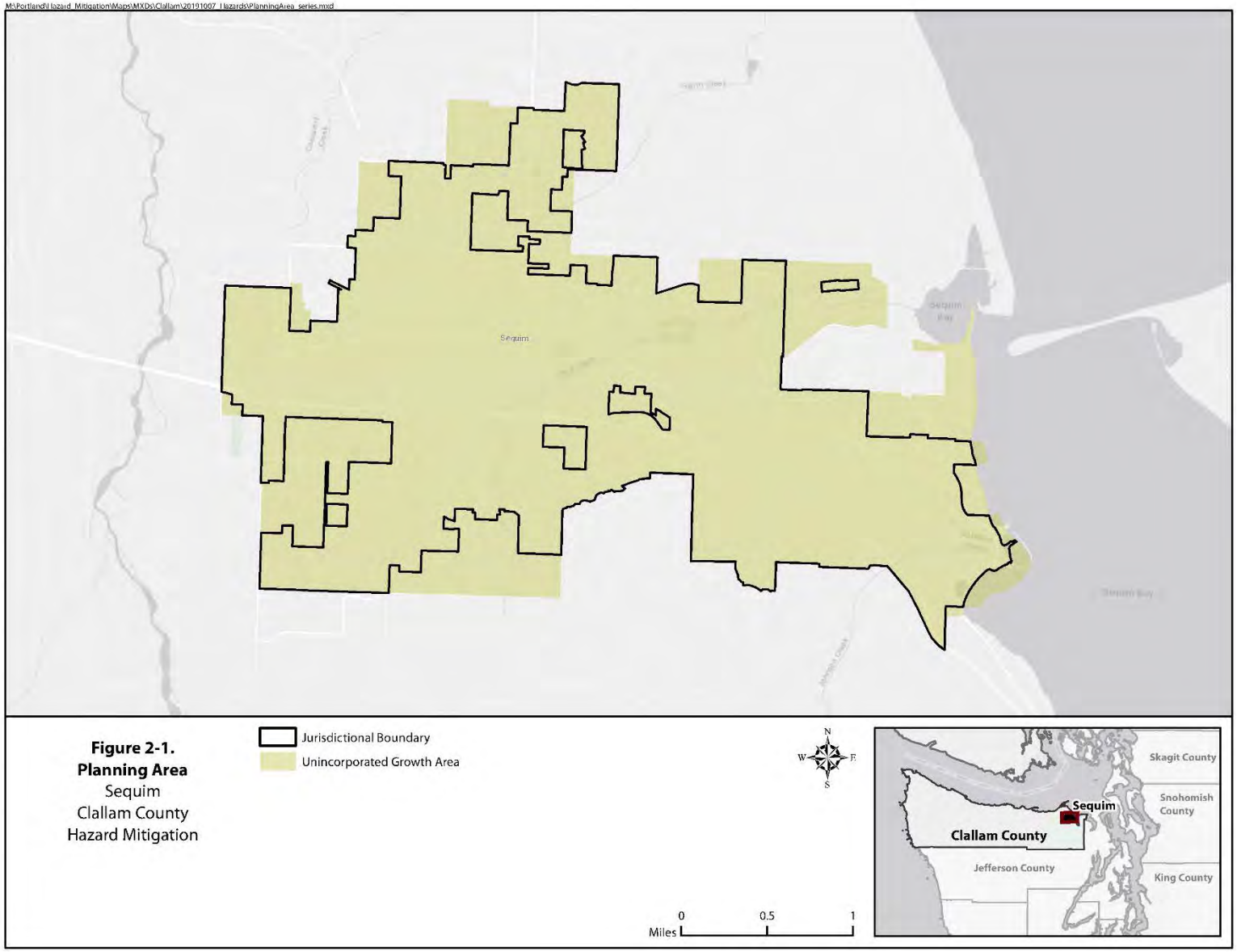

Figure 2-1.
Planning Area
Sequim
Clallam County
Hazard Mitigation

3 HAZARD PROFILES AND VULNERABILITY ASSESSMENTS

Chapter 3 contains hazard profiles and vulnerability assessments to determine the potential impact of hazards to the people, economy, and built and natural environments of the City of Sequim. They have been streamlined to increase the effectiveness and usability of the HMP.

FEMA	B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect [the City of Sequim]? (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 [the City of Sequim]? (Requirement §201.6(c)(2)(i)) B3. Does the plan include a description of each identified hazard's impact as well as an overall summary of the vulnerability of the planning area? [44 CFR § 201.6(c)(2)(ii)]

3.1 General

Clallam County has encountered several major disaster declarations that have affected the City Sequim. In total, the County has experienced 21 disaster declarations since 1953. Table 3-1 identifies the disaster declarations since 2010:

Table 3-1 Disaster Declarations (2010 to Present)

Disaster ID	Date of Declaration	Disaster Type	Incident Period
DR-1956	05-Mar-12	Severe Winter Storms, Flooding, Landslides, and Mudslides	14-Jan-12 to 23-Jan-12
DR-4242	15-Oct-15	Severe Windstorm	29-Aug-15
DR-4249	1-Jan-16	Severe Storms, Straight-line Winds, Flooding, Landslides, and Mudslides	12-Nov-15 to 21-Nov-15
DR-4253	2-Feb-16	Severe Winter Storm, Straight-line Winds, Flooding, Landslides, Mudslides, and a Tornado	1-Dec-15 to 14-Dec-15
DR-4418	4-Mar-19	Severe Winter Storms, Straight-line Winds, Flooding, Landslides, Mudslides, Tornado	10-Dec-18 to 24-Dec-18

Source: FEMA, Washington Disaster History, Major Disaster Declarations (https://www.fema.gov/data-visualization-disaster-declarations-states-and-counties)

The hazard profiles and vulnerability assessments contained in this chapter represent a considerable amount of work performed by the MPT. MPT members ranked hazards using several key considerations, followed up by activities to validate hazard analysis results and identify specific areas of risk. Table 3-2 displays the hazards that MPT selected for further assessment.

Table 3-2 Hazards Addressed in Plan

Hazard Type	Hazard Name
Natural Hazards	Cascadia Earthquake Power Outages

Table 3-2 Hazards Addressed in Plan

Hazard Type	Hazard Name
	Wildfire and Wildfire Smoke Heat Events and Drought Windstorm Flooding Landslide
Human-Caused Hazards	Hazardous Material Incident Active Shooter

3.2 Hazard Ranking Methodology

The hazards identified in the HMP were initially ranked based on MPT feedback during MPT Meeting #1 and #2.

Following the individual hazard ranking activity, the results were added up and aggregated to show an average score for Sequim-area-based MPT members and are available in Figure 3-1. These rankings are relative to enable general prioritization of hazards.

Figure 3-1 Sequim-Area Hazard Rankings

City of Sequim - Local Hazard Rankings

	Magnitude (1=lowest, 5=highest)	*Onset (1=slowest, 5=fastest)*	*Duration (1=shortest, 5=longest)*	*Frequency (1=lowest, 5=highest)*	*Average*	*Rank*
Cascadia Earthquake	5	5	3	1	3.5	1
Earthquake	4	5	3	1.5	3.375	2
Active Shooter	2.5	5	2.5	3	3.25	3
Power Outages	2	3.5	3	4	3.125	4
Wildfire Smoke	2	3	3	4	3	5
Heat Events	2	3	3	4	3	5
Windstorm	2	3	2.5	3.5	2.75	7
Wildfire	2	3	3	2.5	2.625	8
Hazardous Materials Accident	1.5	5	2	2	2.625	8
Flooding	1.5	3	2	3	2.375	10
Winter Storm	1.5	2.5	2.5	3	2.375	10
Tsunami	1.5	4.5	2	1.5	2.375	10
Disease	2.5	2	3	1.5	2.25	13
Landslide	1	2.5	2.5	2	2	14
Drought	1	2	3	2	2	14
Storm Surges/Tides	1	1	2	4	2	14

3.3 Hazard-Specific Profiles and Risk Assessments

The following section profiles each hazard identified in Section 3.2 and assesses the risk associated with each. Each risk assessment considers the following attributes:

- **Location:** An indication of geographic areas that are most likely to experience the hazard.
- **Past Occurrences/History:** Like location, a chronological highlight of recent occurrences of the hazard accompanied by an extent or damage cost, if available.
- **Extent/Probability:** A description of the potential magnitude of the hazard, accompanied by the likelihood of the hazard occurring (or a timeframe of recurrence, if available).
- **Vulnerability:** A description of the potential magnitude of losses associated with the hazard. Vulnerability may be expressed in quantitative or qualitative values depending upon available data. Identifies development trends' impact on the City's vulnerability to each hazard since the 2010 plan development (increased, decreased, unchanged).

Note: Hazard Descriptions, Potential Impacts from Future Climate Conditions, and Cascading Impacts can be found in Chapter 4 of the HMP Basic Plan, as these are not jurisdiction specific.

In addition, the hazards have been organized into three categories (high-, medium-, and low-priority) to illustrate the risk-driven nature of the HMP. Each hazard has been given serious consideration of all attributes discussed within. However, low-priority hazards may be shorter in length and with less quantitative analyses, as a lack of usable data is frequently present when considering low-likelihood or low-magnitude events. The three sub-sections are as follows:

- **High-Priority:** Cascadia Earthquake, Earthquake, Active Shooter, Power Outages, Wildfire Smoke, Heat Events.
- **Medium-Priority:** Windstorm, Wildfire, Hazardous Materials Accident, Flooding, Winter Storm, Tsunami, Disease.
- **Low-Priority:** Landslide, Drought.

For this jurisdictional annex, several of these hazards have been grouped to streamline the hazard profiles. For a complete overview of the County-wide hazards that may also impact the City of Sequim, refer to the Base Plan.

3.3.1 Earthquake

Earthquake

	Magnitude	Onset	Duration	Frequency	Average	Rank
Cascadia Earthquake	5	5	3	1	3.5	1
Earthquake	4	5	3	1.5	3.375	2
Tsunami	1.5	4.5	2	1.5	2.375	10

Location

The Cascadia Subduction Zone (CSZ) poses a great risk to all coastal communities along its length. Earthquakes have the potential to damage critical infrastructure, such as bridges and roads, cutting off county and tribal communities from outside aid in the aftermath of an event and forming isolated "micro-islands." Other active faults, such as the Seattle fault and the Southern Whidbey Island fault, zone cross under major cities and pose a significant hazard (DNR 2019).

The Sequim fault is an exposed fault that is less than 15,000 years old and runs east-west along Sequim's Happy Valley Road. Radiocarbon dating of charcoal fragments from the area suggests a possible earlier surface-faulting earthquake less than 5,000 years ago. The Sequim fault may be an extension of the Lake Creek Fault, which runs east-west in the vicinity of Port Angeles.

See Section 4.5.11 of the HMP for the localities at risk for tsunami. The John Wayne Marina and private land along the bluffs are two areas that are of particular concern for the City of Sequim.

Liquefaction typically occurs in areas with artificial fill or of loose sandy soils that are saturated with water (e.g., low-lying coastal areas, lakeshores, and river valleys). Areas that contain soils with high risk of liquefaction include (but are not limited to) the coastal Port Angeles; and much of the City of Sequim and the Sequim area (DNR 2004).

Previous Occurrence/History

The most recent earthquake that affected Clallam County was the 2001 Nisqually Earthquake. Small earthquakes occur regularly throughout the region and go unnoticed by residents. Over the last 135 years, there have been nine earthquakes with a magnitude (M) greater than 6.0 in the area that we consider the Northwest. Five of those large quakes (including the Nisqually earthquake) directly impacted the Olympic Peninsula, according to eyewitness accounts.

- 1700, CSZ Earthquake, M 9.0
- 1909, San Juan Island, M 6.0
- 1939, Vashon Island, M 6.1
- 1949, Olympia, M 7.1
- 1965, Seattle – Tacoma, M 6.5
- 2001, Nisqually, M 6.8

Extent and Probability

Earthquakes pose a widespread hazard throughout Clallam County, including Sequim. The cascading impacts of earthquakes, such as tsunami and liquefaction, are dependent on geography and soil type, as detailed above.

Earthquake

The CSZ has produced earthquakes measuring M 8.0 and above at least seven times in the past 3,500 years. The time intervals between these events has varied from 140 to 1,000 years, with the last event occurring just over 300 years ago.

There is evidence of two earthquakes on the Lake Creek Fault between 2,000 and 700 years ago. An earthquake of M 6.8 along the Lake Creek Fault would produce the greatest intensity shaking in the vicinity of Port Angeles and Sequim.

Future Probability Trend – Future weather and development trends play no known role in the probability of future earthquake events. However, both may play a role in the magnitude of earthquake impacts.

Vulnerability

Vulnerability posed by earthquakes to the Sequim area is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.4 of the HMP Basic Plan, the following infrastructure types are at high to very high risk from earthquake impacts (Buck 2016):

- Commercial facilities (6 properties)
- Communications Systems (1 property)
- Electric Systems (10 properties)
- Fire Departments (7 properties)
- Government Buildings (4 properties)
- Hazardous Materials Storage (1 property)
- Medical Facilities (3 properties)
- Natural Gas Facilities (2 properties)
- Schools (7 properties)
- Shelters (37 properties)
- Wastewater Systems (5 properties)
- Water Systems (21 properties)

The following infrastructure types are at high to very high risk from liquefaction:

- Commercial Facilities (6 properties)
- Communication Systems (1 property)
- Electric Systems (11 properties)
- Fire Department (5 properties)
- Government Buildings (4 properties)
- Hazardous Materials Storage (1 property)
- Medical Facilities (3 properties)
- Natural Gas Facilities (2 properties)
- Schools (7 properties)
- Shelters (37 properties)
- Wastewater Systems (5 properties)
- Water Systems (10 properties)

These facilities are outlined in their entirety in Section 3.4.3 of this Annex.

Earthquake

Awareness of the City's vulnerability to earthquakes or tsunamis has increased with participation in regional drills and public outreach efforts. More structures are being designed to be resilient to tectonic activity. However, development has increased in areas that are vulnerable to an event along the Sequim fault. The Lake Creek Fault is also located near Sequim, which is a growing population center. Given these changes, the vulnerability of Sequim to earthquakes and tsunami is **unchanged**.

See Appendix B for full Risk Exposure Tables and Appendix C for additional maps.

3.3.2 Active Shooter

Active Shooter

Magnitude	Onset	Duration	Frequency
2.5	5	2.5	3

Average	Rank
3.25	3

Location

Any populated area can be impacted by active shooter incidents. These areas include, but are not limited to, shopping structures, clinics, schools, government offices and buildings, and housing.

Previous Occurrence/History

There have not been any recent active shooter events in the City of Sequim.

Extent and Probability

With no existing records of recent active shooter events directly impacting the City, it is difficult to estimate the extent or probability of its occurrence. Nonetheless, it can be deduced that an active shooter events would most likely impact government facilities and schools.

Future Probability Trend – Future weather conditions have no direct connections to active shooters. However, increased development and urbanization have the potential to **increase** the probability of a future active shooter event.

Vulnerability

No estimates are available to determine potential losses associated with active shooter events. However, we can assume that if an active shooter event were to be directed at the City, schools and government buildings would likely be a top target. Active shooters could have an impact on the community in the following ways: loss of human life, damage to buildings and structures, temporary displacement during the threat and/or investigation, stress on medical and security services, loss of hospitality business during the event, and an increased need for emergency services and funding.

Since the 2010 plan, there is more public awareness regarding how to respond in the event of an active shooter. School districts and police departments hold drills to practice response actions. The City's vulnerability to an active shooter event is **unchanged.**

3.3.3 Power Outages

Power Outages

Magnitude	Onset	Duration	Frequency
2	3.5	3	4

Average	Rank
3.125	4

Location

Numerous City properties are at risk of being affected by utility failures. Rural and populated areas alike are known to experience power outages during winter and windstorms that can last anywhere from several hours to several weeks. In addition, the Clallam County Public Utility District (PUD) operates extensive utility and information technology networks that could be at a risk to exposure of a hazard that could lead to a utility failure.

The Bonneville power line, operated by the PUD, is a major power source for the entire Olympic Peninsula.

Previous Occurrence/History

Historically, utility disruptions and failures have been caused by natural disasters and human-caused accidents but have not been recorded in a way that is publicly accessible. Numerous utility failures occur every year, most frequently in the form of electricity outages that may last as short as hours or as long as weeks.

Extent and Probability

It is difficult to predict the impacts of future utility failures, but they have the potential to impact all government and business operations and cause extensive economic losses among other impacts. Due to the sporadic nature of failures, it is also difficult to estimate how frequently such failures will occur or their duration. Various parts of the City generally deal with power outages multiple times per year with many of them only lasting a matter of hours. Every several years, a large utility failure is experienced.

Future Probability Trend – Based on potential increases in severe winter storms and increasing development trends resulting in greater demand, the City may be impacted by an **increase** in the probability of future utility failure. However, mitigation actions outlined in this HMP are designed to **decrease** such strain on utility systems.

Vulnerability

The Clallam PUD operates 15 electrical facilities within the Sequim area that are vulnerable to failure due to an array of hazards. These facilities are outlined further in Section 3.4.3 of this Annex. Additionally, there are 31 wastewater and general water systems that are also vulnerable to failure. Two natural gas facilities are also vulnerable to failure.

These facilities are primarily vulnerable to earthquakes and associated hazards (liquefaction and tsunami); however, several facilities are also vulnerable to wildland fires.

Since the 2010 County HMP, development in Sequim has expanded further into the Wildland-Urban Interface (WUI); therefore, the vulnerability to power outages has **increased**.

3.3.4 Wildfire

Wildfire & Wildfire Smoke

	Magnitude	Onset	Duration	Frequency	Average	Rank
Wildfire Smoke	2	3	3	4	3	5
Wildfire	2	3	3	2.5	2.625	8

Location

Wildland fire protection is provided by federal, state, county, city and private fire protection agencies and private timber companies. Factors affecting the risk of wildland fires include rainfall, type of vegetation, number of snags, amount of old growth timber, and proximity to firefighting agencies. Fire damage to watersheds will increase the vulnerability to flooding. City of Sequim water system includes a shallow gallery well under the Dungeness River which is vulnerable to sediment runoff in the upper watershed; if a wildfire occurred in the watershed, water supply would have to be shut down.

Wildfires within the broader region can cause air quality degradation that is particularly harmful to children and the elderly populations in the City of Sequim.

Previous Occurrence/History

Wildfire smoke from outside of Clallam County has disrupted public health and commerce as recent as 2017 and 2018.

Historically, the City of Sequim has not been directly at risk from a wildland fire, and so the previous occurrences are discussed below on a County-wide basis.

Previous wildland fires that have affected Clallam County include “The Great Forks Fire of 1951,” 1955 in the West Twin River area, and 2002 in the Clallam Bay area. The fires in 1951 began near Lake Crescent and burned into and around Forks. Approximately 30 buildings and between 33,000 and 38,000 acres of timber were lost. The 1955 fire burned approximately 5,000 acres of timber. The 2002 fire started as slash burnings on private land. In July 2004, a wildfire ignited near Joyce at Striped Peak, burning between three and four acres of private hillside land. Joyce experienced another wildfire in May 2006, when a controlled burn near the town grew into a five-acre wildfire. From January 2008 to August 2009, 38 different wildfire incidents have occurred within Clallam County, outside of Olympic National Park (Clallam County 2010).

Wildfire & Wildfire Smoke

Extent and Probability

A Headwaters Economics study found that Clallam County has more square miles of developed land within the WUI than any other county in Washington State (72 square miles) and the fifth most area in the WUI in the entire United States. The same study found that 13,271 homes were located within the WUI throughout the County (Headwaters Economics 2013).

Weather conditions greatly influence the impact and extent of wildfires. Drought, high temperatures, and wind contribute to a dynamic and changing conditions of wildfires. Fuel load and vegetation contribute to the size and intensity of wildfires.

Wildfires are frequent and inevitable. Within the region, many wildfires burn during the June to October time period.

Future Probability Trend – Based on expected decreases in annual snowpack and increases in the frequency and magnitude of drought and heat, the City may be impacted by an **increase** in the probability of future fires.

Vulnerability

As the population of the City continues to grow, development may extend further into the WUI, rendering the City more vulnerable to wildfires and wildfire smoke.

While the City has not been as vulnerable to WUI fire as other jurisdictions in Clallam County, increased encroachment of development into the WUI in recent years may result in greater vulnerability. Therefore, the City's vulnerability to wildfire has **increased** since the 2010 plan.

3.3.5 Heat Events and Drought

Heat Events & Drought

	Magnitude	Onset	Duration	Frequency	Average	Rank
Heat Events	2	3	3	4	3	5
Drought	1	2	3	2	2	14

Location

The City is located within the rainshadow of the Olympic Mountains and within the Dungeness Watershed.

The Dungeness Watershed is currently experiencing a "snowpack drought," which occurs when total precipitation may be near normal levels, but the snowpack in local mountains is significantly below normal.

Heat Events & Drought

Previous Occurrence/History

There has been one period of extreme drought within Clallam County over the last 17 years. During a two-month period in 2015, 100% of the County's area was marked by D3 to D4 droughts (the most intense forms of drought). Additionally, in 2001, 2003, 2006, 2009, 2014, 2017, and 2018, areas of the County experienced moderate to extreme drought. As of May 2019, a drought emergency was declared in the Elwha-Dungeness Watershed, which encompasses the entirety of the Sequim planning region.

Drought animations over time are available at: http://droughtmonitor.unl.edu/Maps/Animations.aspx (U.S. Drought Monitor 2019).

Extent and Probability

Northeast Clallam County, including the City of Sequim, which is located in the rainshadow of the Olympic Mountains, is the most vulnerable to the effects of drought.

Future Probability Trend – Based on continuing decreases in annual snowpack and increases in the frequency and magnitude of prolonged heat, the City will be impacted by an **increase** in the probability of future droughts.

Vulnerability

Drought impacts individuals (including farm owners, tenants, and farm laborers), the agricultural industry, and other agriculture-related sectors. Lack of snowpack has forced ski resorts into bankruptcy. Declining snowpack results in low snowmelt flows in local streams, affecting instream resources important to commerce as well as the ecosystem. There is increased danger of wildfires and the associated wildfire hazards.

Problems of domestic and municipal water supplies are historically corrected by building another reservoir, a larger pipeline, a new well, or some other facility. Future preparedness will depend on underground or reservoir water storage. Stormwater capture and filtration through green infrastructure is a proven method for improving water management and long-term resiliency of the aquifer system. Short-term measures, such as using large-capacity water tankers to supply domestic potable water, have also been used. Low stream flows have created high temperatures, oxygen depletion, disease, and lack of spawning areas for our fish resources. More frequent low stream flows result in declining recharge to the aquifer system that the population in eastern Clallam County depends on for drinking water.

The City's vulnerability to drought has **increased** since 2010, as the demand has grown, and historic water supply shifts due to climate change and increased development.

See Appendix C for maps.

3.3.6 Windstorm

Windstorm

Magnitude	Onset	Duration	Frequency
2	3	2.5	3.5

Average	Rank
2.75	7

Location
All City properties and structures can be affected by windstorms. Properties with infrastructures, utilities, and tree stands can have more damaging impacts during windstorms, especially in coastal areas where winds speeds can reach 40 to 60 miles per hour (mph) during the winter months.

Previous Occurrence/History

Recent windstorms occurring in Clallam County resulting in major damage include:

- 17 December 2018 – Clallam and East Jefferson Counties Windstorm
- 15-16 October 2016 – Typhoon Songda
- 1-14 December 2015 – Severe Winter Storm, winds, flooding, landslides, mudslides, and a tornado
- 12-21 November 2015 – Severe Storms, winds, flooding, landslides, and mudslides
- 29 August 2015 – Severe Windstorm
- 14 December 2006 – "Hanukkah Eve" Windstorm
- 20 January 1993 – "Inaugural Day" Storm

These windstorms have caused damage to County structures and housing; extensive utilities damage; restricted access to public lands; and required increased strain on the government's operations.

Extent and Probability

Coastal areas of Clallam County, including the outskirts of Sequim, experience higher winds than other areas. However, windstorms can occur anywhere throughout the County. Windstorms can damage buildings, structures, utilities, and tree stands, causing millions of dollars' worth of damage.

Future Probability Trend – Changing weather conditions are likely to lead to an increase in severe and extreme weather patterns, leading to an **increase** in the probability of a windstorm.

Vulnerability

The City's primary vulnerability from severe windstorms are power outages and impairment of transportation. Because nearly all social and economic activity is dependent on transportation, damage from windstorms can have a serious impact.

Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. More rural communities located in the foothills are particularly vulnerable to road outages and face longer delays in debris removal. Additionally, vehicle accidents rise among those who try to drive during windstorms (USDOT 2018).

Power outages can result from physical damage to electrical infrastructure as a result of downed trees and blown debris. Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe windstorms. Additionally, persons with electric-based health support systems are vulnerable to power outages everywhere.

Windstorm

Since the 2010 plan, the City's vulnerability to windstorms has **increased** as weather patterns change due to climate change, and as increased development has resulted in more infrastructure that can be exposed to damage during severe weather.

3.3.7 Hazardous Materials Accident

Hazardous Materials Accident

Magnitude	Onset	Duration	Frequency
1.5	5	2	2

Average	Rank
2.625	8

Location

Numerous fixed-location storage sites exist near City properties but have rarely caused an incident. Therefore, the City views the most likely hazardous materials incident to be caused by a traffic accident along US-101 or the railroad corridor.

The John Wayne Marina is an area of high commercial and public vessel traffic. Furthermore, the Strait of Juan de Fuca is a major thoroughfare for oil tankers.

Previous Occurrence/History

According to a review of PHMSA's hazardous materials incident reporting database, the following incidents have occurred in Sequim (PHMSA 2019):

- November 3, 2011, US-101, gasoline spill
- July 31, 2000, US-101, fuel oil spill
- July 11, 1990, US-101, sulfur dioxide spill
- February 24, 2981, no location (highway), ethyl alcohol spill
- December 13, 1975, no location (highway), ethyl alcohol spill

There were no fatalities associated with these incidents, but two of the incidents (2011, 1981) were serious bulk releases of material.

Extent and Probability

The uncontrolled release of hazardous materials during transport can result in death or injury to people and damage to property and the environment through the material's flammability, toxicity, corrosiveness, chemical instability, and/or combustibility. Individuals may be exposed to hazardous materials at acute or chronic levels. In the event of a marine oil spill, ecological systems could be damaged from the pollution and recreational activities subsequently limited.

Future Probability Trend – Increased development trends and potential increase in high-intensity precipitation events present the potential for an increase in hazardous materials passing through the area and traffic accidents, respectively. Each presents the potential for an **increase** in future hazardous materials incidents.

Hazardous Materials Accident

Vulnerability

The City's hazardous materials threats stem from facilities that include gas stations, marinas, propane storage sites, port facilities, and transportation thoroughfares. US-101, the John Wayne Marina, and the Pacific Northwest National Laboratory are areas of concern for the City of Sequim.

Since the 2010 plan, the City's vulnerability to hazardous materials incidents has **increased**.

See Appendix C for additional hazard maps.

3.3.8 Winter Storm

Winter Storm

Magnitude	Onset	Duration	Frequency	Average	Rank
1.5	1.5	2.5	3.00	2.735	7

Location
While much of the County can be affected by winter storms, the higher elevation and western coastal areas are exposed to the more damaging impacts of winter storms. Furthermore, many of the communities along the western coast of Clallam County are very remote and have limited road infrastructure that can quickly become compromised during a winter storm.

Previous Occurrence/History

Recent winter storms occurring in Clallam County resulting in major damage include (snowstorms listed below; see Section 3.3.6, Windstorms, for other types of winter weather):

- 9 February 2019 – North Olympic Peninsula severe winter weather
- 14 March 2014 – Sequim/Port Angeles Blizzard
- 27 December 1996 – Christmas Snowstorm

Extent and Probability

Severe freezes, when daily high temperatures remain below freezing for five or more days, occur on average every three to five years in Clallam County. Winter storm weather is common in the winter, but typically lasts a short time; ice storms (sleet and freezing rain) likewise are typically brief events.

Winter storms may be more extreme during La Niña weather years, such as the 1996 flooding associated with the 1996-1997 La Niña pattern.

Future Probability Trend – The impact of changing weather patterns may have an impact on the probability of future winter storm events. Based on potential decreases in annual snowpack and increases in the frequency and magnitude of drought and heat, it would seem the County may be impacted by a **decrease** in the probability of future winter storms. However, it is also possible that changing weather patterns could result in an increased likelihood of precipitation during sub-zero temperatures, resulting in an **increase** in the probability of winter storms.

Winter Storm

Vulnerability

The City's primary vulnerability from severe weather is from power outages and impairment of transportation. Because nearly all social and economic activity is dependent on transportation, snow can have a serious impact.

Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. Vehicle accidents rise among those who try to drive. Power outages can result from physical damage to electrical infrastructure as a result of ice or snow or increases in demand beyond the capacity of the electrical system.

Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe winter weather events. Persons who are older, are isolated or have disabilities may be more vulnerable, especially those that may be trapped in their homes from power failures, heavy snow and ice, and debris from falling trees and power lines. Power losses during winter storms have resulted in deaths from carbon monoxide poisoning if people attempt to keep warm by lighting charcoal fires or operating backup generators indoors.

Snowstorms also slow the local economy, but there is a debate about whether these slowdowns cause permanent revenue losses. Productivity and sales may decline but often accelerate after a storm. Some permanent effects may occur if some areas in the region are accessible and some are not.

For workers, snow can be a hardship, especially for those who lack benefits and vacation time. For local governments, responding to snowstorms can be a major unbudgeted expense. Some have even had to issue emergency bonds to cover snowstorm recovery costs.

Since the 2010 plan, the City vulnerability to winter storms has **increased** as weather patterns change due to climate change and as increased development has resulted in more infrastructure that can be exposed to damage during severe weather.

1

2

3.3.9 Flooding

Flooding

Magnitude	Onset	Duration	Frequency
1.5	3	2	3

Average	Rank
2.375	10

Location

The main flooding impacts for the City of Sequim originate when there is a major storm or when rapid snowmelt cannot infiltrate at a fast-enough rate. Additionally, irrigation ditches will impact the baseflow of major drainages. Levees protect many of the Sequim-area resources. For example, a levee protects the gravity-fed water supply for the City's Ranney well system (Clallam County 2009).

According to the City of Sequim Stormwater Management Needs Assessment (City of Sequim 2014), the following areas within City drainages are prone to repeat flooding:

- Bell Creek: where it flows south of downtown Sequim, E. Washington Street, N. Blake Avenue, and throughout Carrie Blake Park.
- West Happy Valley (a.k.a. West Fork Bell Creek): where it flows near Falcon and Silberhorn Roads, E. Cobblestone and US 101, and multiple locations in central Sequim when irrigation ditches carry high flows from storms.
- Highland Irrigation Main Channel

Previous Occurrence/History

Flood damages with the highest consequence, either related to the cost to repair or by the impact on human activities, were incurred during the 1979, 1990, 1996/1997, and 2008/2009 flood and severe storm events. Historically, the most damage to property are in the Lower Dungeness area.

Extent and Probability

Severe floods may result in serious injuries and fatalities as well as damage to public facilities and private property. Extent of flooding can be determined by the height of river flows in comparison to flood stages determined by U.S. Geological Survey stream gauges located throughout the area. It can also be measured by past damages of flooding.

Future Probability Trend – Based on potential increase in high-intensity precipitation events and increased development trends (resulting in additional impervious surfaces and stormwater runoff), the City may be impacted by an **increase** in the probability of future floods.

Vulnerability

Vulnerability posed by flooding to the City of Sequim is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of the Basic Plan, there are no critical infrastructure types that are vulnerable to flood hazards in the City of Sequim.

Flooding frequency and intensity is changing as the climate changes; however, the City is making more effort to manage floodplains and stormwater runoff through stormwater capture close to its source and infiltration via green infrastructure (City of Sequim 2016). Therefore, the vulnerability of Sequim to flood hazards is **unchanged** since 2010.

3.3.10 Landslide

Landslide

Magnitude	Onset	Duration	Frequency
1	2.5	2.5	2

Average	Rank
2	14

Location

The following are areas of concern for landslides in the Sequim area (FEMA 2013):

- Along major roadways, including US-101 and Route 122
- Olympic Discovery Trail
- Bluff area along West Sequim Bay Road, Johnson Creek, and Bell Creek
- Along Chicken Coop Road in Blyn

Previous Occurrence/History

Historically, the damages with the highest consequence, either related to the value of the repair or by the impact on human activities, include slides that have closed US-101 and slides in Port Angeles (one of which caused a fatality in 1998) (Clallam County 2010).

A landslide obstructed the Olympic Discovery Trail in 2014 (Peninsula Daily News 2014).

Extent and Probability

The following is excerpted from the hazard assessment conducted by Clallam County Emergency Management Division (EMD) as part of the 2016 Cascadia Rising Exercise:

> "It is very difficult to make quantitative predictions of the likelihood or the size of a future landslide event. An accurate understanding of the landslide hazard for a given facility requires a detailed landslide hazard evaluation by a geotechnical engineer. Such site-specific studies evaluate the slop, soil/rock and groundwater characteristics. Such assessments may require drilling to determine subsurface soil/rock characteristics. In some cases, landslide hazard assessments by more than one geotechnical engineer may reach confliction opinions." (Buck 2016)

Due to the geology and likelihood of landslide-triggering storms in Clallam County, the probability of future occurrence of landslides is high.

Future Probability Trend – Similarly to the entire County, due to expected increases in drought and wildfires, as well as presumed higher intensity precipitation events, the City may be impacted by an **increase** in the probability of future landslides. However, with Critical Areas ordinances, some of the hazard may be offset.

Landslide

Vulnerability

Vulnerability posed by flooding to the City of Sequim is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of the Basic Plan, there are no critical infrastructure that are at risk due to landslide.

Since the 2010, the City's vulnerability to landslides is **unchanged.** While there may be an increase in probability of a landslide occurring due to natural causes, the County and City have Critical Areas ordinances that regulate construction or tree removal in geologically hazardous areas, thereby offsetting the vulnerability.

3.4 Vulnerability Assessment

3.4.1 Identifying Critical Infrastructure and Asset Inventory

Critical infrastructure was identified for the City of Sequim following the methodology outlined in Chapter 4.6 of the Basic Plan.

Appendix B contains the complete vulnerability assessment and associated methodology.

3.4.2 Repetitive Loss Properties

As outlined in the Basic Plan, a single National Flood Insurance Program (NFIP)-identified repetitive loss structure is in the City of Sequim (Table 3-3).

Table 3-3 NFIP Severe Repetitive Loss Properties

FEMA ID	City	Occupancy	Flood Zone	Property Value	Building Value	Contents Value	Paid	Date of Payment	Date of First Loss
11317	SEQUIM	SINGLE FMLY	C	100000	101766.51	11820.28	113586.79	01/31/2018	02/04/1991

Source: FEMA Severe Repetitive Loss Properties, Compiled by the Houston Chronicle (2019). https://data.world/houstonchronicle/severe-repetitive-loss-properties-flood-games

3.4.3 Exposure Assessment

Table 3-4 contains a summary of the critical infrastructure associated with the Sequim area (Buck 2016). The vulnerability of each structure to earthquake, tsunami, flooding, WUI fires, and landslides is assessed.

Table 3-4 Sequim-Area Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 years - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami Hazard	Floods	WUIF	Landslides
Sequim Valley Airport	468 Dorothy Hunt Ln	Sequim	Airport	60%	D	Mod	Mod	Very High	NO	NO	NO	NO
Diamond Point Airstrip	Airport Way	Sequim	Airport	60%	C	Low/Mod	Low	Very High	NO	NO	NO	NO
PUD Main Office	104 Hooker Road, Carlsborg	Sequim	Electric System	60%	C	Mod	Mod	High	NO	NO	NO	NO
Carlsborg Warehouse	100 Hooker Rd, Carlsborg	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Carlsborg Operations Center, Engineering, crew, shop and storage	110 Idea Pl, Carlsborg	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Carlsborg Substation	112 Idea Pl, Carlsborg	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Carlsborg Utility Services	83 Idea Place, Carlsborg	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Blyn Substation	83 Zaccardo Rd	Sequim	Electric System	60%	C	Mod	Mod	High	NO	NO	YES	NO
Johnson Creek Substation	400 Washington Harbor Loop	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Sequim Substation	150 N. Govan Ave.	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Sunland Substation	1971 Sequim-Dungeness Way	Sequim	Electric System	60%	D	High	High	High	NO	NO	NO	NO
Prairie Power Substation	670 S 3rd Ave	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO

Table 3-4 Sequim-Area Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 years - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami Hazard	Floods	WUIF	Landslides
Evergreen Substation	9701 Old Olympic Hwy	Sequim	Electric System	60%	C	High	Very High	Very High	NO	NO	NO	NO
Dungeness Substation	761 Hogback Rd	Sequim	Electric System	60%	C	Mod	High	High	NO	NO	NO	NO
Olympic Substation	630 Carlsborg Rd	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
John Wayne Marina	2577 W Sequim Bay Rd	Sequim	Hazardous Materials Storage	60%	D	Very	Very	Very	Yes	NO	NO	NO
Longhouse Market & Deli	271020 US-101	Sequim	Hazardous Materials Storage	60%	D/E	Very	Very	Very	Yes	NO	NO	NO
Ferrell gas	646 3rd Ave South	Sequim	Natural Gas	60%	C/D	Very	Very	Very	NO	NO	NO	NO
Pioneer Propane	931 Carlsborg Rd.	Sequim	Natural Gas	60%	C/D	Very	Very	Very	NO	NO	NO	NO
Carlsborg Reservoir	110 Frost Rd	Sequim	Water Systems	60%	C/D	High	Very High	High	NO	NO	NO	NO
Carlsborg Well & Pump Station	315 Business Park Loop	Sequim	Water Systems	60%	C/D	High	Very High	High	NO	NO	NO	NO
Smithfield Dr Well & Pump Station	161 Smithfield Dr	Sequim	Water Systems	60%	C/D	High	Very High	High	NO	NO	NO	NO
Carlsborg Warehouse Facility	100 Hooker Rd	Sequim	Water Systems	60%	C/D	High	Very High	High	NO	NO	NO	NO
Loma Vista Well, Pump & Reservoir	100 Burnt Mountain Pl	Sequim	Water Systems	60%	60%	High	Low	High	NO	NO	NO	NO
Duxbury Reservoir & Pump Station	2294 S 7th Ave	Sequim	Water Systems	60%	60%	High	Low	High	NO	NO	NO	NO
Raven's Ridge Reservoir & Pump Station	8932 Raven's Ridge Rd	Sequim	Water Systems	60%	60%	High	Low	High	NO	NO	NO	NO
Stampede Dr Reservoir	1120 Stampede Dr	Sequim	Water Systems	60%	60%	High	Low	High	NO	NO	NO	NO

Table 3-4 Sequim-Area Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 years - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami Hazard	Floods	WUIF	Landslides
Haller Well	2510 Doe Run Rd	Sequim	Water Systems	60%	60%	High	Low	High	NO	NO	NO	NO
Holgerson Well & Pump Station	70 Coyote Meadow Rd	Sequim	Water Systems	60%	60%	High	Low	High	NO	NO	NO	NO
Ranney Well System	175 Kincaid Rd	Sequim	Water Systems	60%	D/E	High	High	High	NO	NO	NO	NO
Silberhorn Well Field	130 W Silberhorn	Sequim	Water Systems	60%	D/E	High	High	High	NO	NO	NO	NO
Port Williams Well Field	702 Port Williams Rd	Sequim	Water Systems	60%	D/E	High	High	High	NO	NO	NO	NO
Reservoir 1.7 MG Steel	553 Reservoir Rd	Sequim	Water Systems	60%	C	High	Low	High	NO	NO	NO	NO
Reservoir 250 KG Tank	553 Reservoir Rd	Sequim	Water Systems	60%	C	High	Low	High	NO	NO	NO	NO
Reservoir 500 KG Pond	553 Reservoir Rd	Sequim	Water Systems	60%	C	High	Low	High	NO	NO	NO	NO
Reservoir Rd Pump Station	553 Reservoir Rd	Sequim	Water Systems	60%	C	High	Low	High	NO	NO	NO	NO
5th & McCurdy Pump Station	803 S 5th	Sequim	Water Systems	60%	D/E	High	High	High	NO	NO	NO	NO
Solana Lower Pump Station	262 Simdars Rd	Sequim	Water Systems	60%	C	High	High	High	NO	NO	NO	NO
Solana Lower Pump Station	213 Tamerlane Loop	Sequim	Water Systems	60%	C	High	High	High	NO	NO	NO	NO
Water System	5433 Woodcock Rd	Sequim	Wastewater System	60%	D/E	High	Very High	Very high	NO	NO	NO	NO
Reclamation Facility	247 Schmuck Road	Sequim	Wastewater System	60%	D/E	High	Very High	Very high	NO	NO	NO	NO
Pumping Station 1	702 ½ Port Williams Road	Sequim	Wastewater System	60%	D/E	High	Very High	Very high	NO	NO	NO	NO
Pumping Station 2	480 DOE Run Road	Sequim	Wastewater System	60%	D/E	High	Very High	Very high	NO	NO	NO	NO

Table 3-4 Sequim-Area Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 years - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami Hazard	Floods	WUIF	Landslides
Pumping Station 3	East Lobelia Street	Sequim	Wastewater System	60%	D/E	High	Very High	Very high	NO	NO	NO	NO
Pumping Station 4	Jones Farm Road	Sequim	Wastewater System	60%	D/E	High	Very High	Very high	NO	NO	NO	NO
KSQM FM 91.5	609 W Washington St, Suite 17	Sequim	Communications System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Sequim Campus	#1500, 840 N 5th Ave	Sequim	Medical Facility	60%	C/D	High	High	High	NO	NO	NO	NO
Sequim Medical Plaza	777 N 5th Ave	Sequim	Medical Facility	60%	C/D	High	High	High	NO	NO	NO	NO
Olympic Medical Cancer Center	844 N 5th Ave	Sequim	Medical Facility	60%	C/D	High	High	High	NO	NO	NO	NO
Dungeness – Station 31	4721 Sequim Dungeness Way	Sequim	Fire Department	60%	F	High	Very High	Very High	YES	NO	NO	NO
R-Corner – Station 32	256702 Hwy 101	Sequim	Fire Department	60%	C	High	Low	High	NO	NO	NO	NO
Sequim – Station 34, HQ	323 N 5th Avenue	Sequim	Fire Department	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Carlsborg - Station 33 And Maintenance Facility	70 Carlsborg Rd	Sequim	Fire Department	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Diamond Point Station – Station 35	121 Sunshine Ave	Sequim	Fire Department	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Lost Mountain – Station 36	269160 Hwy 101	Sequim	Fire Department	60%	C	High	Low	High	NO	NO	YES	NO
Blyn Station – Station 37	Hwy 101	Sequim	Fire Department	60%	F	High	Very High	Very High	YES	NO	NO	NO
Grey Wolf School	171 Carlsborg Rd	Sequim	School	60%	D/E	Very	Very High	Very	NO	NO	NO	NO

Table 3-4 Sequim-Area Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 years - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami Hazard	Floods	WUIF	Landslides
Haller School	350 W Fir St	Sequim	School	60%	D/E	Very	Very High	Very	NO	NO	NO	NO
High School, Sequim	601 N Sequim Ave	Sequim	School	60%	D/E	Very	Very High	Very	NO	NO	NO	NO
Middle School, Sequim	301 W Hendrickson	Sequim	School	60%	D/E	Very	Very High	Very	NO	NO	NO	NO
Sequim Community School	220 West Alder	Sequim	School	60%	D/E	Very	Very High	Very	NO	NO	NO	NO
Mountain View Christian	255 Medsker Rd	Sequim	School	60%	D/E	Very	High	Very	NO	NO	NO	NO
Olympic Christian – O'Brien	43 O'Brien Rd	Sequim	School	60%	D/E	Very	High	Very	NO	NO	NO	NO
Office Building	152 W Cedar Street	Sequim	Government Building	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Maintenance	169 W. Hemlock	Sequim	Government Building	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Carrie Blake Park	202 N Blake Ave	Sequim	Government Building	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Sequim Police Department	152 W Cedar St	Sequim	Government Building	80%	D/F	Very High	Very High	Very High	NO	NO	NO	NO
Sequim Transit Center (City EOC)	190 W Cedar Street	Sequim	Government Building	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
American Legion - Sequim	107 E PRAIRIE ST	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
First Baptist Church of Sequim	1323 Sequim Dungeness Way	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Carrie Blake Park	202 N Blake Ave	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Catholic, St. Josephs	121 E Maple St	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO

Table 3-4 Sequim-Area Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 years - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami Hazard	Floods	WUIF	Landslides
Dungeness Community Church	45 Eberle Lane	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Elks - Sequim 2642	143 Port Williams Rd	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Episcopal, St Lukes	525 N 5th	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Grange - Macleay Hall	290 Macleay Rd	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Greywolf Elementary	Carlsborg Rd	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Groveland Cottage	4861 Sequim-Dungeness Way	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Haller Elementary School	350 W Fir St	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Juan de Fuca Cottages	182 Marine View Dr	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Kingsway 4 Square Church	1023 Kitchen Dick Road	Sequim	Shelter	60%	C	High	High	High	NO	NO	NO	NO
Latter Day Saints - Sequim	815 W Washington St	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Lutheran, Dungeness ELCA	925 N Sequim Ave	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Lutheran, Faith Lutheran Church-Missouri Synod	382 W Cedar	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Masonic Temple, Sequim	700 S 5th Ave	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Methodist, Trinity United	100 Blake Ave	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO

Table 3-4 Sequim-Area Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 years - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami Hazard	Floods	WUIF	Landslides
Mountain View Christian	255 Medsker Rd	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Nazarene, Sequim Valley	481 Carlsborg Rd	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Pioneer Park Clubhouse	387 E Washington St	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Presbyterian, Community	950 N 5th Ave	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Quality Inn & Suites	134 River Rd	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Ramada Limited	1095 East Washington	Sequim	Shelter	60%	C	High	High	High	NO	NO	NO	NO
Ramble-Wood Retreat Center	Sequim Bay State Park	Sequim	Shelter	60%	C	High	High	High	NO	NO	NO	NO
Senior Center - Sequim	921 E Hammond St	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Sequim Bay Lodge	268522 Hwy 101	Sequim	Shelter	60%	C	High	High	High	NO	NO	NO	NO
Sequim Bay Resort	2634 W Sequim Bay Rd	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	YES	NO	NO	NO
Sequim Bay Yacht Club	2577 W Sequim Bay Rd	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	YES	NO	NO	NO
Sequim Boys & Girls Club	400 Fir St	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Sequim Community School	220 W Alder	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Sequim High School	601 N Sequim Ave	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Sequim Middle School	301 Hendrickson Rd	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Sequim West Inn	740 W Washington St	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO

Table 3-4 Sequim-Area Critical Infrastructure

Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 years - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami Hazard	Floods	WUIF	Landslides
Seventh Day Adventist - Sequim	30 Sanford Lane	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
VFW #4760	169 E Washington St	Sequim	Shelter	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Grocery, Safeway	680 W Washington Street	Sequim	Commercial	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Warehouse-Costco	955 W Washington Street	Sequim	Commercial	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Grocery, Walmart	1110 W Washington Street	Sequim	Commercial	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Home Depot	1145 Washington Street	Sequim	Commercial	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Grocery, QFC	990 E Washington St	Sequim	Commercial	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO
Warehouse Grocery Outlet	1045 W Washington Street	Sequim	Commercial	60%	D/E	Very High	Very High	Very High	NO	NO	NO	NO

Key:
EQ = Earthquake
PGA = Peak Ground Acceleration
WUIF = Wildland Urban Interface Fire

3.5 Land Use and Development Trends

FEMA	D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

The City of Sequim recently reviewed and update their Comprehensive Plan to comply with the periodic review requirement outlined in Washington State's Growth Management Act (City of Sequim 2018). The City has seen a 13% population growth since 2010, and the City's land use has reflected these changes as development expands.

Changes have been measured by accounting for shifts in land use and public awareness since the adoption of the 2010 County HMP. Each measure has been identified as having an increased, decreased, or unchanged vulnerability. Table 3-5 provides a snapshot of how vulnerability has changed since development of the 2010 HMP.

Table 3-5 Vulnerability Changes Since 2010

Hazard	Status
Earthquake	+/-
Active Shooter	+/-
Power Outages	+
Wildfire	+
Heat Events and Drought	+
Windstorm	+
Hazardous Materials Accident	+
Flooding	+
Winter Storm	+
Landslide	+/-

Key:
+ Increased vulnerability
- Decreased vulnerability
+/- Increased vulnerability, but actions taken to decrease vulnerability
= Unchanged vulnerability

4 CAPABILITY ASSESSMENT

FEMA	C1. Does the plan document [the City of Sequim'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)]

4.1 Human and Technical Resources

Table 4-1 describes the City's human and technical capabilities to engage in and improve mitigation planning and program implementation.

Table 4-1 Human and Technical Resources Integrated with Hazard Mitigation

Resource	Department	Tasks and Activities Integrated into Mitigation Planning
Community Development Director	Community Development	Oversees community development and update of strategic planning relating to land use
Community Development Senior Planner	Community Development	Planner with knowledge of land development and land management practices
Director of Public Works	Public Works Department	Engineers and/or professionals trained in construction practices related to City buildings and/or infrastructure
City Engineer	Public Works Department	
Project Engineer	Public Works Department	
Resource Manager	Public Works Department	Geologist with an understanding of natural and/or human-caused hazards in the area. Additionally, serves as resource development lead and grant writer.
Police Chief	City of Sequim Police Department	Serves as a liaison for County emergency management and planning.
GIS/Engineering Technician II	Public Works Department	Personnel skilled in Geographic Information Systems (GIS)

4.2 Financial Resources

The City maintains many fiscal and financial resources to support its mitigation program. Table 4-2 identifies specific resources accessible for use.

Table 4-2 Accessible Financial Resources

Financial Resource	Accessible?
Community Development Block Grants	No
Special Purpose Taxes	Yes, Transportation Benefit District
Insurance	Yes
User fees for utility services	No
Incur debt	Yes
Development Impact Fees	Yes

General Obligation, Revenue, and/or Special Tax Bonds	Yes
Partnering arrangements or intergovernmental agreements	Yes

Table 4-3 identifies current and potential sources of funding to implement identified mitigation actions contained within the HMP.

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Federal		
Pre-Disaster Mitigation Program	Federal Emergency Management Agency (FEMA)	Provides funding to develop hazard mitigation plans (HMPs) and implement mitigation actions contained within.
Hazard Mitigation Grant Program	FEMA	Post-disaster funds to hazard reduction projects impacted by recent disasters.
Flood Mitigation Assistance Program	FEMA	Provides funds for flood mitigation on buildings that carry flood insurance and have been damaged by floods.
Community Development Block Grant Program	U.S. Department of Housing and Urban Development	Funds projects that benefit low- and moderate-income communities, prevent or eliminate slums or blight, or meet urgent community development needs posing a serious and immediate threat to community health or welfare.
Emergency Management Performance Grants Program	FEMA/Washington Department of Emergency Management	Provides funding to states for local or tribal planning, operations, acquisition of equipment, training, exercises, and construction and renovation projects.
Flood Mitigation Assistance	FEMA/Washington Department of Emergency Management	Provides funding to support development of the flood hazard portion of state and local mitigation plans and up to 100% of the cost of eligible mitigation activities. This funding is only available to communities participating in the National Flood Insurance Program (NFIP).
Earthquake State Assistance Program	National Earthquake Hazards Reduction Program Interagency Coordinating Committee	Funds activities including seismic mitigation plans; seismic safety inspections of critical structures and lifelines; updates of building codes, zoning codes, and ordinances; and earthquake awareness and education.
National Fire Plan	U.S. Forest Service	Provides funding opportunities for local wildland-urban interface planning, prevention, and mitigation projects, including fuels reduction work, education and prevention projects, community planning, and alternative uses of fuels.
Risk Mapping, Assessing, and Planning	FEMA	Provides funding and technical support for hazard studies, flood mapping products, risk assessment tools, mitigation and planning, and outreach and support.
Strategic Economic and Community Development Grant	U.S. Department of Agriculture	Provides funding in rural areas for multi-jurisdictional plan development and with a community development focus. Available only to rural areas outside of urbanized zone of any city with a population greater than 50,000.
Coastal Ecosystem Resiliency Program	National Oceanic and Atmospheric Administration	Provides funding for ecosystem restoration. Governor must approve project funds prior to award and there is a 2:1 cost-sharing ratio.
State		

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Washington State Department of Transportation (WSDOT) Avalanche Forecasting and Control	WSDOT	Avalanche forecasting determines the potential risk along a particular mountain slope. When an avalanche hazard develops, WSDOT uses artillery, or explosives to trigger the avalanche. In addition to active avalanche control, WSDOT also uses passive control methods to control snow slides.
Washington Sea Grant	Washington Sea Grant	Washington Sea Grant provides funding opportunities through State and National competitions, program development services, and sponsorships.
Ecology Water Resources Program	Washington Department of Ecology (DOE)	DOE's Water Resources Program provides support in monitoring water supply, managing water supply projects, overseeing water rights, performing streamflow restoration, protecting streamflow, regulating well construction and licensing, and ensuring dam safety.
WSDOT Seismic Retrofit Program	WSDOT	WSDOT provides funding and project support to retrofit bridges at risk of failure due to seismic events.
Washington State Department of Agriculture (WSDA) Livestock Inspection Program	WSDA	Dedicated to providing asset protection for the livestock industry by recording brands, licensing feedlots and public livestock markets by conducting surveillance and inspection of livestock at time of sale and upon out of state movement. The program is funded by fees paid by the livestock industry and receives no general fund dollars.
Washington Local Emergency Planning Committee Program	Washington Emergency Management Division (EMD)	WA EMD provides funding support to ensure Local Emergency Planning Committees (LEPCs) can be implemented across the state.
Washington Pipeline Safety Program	Washington Utilities and Transportation Commission	The commission is responsible for developing and enforcing safety standards for natural gas and hazardous liquid pipelines located within the state. The commission also inspects the portions of interstate natural gas and hazardous liquid pipelines located within Washington State; the standards and enforcement actions are the responsibility of the federal Pipeline and Hazardous Materials Safety Administration (PHMSA).
State Water Pollution Control Revolving Fund	Washington DOE	This program provides funds to local governments to set up low-interest loan programs to repair or replace failing on-site sewage systems. Property owners unable to qualify for conventional bank loans and marine waterfront property owners can use the program to get loans to fix or replace their systems where failures might directly affect Puget Sound. Both the Clean Water State Revolving Fund and the Centennial Clean Water Program.
Other		
Community Planning Assistance Teams	American Planners Association Foundation	Provides pro bono technical assistance for planning frameworks or community vision plans for communities needing extra assistance. Local governments are responsible for travel costs.
Thriving Resilient Communities	Threshold Foundation	Wide-ranging resiliency project funding.
Kresge Foundation Environmental Grants	Kresge Foundation	Provides funding for climate adaptation and mitigation, as well as sustainable water resources management.

4.3 Legal and Regulatory Resources

Table 4-4 describes the legal and regulatory capabilities, including plans, policies, and programs that have integrated hazard mitigation principles into their operations.

Table 4-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2010-2019)	Hazard Mitigated
Plans	County Comprehensive Emergency Management Plan	Outlines roles and responsibilities of tribal government in mitigating potential hazards.	▪ Incorporation of partners into emergency planning into operations	All
	2015 – 2035 Comprehensive Plan	The City's Comprehensive Plan establishes Urban Growth Areas, natural resource lands, rural lands, and public lands.	▪ Updated zone mapping	All
	Stormwater Management Needs Assessment	Sequim Public Works identified "problem areas" and documented physical and operational stormwater management.	▪ Major findings of the Needs Assessment project were presented to City Council at a study session on March 10, 2014.	Flooding
	Storm & Surface Water Master Plan	The Storm & Surface Water Master Plan is established to improve the quality of stormwater runoff, reduce speed and volume of stormwater flows, and raise public awareness of stormwater issues.	▪ Plan adopted by Council in April 2016	Flooding
	2019 – 2024 Capital Improvement Plan	Identifies capital improvement projects to be undertaken by the City over the next five-year period.	▪ Inclusion of hazard mitigation and maintenance projects (updated annually)	All
	State of Washington Enhanced Hazard Mitigation Plan	Profiles hazards throughout the State, assesses risks, and outlines potential mitigation actions.	▪ Collaboration between State and County	All
Policies	Zoning Ordinance	Provides land use regulation in the unincorporated portions of the City.	▪ Current code through Ordinance 2019-012, passed July 8, 2019	All
	Subdivision Ordinance	Incorporated into zoning ordinance, establishes regulations around subdivision of properties.	▪ Current code through Ordinance 2019-012, passed July 8, 2019	All

Table 4-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2010-2019)	Hazard Mitigated
	Flood Damage Prevention Ordinance	The City floodplain management ordinance incorporated into the Critical Areas ordinance is designed to protect and conserve the environmental attributes of the City and add to the quality of life for residents.	▪ Defines areas of special flood hazard ▪ Requirements for development within an area of special flood hazard ▪	Flooding
	Critical and Environmentally Sensitive Areas Protection	Define and protect critical areas as required by the Growth Management Act.	Defines areas of geological hazard that are of special concern to the City.	Landslide, Earthquake, Flooding
	National Flood Insurance Program (NFIP)	NFIP aims to reduce the impact of flooding on private and public structures.	▪ All participating jurisdictions currently participating in NFIP	Flooding
	Building Codes	Building permits are issued by the Department of Community Development and aligned with ICC 2015 building codes.	▪ Adoption of 2015 ICC codes	All
	Sustainability and Resiliency Resolution	A resolution adopting policies that improve the city's sustainability and resiliency	▪ Prioritized city resiliency and sustainability	All

4.4 Coordination with Community Partners

The City works alongside their community partners to address issues pertaining to emergency management and hazard mitigation. Many of these community partners participated in the HMP update process and collaborate with the City on an ongoing basis.

- **Public**
  - Sequim School District
  - Fire Department
- **Business and Industry**
  - Local Chambers of Commerce
  - Sequim Radio Stations
  - Irrigation districts and companies
- **Healthcare**
  - Olympic Medical Center
- **Utilities**
  - Clallam Public Utility District
  - Sequim Water and Sewer Utilities
- **Transportation**
  - Washington Department of Transportation

- Clallam Transit

4.5 Integration of Mitigation into Existing Planning Mechanisms

Integration of the principles of mitigation into the City's daily operations and ongoing planning activities is a priority of the City's mitigation program. These activities will support:

- Raising awareness of the importance of hazard mitigation for the whole community;
- Facilitating an understanding that hazard mitigation is not just an 'emergency services' function and building ownership of mitigation activities across the organization; and
- Maximizing planning resources through linked or integrated planning efforts.

The City is encouraged to consider integration actions into planning mechanisms including:

- Budget decision-making;
- Building and zoning ordinances and decision-making;
- Emergency planning mechanisms; and
- Economic developing planning and decision-making.

4.5.1 Existing Plans

FEMA	C6. Does the Plan describe a process by which the local government will incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(iii))

The following existing plans provide ongoing opportunity for integration of hazard mitigation and the City will work with plan owners and stakeholders to consider hazard mitigation data and principles when these plans are updated. Table 4-5 contains a summary of the County's existing plans and how each incorporates the hazard mitigation planning.

Table 4-5 Summary of Clallam County Plans

County Plan	Hazard Mitigation Components
Comprehensive Emergency Management Plan (2016)	Outlines hazard mitigation roles and responsibilities.
Continuity of Operations Plan	In development.
Comprehensive Land Use Plan	Identifies designated land uses and areas of economic and environmental value.
Floodplain Management Plan	Outlines strategies that directly or indirectly mitigate the risks posed by flood hazards.
Capital Improvements Plan	Identifies large capital projects to reduce risks to key County infrastructure.
Historic Preservation Plan (a component of Critical Areas)	Identifies areas of cultural value that may be vulnerable to hazards.

5 MITIGATION STRATEGY

FEMA	C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for the [City of Sequim] being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))

5.1 Review of 2010 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2010 plan were evaluated to determine what the status of the action was and whether any ongoing or incomplete actions should be included as actions in the 2019 plan update. The MPT worked through each previous action during MPT Meeting #1 to document steps taken to fulfill the action.

See Table 5-1 for an overview of the status of all City actions from the 2010 plan update.

Table 5-1 Status of 2010 Mitigation Actions

Action No.	Mitigation Action	Action Status	Timeline	Lead Department	Priority
1	Build redundant water source (3rd reservoir)	2010 Action - Ongoing	2009-2010	Public Works Department	High
2	Alternative power source for water reuse facility	2010 Action - Ongoing	2010-2011	Public Works and Planning Departments	High
3	Backup power to Battelle Laboratory	Public Utility District (PUD) and Pacific Northwest National Labs – no longer a City action.	2010-2011	Public Works Department	High
4	Purchase Additional Heavy Equipment for Use during Severe Storms	2010 Action - Ongoing	2013	Public Works Department	High
5	Develop Reliable Backup Program for Critical City Data Entry Post-Disaster	2010 Action - Ongoing	2013	Public Works Department	High
6	Upgrade storm drains.	2010 Action - Ongoing	2013	Public Works Department	High
7	Adopt 2010 Hazard Mitigation Plan	Completed	2010	Planning Department	High

5.2 Identification and Analysis of New Mitigation Actions

In order to achieve the County-wide mitigation goals, the City has identified a comprehensive series of mitigation objectives and supporting actions that are focused on reducing vulnerability and maximizing

loss reduction. The actions can typically be broken out into the following types of activities which are indicated in Table 5-2.

Table 5-2 2019 Mitigation Actions by Group

Mitigation Group	Related Mitigation Actions
Plans and Regulations	
Infrastructure/Capital Project	SQ01, SQ02, SQ03, SQ04, SQ05, SQ06, SQ07, SQ08, SW09, SQ10 SQ12, SQ13
Natural System Protection	
Education and Awareness	SQ14, SQ18
Preparedness and Response	SQ01, SQ03, SQ08, SW09, SQ11, SQ15, SQ16, SQ17, SQ19

All mitigation actions identified in the plan are addressed in the mitigation implementation plan provided in Section 5.3. The actions include both interim- and long-term strategies for reducing vulnerability to hazard and are characterized as such in the 'life of action' column of the implementation plan.

5.2.1 2019 Mitigation Actions by Hazard

All mitigation actions identified in the plan address at least one priority hazard outlined in Chapter 4 of the HMP. Table 4-2 indicates which mitigation actions address which hazards.

Table 5-3 2019 Mitigation Actions by Hazard

Hazard	Related Mitigation Actions
All Hazards	SQ09, SQ11, SQ16, SQ17, SQ18, SQ19
Earthquake/Tsunami	SQ01, SQ03, SQ07, SQ12, SQ13, SQ14,
Active Shooter	
Power Outages	SQ01, SQ02, SQ05, SQ06, SQ07, SQ12,
Wildfire	SQ07, SQ10, SQ15
Heat Events and Drought	SQ06, SQ10
Windstorm	SQ01
Hazardous Materials Accident	
Winter Storm	SQ13
Flooding	SQ01, SQ02, SQ03, SQ04, SQ08, SQ10, SQ13
Landslide	SQ13

A complete mitigation implementation plan is provided in Table 5-4.

5.3 2019-2025 Mitigation Implementation Plan

FEMA	C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by [the City of Sequim]? (Requirement §201.6(c)(3)(iii))

The mitigation implementation plan lays the groundwork for how the mitigation plan will be incorporated into existing planning mechanisms and how the mitigation actions will be prioritized, implemented, and administered by the City. The implementation plan includes both short-term strategies that focus on planning and assessment activities, and long-term strategies that will result in ongoing capability or structural projects to reduce vulnerability to hazards.

See Appendix D for Mitigation Action Worksheet instructions and completed Mitigation Action Worksheets for each action listed in Table 5-4.

Table 5-4 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
City of Sequim													
SQ01	Build fuel station at City Public Works Yard to supply fuel to City departments and all emergency responders.	New	2,4	City Public Works, Police Department	1-3 years	$850,000	Yes	Federal Emergency Management Agency (FEMA)	Earthquake, Flood, Utility Failure, Winter Storm, Tsunami, Windstorm	19	6	25	10
SQ02	Replace 3-mile 12" water main from Ranney Will (infiltration gallery) beginning near the Dungeness River and ending at the Reservoir Road Reservoirs.	New	4,5	Public Works Department	1 – 3 years	Unknown	Yes	FEMA	Floods, Utility Failure, Winter Storm,	12	6	18	1
SQ03	Purchase a portable water purification system and small tanks. Prepare multiple sites and equipment to operate water purification	New	4,5	Public Works Department	2 years	Unknown	Yes	Drinking Water State Revolving Fund (DWSRF), FEMA	Earthquake, flooding, tsunami	18	6	24	8
SQ04	Locate site for new potable water reservoir, purchase property, design and construct.	New	4,5	Public Works Department	3-5 years	Unknown	No	City of Sequim general fund, property owners, developers, Public Utility District (PUD	Winter storms, flooding	15	8	23	4
SR05	Reroute/reconfigure electrical supply to the City of Sequim Water Reclamation Facility at 247 Schmuck Road by bringing new power source into the facility and using existing supply as backup.	2010 Action – Ongoing	4,5	Public Works Department, PUD	3-5 years	Unknown	No	Drinking Water State Revolving Fund (DWSRF), FEMA	Utility Failure	19	4	23	5
SR06	Construct deep water well (>600 feet) to increase resiliency and reliability within water system.	New	4,5	Public Works Department	1-3 years	Unknown	Anticipated	Drinking Water State Revolving Fund (DWSRF), FEMA	Utility Failure, Drought, Water Shortage	17	4	21	2

Table 5-4 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
SR07	Connect and extend City water mains to improve looping, during water main replacements and developer projects.	New	4,5	Public Works Department	3-5 years	Unknown	Anticipated	Drinking Water State Revolving Fund (DWSRF), Developers	Earthquakes, Excessive Heat, Utility Failure, Water Shortages, Wildfires	17	4	21	3
SQ08	Purchase Additional Heavy Equipment for Use during Severe Storms	2010 Action – Ongoing	2,4	Public Works Department	0-5 years	UNK	Yes	City of Sequim general fund	Winter storms, flooding	19	8	27	15
SQ09	Develop Reliable Backup Program for Critical City Data Entry Post-Disaster	2010 Action – Ongoing	2,3	Finance Department (Information Technology)	2 years	UNK	Yes	City of Sequim general fund	All hazards	19	6	25	11
SQ10	Capture stormwater in the County southwest of Sequim city limits and re-infiltrate using green stormwater infrastructure to benefit the watershed.	New	4,5	City of Sequim Public Works, Clallam County Public Works	<1 year	Capture & Infiltration project ~ $1.23M total. Match of $154k will be 97% met by land acquisition, the rest by staff time.	Anticipated	Application submitted to FEMA Hazard Mitigation Program	Flooding, Drought, Wildfire	18	6	24	9
SQ11	Install an energy storage microgrid for storing solar energy for use in the EOC and Civic Center during power outage emergencies.	New	2,3,4	Public Works Department	1-3 years	~$250,000	No	Washington State Department of Commerce	All hazards	19	4	23	6
SQ12	Replace mid-1900s AC pipe running through the City with earthquake-resistant pipe.	New	4	Public Works Department	3-5 years	$6-8 million	No	City Budget, Grant	Earthquake, Utility Failure	18	8	26	14
SQ13	Protect/reinforce Johnson Creek Trestle for the Olympic Discovery Trail west of Whitefeather Way	New	1,4	Public Works Department	3-5 years	$100,000	No	City Budget, Grant	Earthquake, Flooding, Landslide, Winter Storm	19	4	23	7
SQ14	Train City staff to perform seismic assessments of City properties	New	2,6	Public Works Department	1-3 years	Minimal	Yes	Staff time	Earthquakes	19	8	27	16
SQ15	Conduct wildfire risk assessment for City of Sequim and Fire District 3	New	4,5	Public Works Department and Clallam Co. Fire District 3	1-3 years	$20,000-$40,000	No	Grant	Wildfire	19	6	25	12
SQ16	Implement asset management using GIS for all capital facilities	New	4	Public Works Department	1-3 years	$20,000 per year plus staff time	No	Existing Budget	All Hazards	19	8	27	17

Table 5-4 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
SQ17	Coordinate Emergency Management/Incident Response trainings for North Olympic Peninsula jurisdictions	New	2	Sequim Police Department	<1 year	Negligible	Yes	Existing Budget	All Hazards	19	8	27	18
SQ18	Public education of potential hazards, local agency response, and preparedness	New	6	Sequim Police Department	<1 year	Negligible	Yes	Existing Budget	All Hazards	17	8	25	13
SQ19	Develop risk assessment and response plan for vulnerable populations regarding excessive heat, cold, smoke inhalation – including loss of power and/or ability to transport	New	6	Sequim Police Department	<1 year	$20,000	No	Existing Budget, Grant	All Hazards	19	8	27	19
Adopt the Hazard Mitigation Plan	Adopt the Hazard Mitigation Plan	Completed – Re-adopting updated 2019 HMP		Planning Department	1 year	N/A	Yes	N/A	All hazards				

Key:
STAPLEE - Strategy and Prioritization Methodology

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Jamestown S'Klallam Tribal Annex – Clallam County Hazard Mitigation Plan

DRAFT – 2019 Plan Update

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

Tables

Figures

1 INTRODUCTION

1.1 Jamestown S'Klallam Tribal Hazard Mitigation Program

Throughout the hazard mitigation planning process, the Tribal Planner Luke Strong-Cvetich and Tribal Planning Director Leanne Jenkins were the main points of contact for the Jamestown S'Klallam Tribe (herein referred to as 'Jamestown' or 'Tribe'). They each attended one or more Mitigation Planning Team (MPT) meetings.

The Jamestown S'Klallam Tribe adopted a Tribal Multi-Hazard Mitigation Plan (HMP) in 2011 and updated the HMP in 2015.

See Appendix E for the completed Federal Emergency Management Agency (FEMA) Local Plan Mitigation Review Tool for the Jamestown S'Klallam Tribe.

1.2 What's New in the 2019 Update?

This 2019 Jamestown S'Klallam Tribal Hazard Mitigation jurisdictional annex serves as a continuation of the Tribe's mitigation efforts. This annex includes the following major revisions to the 2015 plan:

- Incorporation into the larger County-wide hazard mitigation planning process, which represents the collaborative relationship between the Tribal and County planning teams;
- Incorporation of additional hazards, including human-induced hazards (Chapter 3);
- Updated vulnerability assessment built on the critical infrastructure established in the 2015 planning process (Chapter 3); and
- Focused mitigation strategy and prioritization methodology (STAPLEE) (Chapter 5).

Additionally, to aid in plan review and to ensure that all FEMA Tribal planning requirements are met, text box callouts have been inserted into the plan that identify the planning element, based on FEMA's mitigation plan review tool, that is addressed in that particular section of the plan. The plan also strives to make robust use of internal call outs to ensure that plan users can easily find related information. For example, in Chapter 4, which addresses the capability assessment, the following text box appears:

FEMA	C1. Does the plan include a discussion of the tribal government's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including an evaluation of tribal laws and regulations related to hazard mitigation as well as to development in hazard-prone areas? (Requirement §201.7(c)(3)(iv))

2 COMMUNITY PROFILE

2.1 Tribal Sovereignty and Governance

The 2016 Jamestown S'Klallam Comprehensive Plan details the structure of the Tribal government:

> "The Jamestown S'Klallam Tribe is governed by a five-member Tribal Council elected to four-year terms on a staggered basis. All enrolled Tribal citizens over 18 years are eligible to vote and those who live within the Tribal service area are eligible to run for office. The Tribal constitution was drafted and adopted in 1975. Tribal governmental programs receive overall direction from the Tribal Council through the Chief Executive Officer. We adhere to the practice of separation of Tribal government and Tribal administration to provide continuity and stability in its day-to-day operations. The Council sets policy, considers community input, and relies upon the administrative staff to effectively carry out its policies.
>
> Since achieving recognition in 1981, the Council and staff have worked hard to set up basic operational structures to administer governmental policies and provide services, programs and activities for the Tribal citizenship. This structure has allowed the Tribe to create programs to assist Tribal citizens as well as begin building a strong economic base for future needs." (Jamestown S'Klallam Tribe 2016)

Tribal self-governance is key to the Tribe's ability to restructure programs and address Tribal priorities and needs:

> "Self-Governance is premised on the government-to-government relationship that exists between Indian Tribes and the United States as sovereign nations. Indian Tribes have always been recognized as independent sovereign nations with the authority to conduct their affairs under their inherent powers. In 1988, Congress authorized a demonstration project called Self-Governance which allowed for many programs and services formally administered by the Bureau of Indian Affairs (BIA) to be transferred to the Tribes themselves. The Jamestown S'Klallam Tribe was one of the first seven Tribes in the nation to participate in this project." (Jamestown S'Klallam 2018a).

2.2 Geography and Climate

The following is an excerpt from the 2016 Jamestown S'Klallam Comprehensive Plan:

> "The Jamestown S'Klallam Tribal community is located on the northern portion of the Olympic Peninsula of Washington State, approximately 70 miles northwest of the city of Seattle. The Peninsula is a distinct and relatively isolated geographic region that is separated from Seattle by two bodies of water.
>
> Two counties, Clallam and Jefferson, comprise the bulk of the Olympic Peninsula. The Peninsula is bounded by the Pacific Ocean to the west, the Strait of Juan de Fuca to the

north, by Hood Canal on the east and by the Olympic Mountain range to the south. A large part of the two counties is densely timbered wilderness or undeveloped areas characterized by rugged mountains, steep slopes and rain forests. Annual precipitation varies widely on the Peninsula, from over 100 inches annually on the west end to only 17 inches in the Sequim area. Major towns in the area are the county seat in Port Angeles (population 18,984), Sequim (population 5,688), and Port Townsend (population 9,134). The area known as "Jamestown" is not an incorporated village, nor does it have a commercial center." (Jamestown S'Klallam 2016)

2.3 Population and Demographics

The 2016 Jamestown S'Klallam Comprehensive Plan details the Tribal population profile:

"As of January 2016, the Jamestown S'Klallam Tribe has 569 enrolled citizens in 434 households. Because [the Tribe] never had a traditional reservation, Tribal citizens and their families live within the communities of Clallam and Jefferson counties, throughout Washington State, as well as in many other states across the nation. Depending upon where citizens live, some benefits of Tribal citizenship may not be available; [the Tribe is] limited to providing certain Federally-funded benefits only to those residing within [the Tribal] Service Area. The following text…is based on 2015 data.

- The *local* population of Tribal citizens consists of 207 enrolled citizens living inside the Tribe's designated Service Area. There are 105 males and 102 females. Currently, 47.3% of the population is 55 years or older, thus qualifying them as "Elders." Within the next ten years, 20 additional citizens will advance to age 55 years.
- The *global* population of Tribal members consists of 569 enrolled citizens living both inside and outside of the Tribe's designated Service Area. There are 269 males and 300 females. Currently, 46.2% of the population is 55 years or older, thus qualifying them as "Elders." Within the next ten years, 63 additional citizens will advance to age 55 years and older." (Jamestown S'Klallam Tribe 2016)

2.4 Tribal Enterprises

The 2016 Jamestown S'Klallam Comprehensive Plan details Tribal economic development:

"Promotion of economic development and opportunities is not new to our citizens. In the 1800's, Tribal citizens used their initiative and developed a strong trading relationship with the immigrant European settlers. This enabled them to amass some financial resources, sufficient to acquire property in 1874 to start rebuilding their homeland.

A hundred years after the Tribe purchased their first property, in 1974, when Tribal citizens decided on a major push for re-recognition by the federal government, our main economic engine was our fireworks stand - and it remained so into the 1980's. The steady stream of revenue generated by it, although modest by today's standards, allowed the Tribe to start hiring staff with experience in economic development, among other things. This new staff was able to assist us in tapping into the various funding resources available for our various initiatives.

As it did in 1874, for the S'Klallams today, land still means opportunity. One of our major focuses is acquiring additional property. Some, but not all, of this property is targeted for economic development opportunities.

The Tribe has access, directly or through its business entities, to socio-economic development opportunities that most local governments and non-profit planning organizations do not have, such as the SBA 8(a) program, the HUBZONE program and, in Washington State, the Minority & Women's Business Enterprise program. All of these programs present unique opportunities and challenges that must be managed to ensure that we remain eligible for each program.

Since the Tribal economy is so closely integrated to the regional economy (there is no reservation economy to speak of, as occurs with some of the larger Tribes in the country), we will continue to utilize every opportunity for cooperation with local and regional, public and private planning groups (such as the Peninsula Development Association, the Clallam and Jefferson county planning and economic development departments, as well similar departments in other tribes) to further our economic development goals and objectives, as well as those of the region.

Economic development officials in the Tribe's local jurisdictions have identified certain areas of economic development that seem to have the best chance for success in the region. We generally agree with those findings. The key for the Tribe is to use our comparative advantages when considering development in any of the targeted industries.

Out of the list of industries that have been identified as having the highest chance of success, we have identified several areas of economic development on which to focus.

The primary growth industries which we believe will create new employment and career opportunities are tourism, high-tech businesses, healthcare and medical supplies, marine services and commercial/residential construction." (Jamestown S'Klallam Tribe 2016)

BUSINESS HIGHLIGHT

Tribal business is diverse and varied, representing an array of enterprises that operate on Tribal land and throughout Clallam County.

- Jamestown Family Health Clinic
- Jamestown Family Dental Clinic
- Northwest Native Expressions Gallery
- Jamestown Seafood
- Point Whitney Shellfish Hatchery
- The Longhouse Market and Deli and Chevron Fueling Station
- Jamestown Excavating
- Jamestown Networks (broadband services)
- Jamestown S'Klallam Tribal Library
- 7 Cedars Casino & Hotel
- House of Seven Brothers
- Napoli's Stone Fired Cuisine
- Rainforest Bar
- Cedars at Dungeness Gold Course
- Stymie's Bar and Grill
- Double Eagle Steak and Seafood
- Dungeness River Audubon Center at Railroad Bridge Park
- Carlsborg Self Storage
- JST Capital
- Cedar Greens Cannabis Shop

2.5 Tribal Lands and Ownership Trends

The 2016 Jamestown S'Klallam Comprehensive Plan details the Tribe's historic and present-day land use:

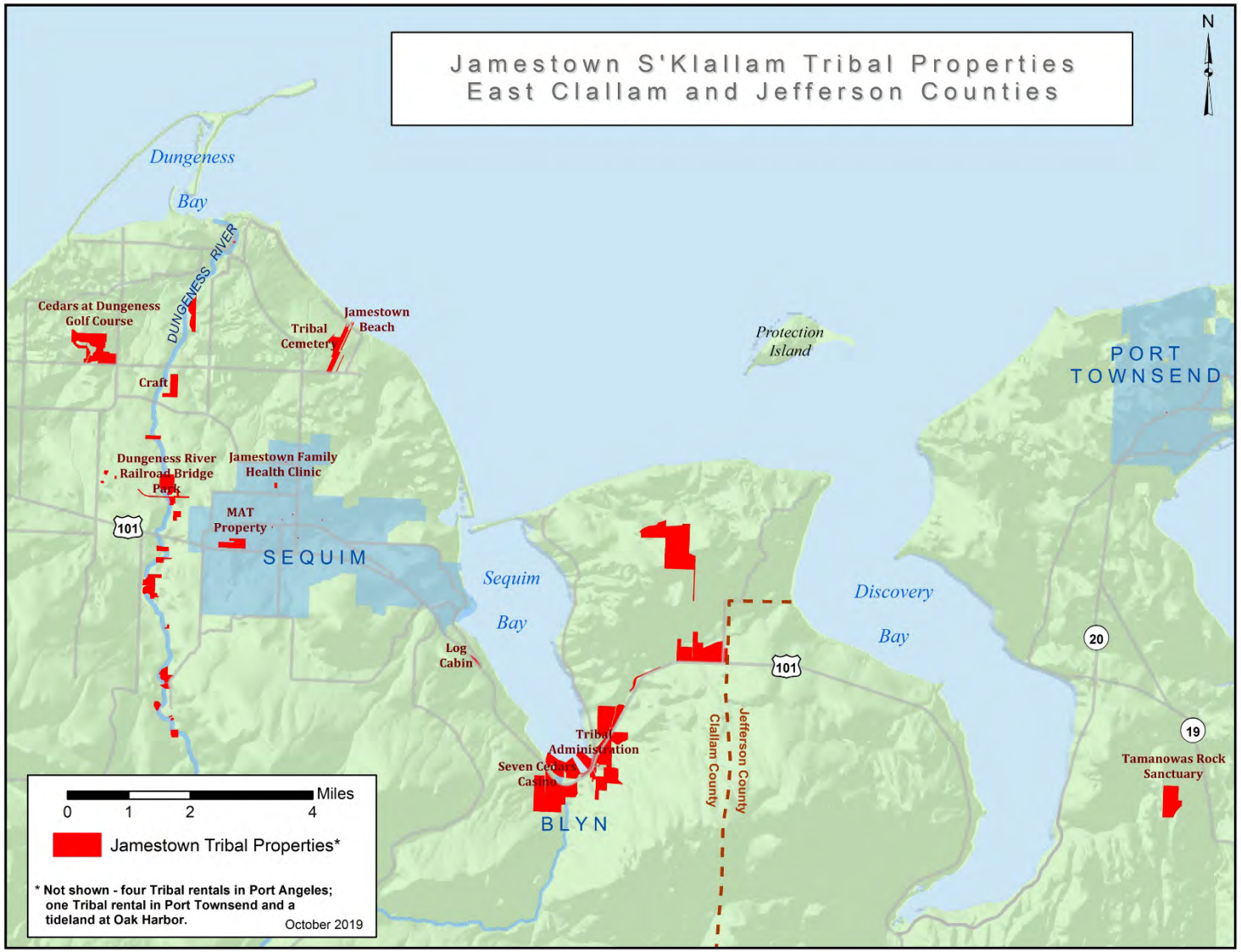
> "The Jamestown S'Klallam Tribe initially acquired roughly ten acres of fee lands in Blyn in 1986, which it then had converted to reservation land, for the Tribal Campus and future Casino. It has been the Tribe's intent from that time forward to continue acquiring lands for rebuilding the Tribe's land base and for future development as they become available; for instance, by in-filling between the Campus and the southwestern edge of the Blyn basin.
>
> The Tribe owns more than 400 acres in Blyn in a mix of reservation, trust and fee status, making it the single largest landowner in Blyn. At some time in the future, all of this property will likely be in reservation/trust status, and therefore no longer under the jurisdiction of Clallam County or the State of Washington.
>
> Although Tribes are not required to plan under Washington State's Growth Management Act, and although our reservation lands are not subject to the jurisdiction of Clallam County or the State, any decisions made by Clallam County or the State with respect to our fee lands will have an impact on our ability to utilize those lands in the future.
>
> Since acquiring initial properties in 1986, it has been the Tribe's intention to establish our Reservation in Blyn primarily (but not exclusively) for economic development and government facilities, and to acquire a land base for a variety of purposes, including housing and cultural activities." (Jamestown S'Klallam Tribe 2016)

2.6 Natural Resources

The 2016 Jamestown S'Klallam Comprehensive Plan details the Tribe's relationship with its natural resources:

> "The Jamestown S'Klallam Tribe has an extremely close and long-lasting relationship with its natural resources. Jamestown people have fished, hunted and gathered across the Olympic Peninsula landscape for thousands of years. Our usual and accustomed fishing areas stretch from the mouth throughout the length of the Strait of Juan de Fuca, the San Juan Islands, Admiralty Inlet and Hood Canal. Historically, Jamestown has been dependent on the wise use and proper management of its natural resources. Today, that dependency and care in management continues even as we increase our economic development.
>
> In modern times the relationship between the Jamestown S'Klallam Tribe and our natural resources has been framed by a treaty with the United States. In 1855 the Jamestown Tribe ceded millions of acres of land to the government while reserving rights to the natural resources on that land and in local waters, including both surface and ground water resources. Water rights are included in the property rights retained by treaty. Today we share these resources with other Tribes and the State of Washington.
>
> The Jamestown S'Klallam Tribe has maintained the right to fish, shellfish, hunt and gather. But that right is empty if there are no fish to catch, no clams to dig, no elk to hunt or berries to gather. Our greatest natural resource concern is that the environment these natural resources live in and the habitat that supports healthy populations be protected. If threatened with harm, the environment must be protected and kept in a highly productive state. If damaged, the habitat must be restored so that fish and wildlife may prosper. If natural resources are in decline, they must be improved so that future populations may thrive.
>
> When we have healthy, sustainable resources we have harvest opportunities. Harvest is important to Tribal citizens, to benefit economically from commercial harvests, to put food on our tables as a result of subsistence harvest and to have access to traditional resources for cultural purposes and for ceremonies." (Jamestown S'Klallam Tribe 2016)

Figure 2-1 Jamestown S'Klallam Tribe



3 HAZARD PROFILES AND VULNERABILITY ASSESSMENTS

Chapter 3 contains hazard profiles and vulnerability assessments to determine the potential impact of hazard to the people, economy, and built and natural environments of the Jamestown S'Klallam Tribe. They have been streamlined to increase the effectiveness and usability of the HMP.

FEMA	B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect [the Jamestown S'Klallam Tribe]? (Requirement §201.7(c)(2)(i)) B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for [the Jamestown S'Klallam Tribe]? (Requirement §201.7(c)(2)(i)) B3. Does the plan include a description of each identified hazard's impact as well as an overall summary of the vulnerability of the tribal planning area? [44 CFR § 201.7(c)(2)(ii)]

3.1 General

Clallam County has encountered several major disaster declarations that have affected the Jamestown S'Klallam Tribe. In total, the County has experienced 21 disaster declarations since 1953. Table 3-1 identifies the disaster declarations since 2010.

Table 3-1 Clallam County FEMA Disaster Declarations

Disaster ID	Date of Declaration	Disaster Type	Incident Period
DR-1956	05-Mar-12	Severe Winter Storms, Flooding, Landslides, and Mudslides	14-Jan-12 to 23-Jan-12
DR-4242	15-Oct-15	Severe Windstorm	29-Aug-15
DR-4249	1-Jan-16	Severe Storms, Straight-line Winds, Flooding, Landslides, and Mudslides	12-Nov-15 to 21-Nov-16
DR-4253	2-Feb-16	Severe Winter Storm, Straight-line Winds, Flooding, Landslides, Mudslides, and a Tornado	1-Dec-15 to 14-Dec-15
DR-4418	4-Mar-19	Severe Winter Storms, Straight-line Winds, Flooding, Landslides, Mudslides, Tornado	10-Dec-18 to 24-Dec-18

Source: FEMA, Washington Disaster History, Major Disaster Declarations (https://www.fema.gov/data-visualization-disaster-declarations-states-and-counties)

The hazard profiles and vulnerability assessments contained in this chapter represent a considerable amount of work performed by the MPT. MPT members ranked hazards using several key considerations, followed up by activities to validate hazard analysis results and identify specific areas of risk. Table 3-2 displays the hazards that MPT selected for further assessment.

Table 3-2 Hazards Addressed in Plan

Hazard Type	Hazard Name
Natural Hazards	Winter Storm Earthquake Flooding Windstorm Landslide Drought Fire
Human-Caused Hazards	Hazardous Material Incident Active Shooter Disease
Technological Hazards	Power Outages

3.2 Hazard Ranking Methodology

The hazards identified in the HMP were initially ranked based on MPT feedback during MPT Meeting #1 and #2. The previous Jamestown S'Klallam Hazard Mitigation Plan (2015) was consulted as well to ensure continuity of Tribal priorities.

Following the individual hazard ranking activity, the results were added up and aggregated to show an average score for both Tribal MPT members and are available in Figure 3-1.

Figure 3-1 Jamestown S'Klallam Tribe Hazard Rankings

	Magnitude (1=lowest, 5=highest)	Onset (1=slowest, 5=fastest)	Duration (1=shortest, 5=longest)	Frequency (1=lowest, 5=highest)		Average	Relative Rank
Power Outages	1	5	3	5		3.5	1
Winter Storm	2	4	2	5		3.3	2
Tsunami	5	5	2	1		3.3	3
Cascadia Earthquake	5	5	2	1		3.3	4
Flooding	1	4	2	5		3.0	5
Windstorm	1	4	2	5		3.0	6
Earthquake	5	5	1	1		3.0	7
Active Shooter	4	5	2	1		3.0	8
Hazardous Materials Accident	3	5	2	2		3.0	9
Disease	4	2	4	2		3.0	10
Landslide	2	5	2	2		2.8	11
Drought	1	1	5	4		2.8	12
Wildfire	2	4	3	1		2.5	13

3.3 Hazard-Specific Profiles and Risk Assessments

The following section profiles each hazard identified in Section 3.2 and assesses the risk associated with each. Each risk assessment considers the following attributes:

- **Location:** An indication of geographic areas that are most likely to experience the hazard.
- **Past Occurrences/History:** Similar to location, a chronological highlight of recent occurrences of the hazard accompanied by an extent or damage cost, if available.
- **Extent/Probability:** A description of the potential magnitude of the hazard, accompanied by the likelihood of the hazard occurring (or a timeframe of recurrence, if available).
- **Vulnerability:** A description of the potential magnitude of losses associated with the hazard. Vulnerability may be expressed in quantitative or qualitative values depending upon available data. Identifies development trends impact on the Tribe's vulnerability to each hazard since the 2012 plan development (Increased, decreased, unchanged).

Note: Hazard Descriptions, Potential Impacts from Future Climate Conditions, and Cascading Impacts can be found in Chapter 4 of the HMP Basic Plan, as these are not place-specific.

In addition, the hazards have been organized into three sub-sections (high-, medium-, and low-priority) to illustrate the risk-driven nature of the HMP. Each hazard has been given serious consideration of all attributes discussed within. However, low-priority hazards may be shorter in length and with less quantitative analyses, as a lack of usable data is frequently present when considering low-likelihood or low-magnitude events. The three sub-sections are as follows:

- **High-Priority:** Power Outages, Winter Storm, Tsunami, Cascadia Earthquake
- **Medium-Priority:** Flooding, Windstorm, Earthquake, Active Shooter, Hazardous Materials Accident, Disease
- **Low-Priority:** Wildfire, Landslide, Drought

3.3.1 Power Outages

Power Outages

Magnitude	Onset	Duration	Frequency
1	5	3	5

Average	Rank
3.5	1

Location
Numerous Tribal properties are at risk of being affected by utility failures. Tribal housing in the foothills of the Olympic Mountains is known to experience power outages during winter and windstorms that can last anywhere from several hours to several weeks. In addition, utility networks and information technology networks are very vulnerable and could be at a risk to exposure of a hazard that could lead to a utility failure.

Previous Occurrence/History

Historically, utility disruptions and failures have been caused by natural disasters and human-caused accidents but have not been recorded in a way that is publicly accessible. Numerous utility failures occur every year, most frequently in the form of electricity outages that may last as short as hours or as long as weeks. Previous utility failures have led to an increase in welfare check-ins and overall Tribal member needs, as well as having negatively impacted the Tribe's economic interests.

Extent and Probability

It is difficult to predict the impacts of future utility failures, but they have the potential to impact all Tribal government and business operations and cause extensive economic losses among other impacts. Due to the sporadic nature of failures, it is also difficult to estimate how frequently such failures will occur or their duration. The Tribe generally deals with power outages multiple times per year with many of them only lasting a matter of hours. Every several years, a large utility failure is experienced.

Future Probability Trend – Based on potential increases in heat waves and increasing development trends resulting in greater demand, the Tribe may be impacted by an **increase** in the probability of future utility failure. However, mitigation actions outlined in this HMP are designed to decrease such strain on utility systems.

Vulnerability

The Tribe is served by the Clallam Public Utility District (PUD) for electricity.

Electric Power Systems

Power facilities in Clallam County are generally protected from Wildland-Urban Interface Fires (WUIF) by defensible space. A limited number are threatened by tsunami, flood, and landslide hazards. All facilities are threatened to varying degrees by destructive earthquakes.

Water Supply

- The Jamestown residential area has its own well and water transmission system. This well is located in an area that could be subject to flooding.
- The Tribe has a main well and three 105,000-gallon reservoir storage tanks on Zaccardo Road that serve the main Tribal campus, the Longhouse Market, the fire station, and several

Power Outages

residences. There are also smaller wells whose primary purpose is irrigation. The 7 Cedars Casino had its own well.

- The large on-site sewage system that serves the Tribal campus has collection tanks by the shoreline. These on-site sewage tanks are being removed because the Tribal properties in Blyn and the Sequim Bay State Park are preparing to connect to the City of Sequim sewage line.
- There are nine water districts and at least two private water systems in Clallam County that supply customers in their areas with water. Many are threatened by tsunami, flood, WUIF, and landslides. All of these districts are expected to sustain some type of damage and/or outage immediately following a destructive earthquake.
- Most water service ceases to function if electrical power is unavailable.
- Service main and line breaks will cause reduced water pressure in affected areas. Pressure reductions could reduce firefighting capability.
- Water utilities will shut down system components to mitigate damage from pressure loss, pipe leaks and breaks inside of buildings.

With the expansion of utilities systems with new development in recent years, the Tribe's vulnerability to utility failure has **increased**.

3.3.2 Winter Storm

Winter Storm

Magnitude	Onset	Duration	Frequency
2	4	2	5

Average	Rank
3.3	2

Location

While much of the Tribe service area can be affected by winter storms, the western coastal areas are exposed to the more damaging impacts of winter storms. Furthermore, many of the communities along the western and northern coast of the Tribe service area are very remote and have limited road infrastructure that can quickly become compromised during a winter storm.

Previous Occurrence/History

Recent winter storms occurring in the Tribal area resulting in major damage include (snowstorms listed below; see Section 3.3.5, Windstorms, for other types of winter weather):

- 9 February 2019 – North Olympic Peninsula severe winter weather
- 17 March 2014 – Sequim/Port Angeles Blizzard
- 27 December 1996 – Christmas Snowstorm

Winter Storm

Extent and Probability

Winter storm weather is common in the winter, but typically lasts a short time; ice storms (sleet and freezing rain) likewise are typically brief events.

Winter storms may be more extreme during La Niña weather years, such as the 1996 flooding associated with the 1996-1997 La Niña pattern.

Future Probability Trend – The impact of changing weather patterns may have an impact on the probability of future winter storm events. Based on potential decreases in annual snowpack and increases in the frequency and magnitude of drought and heat, it would seem the Tribe may be impacted by a **decrease** in the probability of future winter storms. However, it is also possible that changing weather patterns could result in an increased likelihood of precipitation during sub-zero temperatures, resulting in an **increase** in the probability of winter storms.

Vulnerability

The Tribe's primary vulnerability from severe weather is from power outages and impairment of transportation. Because nearly all social and economic activity is dependent on transportation, snow can have a serious impact. Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. Vehicle accidents rise among those who try to drive. Power outages can result from physical damage to electrical infrastructure as a result of ice or snow or increases in demand beyond the capacity of the electrical system.

Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe winter weather events. Persons who are older, are isolated or have disabilities may be more vulnerable, especially those that may be trapped in their homes from power failures, heavy snow and ice, and debris from falling trees and power lines. Power losses during winter storms have resulted in deaths from carbon monoxide poisoning if people attempt to keep warm by lighting charcoal fires or operating backup generators indoors.

Since the 2015 plan, the Tribe's vulnerability to winter storms has **increased** as weather patterns change due to climate change and as increased development has resulted in more infrastructure that can be exposed to damage during severe weather.

3.3.3 Earthquake and Tsunami

Earthquake

	Magnitude	Onset	Duration	Frequency	Average	Rank
Tsunami	5	5	2	1	3.3	3
Cascadia Earthquake	5	5	2	1	3.3	4
Earthquake	5	5	1	1	3.0	7

Location

The Cascadia Subduction Zone (CSZ), where the Juan De Fuca plate slides underneath the North American plate poses a great risk to the Tribe and all communities in the Pacific Northwest. A large earthquake would cause significant impacts to all Tribal properties with a structure, and liquefaction may pose a risk to properties without a structure (though the liquefaction risk in the area is graded as

Earthquake

moderate). The region is also subject to smaller, crustal quakes near the Port Angeles/Sequim area associated with the Lake Creek Fault.

Previous Occurrence/History

The most recent earthquake that damaged the Tribe service area was the 2001 Nisqually Earthquake. Small earthquakes occur regularly throughout the region and go unnoticed by residents. Over the last 135 years, there have been nine earthquakes with a magnitude (M) greater than 6.0 in the area that we consider the Northwest. Five of those large quakes (including the Nisqually earthquake) directly impacted the Olympic Peninsula, according to eyewitness accounts.

- 1700, CSZ Earthquake, M 9.0
- 1909, San Juan Island, M 6.0
- 1939, Vashon Island, M 6.1
- 1949, Olympia, M 7.1
- 1965, Seattle – Tacoma, M 6.5
- 2001, Nisqually, M 6.8

Based on the geological record and first-hand accounts, tsunami from locations across the Pacific Ocean basin and from the CSZ off the Washington coast have hit Washington State coastal communities at least 7 times in the last 3,500 years. The largest of the nearby triggers, the CSZ, produced the most recent great tsunami in 1700 AD (Lange 2003).

- 2006 Kuril Islands, Japan Tsunami (La Push, 0.52 feet; Neah Bay, 0.01 feet; Port Angeles, 0.39; Westport, 0.16 feet)
- 1964 Alaskan Tsunami (Neah Bay, 0.7 feet)
- 1960 Chilean Tsunami (Neah Bay, 1.2 feet)
- 1700 Cascadia Tsunami (Washington Coast, 33 feet)

Extent and Probability

Earthquakes pose a widespread hazard throughout the Tribe service area. Tsunami post a widespread hazard throughout the coastal area. The cascading impacts of earthquakes, such as tsunami and liquefaction, are dependent on geography and soil type, as detailed above.

The Ring of Fire will continue to generate tectonic triggers. The CSZ has produced earthquakes measuring M 8.0 and above at least seven times in the past 3,500 years. The time intervals between these events has varied from 140 to 1,000 years, with the last event occurring just over 300 years ago.

There is evidence of two earthquakes on the Lake Creek Fault between 2,000 and 700 years ago. An earthquake of M 6.8 along the Lake Creek Fault would produce the greatest intensity shaking in the vicinity of Port Angeles and Sequim.

Future Probability Trend – Future weather and development trends play no known role in the probability of future earthquake events. However, both may play a role in the magnitude of earthquake impacts. Great earthquakes in the Pacific Ocean basin generate tsunamis that impact Washington's outer coast and the Strait of Juan de Fuca at a rate of about six every 100 years. In the CSZ, there is a 10 to 14% chance of a M 9.0 earthquake and tsunami in the next 50 years, so the likelihood of recurrence would be low.

Earthquake

Vulnerability

Vulnerability posed by earthquakes to the Tribe is measured by accounting for the critical infrastructure that are at risk. The following infrastructure/property types are at high risk from earthquake shaking:

- Olympic Discovery Trail Dungeness River/RR Bridge Park (6 structures)
- Economic or Cultural Assets (7 structures)
- Dwellings and/or NAHASDA rental properties (19 structures)
- Casino Subarea (1 structure)
- Vulnerable populations (3 structures)
- Offices and Tribal government (8 structures)
- Water Supply (1 structure)
- Wastewater System (5 structures)
- Equipment facilities and storage (3 structures)
- Transportation (1 structure)
- Communication (1 structure)

The following infrastructure/property types are at a high risk for tsunami damage:

- Olympic Discovery Trail Dungeness River/RR Bridge Park (4 structures)
- Tribal economic/cultural asset (13 structures)
- Dwellings and/or NAHASDA rental properties (10 structures)
- Vulnerable populations (2 structures)
- Offices and Tribal government (7 structures)
- Water Supply (2 structures)
- Wastewater System (1 structure)
- Equipment facilities and storage (2 structures)

Awareness of the Tribe's vulnerability to earthquakes or tsunamis has increased with participation in regional drills and public outreach efforts. More structures are being designed to be resilient to tectonic activity. Given these changes, the vulnerability of the Tribe to earthquakes and tsunami is **unchanged**.

3.3.4 Flooding

Flooding

Magnitude	Onset	Duration	Frequency
1	4	2	5

Average	Rank
3.0	5

Location

The primary riverine hazards are associated with the following rivers and streams, general from west to east: Quileute River, Bogachiel River, Calawah River, Sol Duc River, East Dickey Creek, Sekiu River, Hoko River, Clallam River, Reed Creek, Elwha River, Morse Creek and Dungeness River. Riverine hazards extend across the Tribe service area but are primarily located near the mouths of the rivers in the northern portion of the area, and in the central and western portions of the service area, along

Flooding

the extent of US-101, 110, and 110 Spur. Data from the *Dungeness River Comprehensive Flood Hazard Management Plan* indicate a trend of increasing peak flows for the Dungeness and Elwha Rivers in the Tribe service area between 1924 and 2002 (Clallam County 2009; 2010).

Ediz Hook and parts of Port Angeles, and the Gibbon and Travis spits in the mouth of Sequim Bay may become inundated with high tides and storm surges. Much of the Clallam, Elwha, and Dungeness tidal areas may be impacted by high tides and river flooding (Clallam County 2010).

Previous Occurrence/History

Flood damages with the highest consequence, either related to the cost to repair or by the impact on human activities, were incurred during the 1979, 1990, 1996/1997, and 2008/2009 flood and severe storm events. Historically, the most damage to life or property has occurred from flooding of the Bogachiel River and flooding of the Kinkade Island and River's End segments of the Dungeness River.

Jimmycomelateley Creek and the lower Sequim delta was also an area of historic flooding. The Jamestown S'Klallam Tribe, the Clallam Conservation District, Clallam County, and other stakeholders completed a restoration project to return the functionality of the creek's floodplain and to improve fish passage. As of 2009, flooding has largely been remedied (Jamestown S'Klallam 2015).

Extent and Probability

Severe floods may result in serious injuries and fatalities as well as damage to public facilities and private property. Extent of flooding can be determined by the height of river flows in comparison to flood stages determined by U.S. Geological Survey (USGS) stream gauges located throughout the area. It can also be measured by past damages of flooding.

The region experiences some flooding twice a year at minimum, while larger floods occur once a decade and major flood events occurring every 30-50 years.

The County and Tribe have an extensive network of flood management solutions that have evolved as attitudes toward flood management have changed in Washington State. As part of the *Dungeness River Comprehensive Flood Management Plan* (2009), the County and partners conducted an inventory of levees and dikes on the lower Dungeness River to ascertain whether hard armoring could be removed without resulting in damage to private property. The Lower Elwha Dam on the Elwha River was removed in 2014 as part of an effort to restore the floodplain to its historic condition and revitalize wildlife habitat along the river (Lower Elwha Klallam Tribe 2019).

Future Probability Trend – Based on potential increase in high-intensity precipitation events and increased development trends (resulting in additional impervious surfaces and stormwater runoff), the County may be impacted by an **increase** in the probability of future floods.

Vulnerability

The Jamestown residential area has its own well and water transmission system, located in an area vulnerable to flooding.

The Tribe does not currently participate in the National Flood Insurance Program (NFIP) Community Rating System (CRS).

Vulnerability posed by flooding the Tribal service area is measured by accounting for the critical infrastructure that are at risk. The following Tribe infrastructure/property types are classified as being

Flooding

vulnerable to flooding:

- Olympic Discovery Trail Dungeness River/RR Bridge Park (6 structures)
- Dwellings (12 structures)
- Economic or Cultural Asset (22 structures)
- Critical Facilities/Infrastructure (1 structure)
- Vulnerable Populations (2 structures)
- Equipment and Storage Facilities (2 structures)
- Tribal Government and Offices (7 structures)
- Wastewater System (2 structures)
- Water Supply (2 structures)

Since the 2015 plan, the Tribe's vulnerability to nuisance flooding has **increased** as precipitation patterns shift due to climate change. However, the Tribe is taking active steps to mitigate the impacts of flooding.

3.3.5 Windstorm

Windstorm

Magnitude	Onset	Duration	Frequency
1	4	2	5

Average	Rank
3.0	6

Location
All County and Tribal properties and structures can be affected by windstorms. Properties with infrastructures, utilities, and tree stands can have more damaging impacts during windstorms, especially in coastal areas where winds speeds can reach 40 to 60 miles per hour (mph) during the winter months.

Previous Occurrence/History

Recent windstorms occurring in the Tribe service area resulting in major damage include:

- 17 December 2018 – Clallam and East Jefferson Counties Windstorm
- 15-16 October 2016 – Typhoon Songda
- 14 December 2006 – "Hanukkah Eve" Windstorm
- 20 January 1993 – "Inaugural Day" Storm

These windstorms have caused damage to County and Tribal structures and housing; extensive utilities damage; restricted access to public lands; and required increased strain on the government's and Tribe's operations.

Extent and Probability

Coastal areas of the Tribe service area experience higher winds than other areas. However, windstorms can occur anywhere throughout the area. Windstorms can damage buildings, structures, utilities, and tree stands, causing millions of dollars' worth of damage.

Future Probability Trend – Future weather conditions have the potential to lead to an increase in severe and extreme weather patterns, leading to an **increase** in the probability of a windstorm. In addition, increased development has the potential to expose more assets to the impacts of windstorms.

Vulnerability

The Tribe's vulnerability to severe windstorms are related to power outages and debris blocking land-based transportation routes. Because nearly all social and economic activity is dependent on transportation, damage from windstorms can have a serious impact.

Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. More rural communities located in the foothills are particularly vulnerable to road outages and face longer delays in debris removal. Additionally, vehicle accidents rise among those who try to drive during windstorms (U.S. Department of Transportation 2018).

Power outages can result from physical damage to electrical infrastructure as a result of downed trees and blown debris. Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe windstorms. Additionally, persons with electric-based health support systems are vulnerable to power outages everywhere.

Windstorm

Since the 2015 plan, the Tribe's vulnerability to windstorms has **increased** as weather patterns change due to climate change, and as increased development has resulted in more infrastructure that can be exposed to damage during severe weather.

3.3.6 Active Shooter

Active Shooter

Magnitude	Onset	Duration	Frequency
4	5	2	1

Average	Rank
3.0	8

Location

Any populated Tribal property can be impacted by active threat. These areas include, but are not limited to, shopping structures, casinos, clinics, schools, government offices and buildings, and Tribal housing.

Previous Occurrence/History

There have been no active threat incidents in Clallam County's recent history. A murder suspect was shot and killed by County sheriff's deputies at the Longhouse Market and Deli in 2008 after he opened fire (Seattle Times 2008).

Extent and Probability

With no existing records of recent active threat directly impacting the Tribe, it is difficult to estimate the extent or probability of its occurrence. Nonetheless, it can be deduced that active threat could affect all populated areas in the Tribe service area; government and Tribal facilities and schools may be most likely targeted.

Future Probability Trend – Future weather conditions have no direct connections to active threats. However, increased development and urbanization have the potential to **increase** the probability of a future active threat.

Vulnerability

No estimates are available to determine potential losses associated with active threat. However, we can assume that if an active threat were to be directed at the Tribe, schools and government buildings would likely be a top target. Active threats could have an impact on the community in the following ways: loss of human life, damage to buildings and structures, temporary displacement during the threat and/or investigation, stress on medical and security services, loss of hospitality business during the event, and an increased need for emergency services and funding.

Since the 2015 plan, there more public awareness about how to respond in the event of an active threat. School districts and police departments hold drills to practice response actions. The Tribe's vulnerability to an Active Threat is **unchanged.**

3.3.7 Hazardous Materials Incident

Hazardous Materials Incident

Magnitude	Onset	Duration	Frequency
3	5	2	2

Average	Rank
3.0	9

Location
Numerous fixed-location storage sites exist near Tribal properties but have rarely caused an incident. Therefore, the Tribe views the most likely hazardous materials incident to be caused by a traffic accident along US-101 or the railroad corridor. The Port of Port Angeles is also a major shipping facility with an increased potential for hazardous materials incident. Furthermore, the Strait of Juan de Fuca is a major thoroughfare for oil tankers.

Previous Occurrence/History

According to a search of the Pipeline and Hazardous Materials Safety Administration (PHMSA) incident reporting database, there have been no hazardous materials incidents associated with the Tribal service area (PHMSA 2019).

The Washington State Department of Ecology maintains records of marine oil spills since 2015; no oil spills with volumes greater than 10 gallons have been recorded in Sequim Bay (Ecology 2019)

Extent and Probability

The uncontrolled release of hazardous materials during transport can result in death or injury to people and damage to property and the environment through the material's flammability, toxicity, corrosiveness, chemical instability, and/or combustibility. Individuals may be exposed to hazardous materials at acute or chronic levels. In the event of a marine oil spill, ecological systems could be damaged from the pollution and recreational activities subsequently limited.

Future Probability Trend – Increased development trends and potential increase in high-intensity precipitation events present the potential for an increase in hazardous materials passing through the area and traffic accidents, respectively. As the expansion of Tribal enterprise continues in Blyn along the US-101 corridor, there will be increased traffic along the highway. Each factor presents the potential for an **increase** in future hazardous materials incidents.

Vulnerability

Based on the analysis of hazardous materials incidents occurring in Clallam County since 1975, most spills have occurred on the County's major highways. With the expansion of the 7 Cedars Casino and other Tribal economic enterprises in Blyn, traffic along US-101 will continue to increase in volume; thereby **increasing** the Tribe's vulnerability to hazardous materials incidents along this corridor.

3.3.8 Disease

Disease

Magnitude	Onset	Duration	Frequency	Average	Rank
4	2	4	2	3.0	10

Location

The Clallam County Public Health Services administers public health awareness programs to provide information on diseases influencing the County population. The following facilities are communicable disease testing sites:

- Private healthcare provider offices
- Clinicare Walk-In Clinic
- Volunteers in Medicine of the Olympics Clinic for uninsured/low income
- Planned Parenthood for sexually transmitted diseases (STDs), human immunodeficiency virus (HIV), & Hepatitis C
- Clallam County Public Health Section on a limited, case by case basis.

The Jamestown S'Klallam Tribe operates the Jamestown Family Health Clinic in Sequim, which provides primary healthcare services to Tribal citizens and non-tribal community members (Jamestown S'Klallam Tribe 2018b).

Previous Occurrence/History

February 2015: A kindergartner was diagnosed with measles in Port Angeles; a total of 5 people in the Tribe service area were diagnosed with measles, with 1 fatality (Seattle Times 2015).

Extent and Probability

Although it is impossible to predict the next infectious disease outbreak, history shows that outbreaks are not uncommon and can devastate communities. Infectious diseases can affect the County's entire population. Diseases may also infect livestock herds and can potentially be communicated from animal vectors to humans. Recent medical advancements increase our ability to counteract such outbreaks and limit their extent, but additional concerns related to diseases building resistance to drugs is an ongoing concern.

Future Probability Trend – Based on potential changing weather patterns, the County may be impacted by an **increase** in the probability of emerging infectious disease.

Disease

Vulnerability

Epidemic and pandemic diseases have been known to spread quickly throughout communities. Many diseases spread through close contact, meaning that highly populated areas are more prone to widespread outbreaks; a lot of public activities are centered out of the Port Angeles and Sequim area. However, compared to a metropolitan area, the smaller relative population density of the two major County communities decreases the likelihood of a widespread outbreak in comparison to a more densely populated area.

The rural nature of much of the County also presents a key vulnerability: Healthcare resources and hospitals are in short supply and would likely become overburdened immediately following a disease outbreak.

Given the expansion of population centers such as Port Angeles and Sequim, the vulnerability of the County to disease has **increased**.

3.3.9 Landslide

Landslide

Magnitude	Onset	Duration	Frequency
2	5	2	2

Average	Rank
2.8	11

Location

The following are areas that may present a landslide hazard for the Jamestown S'Klallam Tribe (STARR 2013):

- Along major roadways, including US-101 and Route 112
- Areas along major rivers, including the Lower Dungeness
- The Olympic Discovery Trail
- Blyn Basin and the surrounding hills/mountains
- Bluff area along Sequim Bay, Johnson Creek and Bell Creek

Previous Occurrence/History

Historically, the damages with the highest consequence, either related to the value of the repair or by the impact on human activities, include slides that have closed US-101 and slides in Port Angeles (one of which caused a fatality in 1998) (Clallam County 2010).

Rain and high water eroded the west end of the trestle bridge at Railroad Park Bridge in December 2009. The embankment eroded enough to compromise the concrete slab that anchored the bridge (Jamestown S'Klallam 2015). This slope failure has since been remediated.

A landslide obstructed the Olympic Discovery Trail in 2014 (Peninsula Daily News 2014).

Landslide

Extent and Probability

The following is excerpted from the hazard assessment conducted by Clallam County Emergency Management Division (EMD) as part of the 2016 Cascadia Rising Exercise (Buck 2016):

> "It is very difficult to make quantitative predictions of the likelihood or the size of a future landslide event. An accurate understanding of the landslide hazard for a given facility requires a detailed landslide hazard evaluation by a geotechnical engineer. Such site-specific studies evaluate the slop, soil/rock and groundwater characteristics. Such assessments may require drilling to determine subsurface soil/rock characteristics. In some cases, landslide hazard assessments by more than one geotechnical engineer may reach confliction opinions."

Due to the geology and likelihood of landslide-triggering storms in Clallam County, the probability of future occurrence of landslides is high in the Tribal service area.

Future Probability Trend – Based on potential increases in drought and wildfires, as well as potentially higher intensity precipitation events, the Tribe may be impacted by an **increase** in the probability of future landslides. In addition, as the Tribe increases its land ownership and development, landslides may pose a greater risk on disturbed soils.

Vulnerability

The landslides and erosion in upper watersheds and forest lands are causing recurring damage and disruption to important roadways. Sedimentation from these areas is accumulating in the rivers and streams, causing flooding and habitat degradation. It is uncertain what the precise causes of mass wasting are; whether the roads form a conduit, the failures originate from side cast, or a combination of factors is involved.

Vulnerability posed by landslides to the Tribe is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of the Base Plan, the following Tribal infrastructure types are classified as being susceptible to ground failure or erosion (Jamestown S'Klallam 2015):

- Olympic Discovery Trail Dungeness River/RR Bridge Park (6 structures)
- Cultural or Economic Asset (5 structures)
- Dwellings (2 structures)
- Vulnerable Populations (2 structures)
- Tribal Government and Offices (7 structures)
- Storage and Equipment Facilities (2 structures)
- Wastewater Facilities (4 structures)
- Water Supply (2 structures)
- Transportation (1 structure)

Since the 2015 plan, the Tribe's vulnerability to landslides is **unchanged**.

3.3.10 Drought

Drought

Magnitude	Onset	Duration	Frequency
1	1	5	4

Average	Rank
2.8	12

Location
Drought could impact all Tribal properties that use water to a certain extent. The western portion of the Tribe service area (Sequim) historically has low rainfall and is experiencing rapid development and population increase.

Previous Occurrence/History

During the summer of 2007, the Makah Indian Reservation had a declared emergency due to a water shortage and used rationing and a desalination plant on loan from the Navy to weather the crisis. Since that time, they have increased their water storage capacity and have not suffered any further shortage.

Drought animations over time are available at: http://droughtmonitor.unl.edu/Maps/Animations.aspx (U.S. Drought Monitor 2019).

Extent and Probability

Northeast Clallam County, which is in the rainshadow of the Olympic Mountains, is the most vulnerable to the effects of drought (Desisto et al. 2009).

As the graph below indicates, there has been one period of extreme drought within Clallam County over the last 17 years (U.S. Drought Monitor 2019). During a two-month period in 2015, 100% of the County's area was marked by D3 to D4 droughts (the most intense forms of drought). Additionally, in 2001, 2003, 2006, 2009, 2014, 2017, and 2018, areas of the County experienced moderate to extreme drought. As of May 2019, a drought emergency was declared in the Elwha-Dungeness, Lyre-Hoko, and Soleduc watersheds, which encompass the entirety of Clallam County (Governor of Washington 2019).

Future Probability Trend – Based on potential decreases in annual snowpack and increases in the frequency and magnitude of prolonged heat, the County may be impacted by an **increase** in the probability of future droughts.

Vulnerability

Droughts impact individuals (farm owners, tenants, and farm laborers), the agricultural industry, and other agriculture-related sectors. Lack of snowpack has forced ski resorts into bankruptcy. There is increased danger of forest and wildland fires. Millions of board feet of timber have been lost. Loss of forests and trees increases erosion causing serious damage to aquatic life, irrigation, and power development by heavy silting of streams, reservoirs, and rivers.

Problems of domestic and municipal water supplies are historically corrected by building another reservoir, a larger pipeline, a new well, or some other facility. Short-term measures, such as using large capacity water tankers to supply domestic potable water, have also been used. Low stream flows have created high temperatures, oxygen depletion, disease, and lack of spawning areas for our fish resources.

Drought

The Tribe's vulnerability to drought has **increased** since 2015, as the demand has grown, and historic water supply shifts due to climate change and increased development.

3.3.11 Fire

Fire

Magnitude	Onset	Duration	Frequency
2	4	3	1

Average	Rank
2.5	13

Location

According to the *Community Wildfire Protection Plan* (CWPP), large fires in western Washington typically occur on steep south-facing slopes, and often result from a combination of circumstances including a source of ignition in areas of dry, heavy fuels, an extended period of drought, and dry east winds (Clallam County 2009a). Forest fires in this area usually occur during the dry summer months of July, August, and early September, but they can occur anytime between April and October given the right conditions. Fire hazard increases in the late summer and early fall when hot, dry east winds (subsidence winds) occur more frequently and the area has experienced the low point of the annual precipitation cycle. The portion of the Peninsula with the highest potential for major fires is the area between Port Angeles and Hood Canal, though as residents of Forks can attest, large forest can occur anywhere on the Peninsula (Clallam County 2010).

The following is an excerpt from the previous Jamestown S'Klallam Hazard Mitigation Plan (2015):

> "Wildland and Urban Interface fire can occur throughout the study area. As cool moist air moves inland from the Pacific Ocean, the mountains "dam" clouds, and uplift causes the moisture to drain out of the air and fall as precipitation in the western portion of the Peninsula. On the other side of the rainshadow, the Dungeness Watershed where much of the Jamestown S'Klallam Tribe's land holdings are located is considered one of Washington State's driest watersheds west of the Cascade Mountains. The Sequim Bay area is particularly prone to wildland urban interface fires. Natural fuels in the region range from grasslands which are very dry in the summer months to thick stands of timber with a dense understory."

Previous Occurrence/History

Previous wildland fires that have affected Clallam County include "The Great Forks Fire of 1951," 1955 in the West Twin River area, and 2002 in the Clallam Bay area. The fires in 1951 began near Lake Crescent and burned into and around Forks. Approximately 30 buildings and between 33,000 and 38,000 acres of timber were lost. The 1955 fire burned approximately 5,000 acres of timber. The 2002 fire started as slash burnings on private land. In July 2004, a wildfire ignited near Joyce at Striped Peak, burning between three and four acres of private hillside land. Joyce experienced another wildfire in May 2006 when a controlled burn near the town grew into a five-acre wildfire. From January 2008 to August 2009, 38 different wildfire incidents have occurred within Clallam County, outside of Olympic National Park (Clallam County 2010).

Fire

In December 2003, the City of Port Angeles experienced a significant fire at the Elks Naval lodge, one of the City's largest structures located in the downtown core (Clallam County 2010).

Extent and Probability

A Headwaters Economics study found that Clallam County has more square miles of developed land within the wildland-urban interface than any other county in Washington State (72 square miles) and the fifth most area in the Wildland-Urban Interface (WUI) in the entire United States. The same study found that 13,271 homes were located within the WUI throughout the County (Headwaters Economics 2013).

Weather conditions greatly influence the impact and extent of wildfires. Drought, high temperatures, and wind contribute to a dynamic and changing conditions of wildfires. Fuel load and vegetation contribute to the size and intensity of wildfires.

Wildfires are frequent and inevitable. Within the region, most wildfires burn during the June to October time period.

Future Probability Trend – Based on potential decreases in annual snowpack and increases in the frequency and magnitude of drought and heat, the Tribe may be impacted by an **increase** in the probability of future fires.

Vulnerability

Wildfires in Clallam County generally occur in the lower lying, WUI areas, particularly near Forks, Sequim and Blyn.

Due to the limited number of land-based evacuation routes, the County and Tribe may become isolated during a wildfire—limiting access to healthcare facilities, shelters, and other resources. Other critical infrastructures vulnerable to wildfires include water systems, refined fuel systems, and communications systems.

Vulnerability posed by wildfires (particularly WUI fire) to Clallam County is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of the base plan, the following Tribal infrastructure types are classified as being vulnerable to WUI fire:

- Cultural or Economic Assets (13 structures)
- Dwellings (8 structures)
- Tribal Government and Offices (1 structure)
- Storage and Equipment Facilities (4 structures)
- Vulnerable Populations (2 structures)
- Communications (1 structure)
- Water Supply (1 structure)

Since the 2015 Tribal HMP, development in County population centers has expanded further into the WUI; therefore, the vulnerability has **increased**.

3.4 Vulnerability Assessment

3.4.1 Identifying Critical Infrastructure

Critical infrastructure was identified for this plan update using a combination of the methodology outlined in Section 4.6 of the Base Plan in addition to referring to the comprehensive list of critical infrastructure identified in the Tribe's standalone plan in 2015. This list of critical infrastructure has been updated through review by Tribal members of the MPT.

3.4.2 Severe Repetitive Loss Properties

There are no NFIP-identified severe repetitive loss properties located on Jamestown S'Klallam Tribal lands.

3.4.3 Exposure Assessment

Table 3-3 contains a summary of critical infrastructure associated with the Jamestown S'Klallam Tribe. This list was assembled and updated during the 2015 hazard mitigation planning process. The vulnerability of each structure is to earthquake, tsunami, flooding, severe weather (which includes winter storm and windstorm), fire, and landslide is assessed.

Table 3-3 Jamestown S'Klallam Tribe Critical Infrastructure

Property	Planning Area	Importance to Tribe	Flood	Severe Weather	Earthquake	Ground Failure or Erosion	Tsunami	Wildland Fire
Interpretive Building - Railroad Bridge Park Sequim, WA	Audubon/ Dungeness River	Cultural/Historical/ Educational	H	H	M	M	M	H
Olympic Discovery Trail Dungeness River/RR Bridge Park	Audubon/ Dungeness River	Transportation, tourism	H	H	H	H	H	M
Railroad Bridge Park – Picnic Structure Sequim, WA	Audubon/ Dungeness River	Visitor facilities/ recreational	H	H	M	M	M	H
Railroad Bridge Park Sequim, WA	Audubon/ Dungeness River	Cultural/Historical/ Educational/ Recreational/ Transportation	H	M	H	H	H	M
Railroad Bridge Park - Trestle Railroad Bridge Park Sequim, WA	Audubon/ Dungeness River	Cultural/Historical/ Educational/ Recreational Transportation	H	H	H	H	H	M
Restrooms Railroad Bridge Park Sequim, WA	Audubon/ Dungeness River	Visitor facilities	H	H	M	M	M	H

Table 3-3 Jamestown S'Klallam Tribe Critical Infrastructure

Property	Planning Area	Importance to Tribe	Flood	Severe Weather	Earthquake	Ground Failure or Erosion	Tsunami	Wildland Fire
Wood (no address; just north of RR Bridge Park)	Audubon/ Dungeness River	Recreational	H	H	M	M	M	H
431 Patricia Ln. Sequim, WA	Audubon/ Dungeness River	Conservation	H	H	M	M	M	H
Dungeness Meadows/Couhig	Audubon/ Dungeness River	Conservation	H	H	M	M	M	H
"House of Myths" Carving Building 991 Old Blyn Hwy, Sequim, WA	Blyn (lower)	Cultural asset/ tourism	H	H	H	H	H	L
Annex - Building 991 Old Blyn Highway Sequim, WA	Blyn (lower)	Offices	H	H	H	H	H	L
Annex - Gallery Gift Shop 991 Old Blyn Hwy, Sequim, WA	Blyn (lower)	Cultural and economic asset/ tourism	H	H	H	H	H	L
Annex - Library Collection 991 Old Blyn Hwy Sequim, WA	Blyn (lower)	Cultural assets	H	H	H	H	H	L
Campus Maintenance Bldg 1033 Old Blyn Hwy, Sequim, WA	Blyn (lower)	Equipment facility	H	H	H	H	H	L
Dental Clinic/Community Center 1031 Old Blyn Hwy Sequim WA	Blyn (lower)	Vulnerable population Essential facilities	H	H	H	H	H	L

Table 3-3 Jamestown S'Klallam Tribe Critical Infrastructure

Property	Planning Area	Importance to Tribe	Flood	Severe Weather	Earthquake	Ground Failure or Erosion	Tsunami	Wildland Fire
Display Sign 3830 West Sequim Bay, Sequim, WA	Blyn (lower)	Economic asset	L	H	H	M	M	H
Heron Hall 1033 Old Blyn Hwy, Sequim, WA	Blyn (lower)	Potentially vulnerable population	H	H	H	H	H	L
Mobile Home 271963 Hwy 101 E Sequim, WA	Blyn (lower)	Tribal Rental	H	H	M	L	L	M
Modular 2092 Old Blyn Highway Sequim, WA	Blyn (lower)	Tribal Rental	H	H	H	M	H	M
Garage 931 Old Blyn Highway, Sequim, WA	Blyn (lower)	Exercise facility/Economic	H	H	H	H	H	L
Olympic Discovery Trail Hwy 101-Log Cabin Blyn	Blyn (lower)	Transportation, tourism	H	L	H	H	M	L
Olympic Discovery Trail Hwy 101-Tribal Land Blyn	Blyn (lower)	Transportation, tourism	H	L	H	H	M	L
Rental Dwelling 1950 Old Blyn Hwy Sequim, WA	Blyn (lower)	NAHASDA	H	H	H	M	H	M

Table 3-3 Jamestown S'Klallam Tribe Critical Infrastructure

Property	Planning Area	Importance to Tribe	Flood	Severe Weather	Earthquake	Ground Failure or Erosion	Tsunami	Wildland Fire
Rental Dwelling (Knutson) 2150 Old Blyn Hwy Sequim, WA	Blyn (lower)	Tribal Rental	H	H	H	M	H	M
Rental Dwelling 1790 Old Blyn Hwy Sequim, WA	Blyn (lower)	Tribal Rental	H	H	H	M	H	M
Totems and Carved Panels Sequim, WA	Blyn (lower)	Cultural assets	M	L	H	H	M	M
Tribal Center-Administration 1033 Old Blyn Hwy, Sequim, WA	Blyn (lower)	Offices/Tribal records	M	H	H	M	H	L
Tribal Planning Office 931 Old Blyn Highway, Sequim, WA	Blyn (lower)	Tribal offices, records and archives	H	H	H	H	H	L
Tribal Wastewater Infrastructure – Lower Campus Sequim, WA	Blyn (lower)	Wastewater collection and distribution	H	L	H	H	H	L
861 Old Blyn Hwy Sequim, WA	Blyn (lower)	Tribal Government	H	L	H	H	H	L
2150 Old Blyn Hwy Sequim, WA	Blyn (lower)	Tribe rental	H	L	H	H	H	L
271391 Hwy 101 (Pullout) Sequim, WA	Blyn (lower)	Tribal Government, Tourist facilities	H	L	H	H	H	L

Table 3-3 Jamestown S'Klallam Tribe Critical Infrastructure

Property	Planning Area	Importance to Tribe	Flood	Severe Weather	Earthquake	Ground Failure or Erosion	Tsunami	Wildland Fire
1512 Old Blyn Hwy Sequim, WA	Blyn (lower)	Tribal Government	H	L	H	H	H	L
Jensen-Simms II 1790 Old Blyn Hwy Sequim, WA	Blyn (lower)	Olympic Discovery Trail	H	L	H	H	H	L
Westrem 1083 Old Blyn Hwy Sequim, WA	Blyn (lower)	Tribal Government	H	L	H	H	H	L
Barn 263 Zaccardo Road, Sequim, WA	Blyn (upper)	Equipment storage	M	H	H	M	L	H
Canoe Shed 263 Zaccardo Road, Sequim, WA	Blyn (upper)	Cultural/Historical Asset	M	H	M	M	L	H
Deck and Cover 263 Zaccardo Road, Sequim, WA	Blyn (upper)	Residential appurtenance	M	H	H	M	L	H
Cell Tower – wireless communication facilities	Blyn (upper)	Infrastructure, economic asset	M	H	H	M	L	H
Education Center/ Children's Program Facility 233 Zaccardo Road, Sequim, WA	Blyn (upper)	Vulnerable population	M	H	M	M	L	H
Bus Barn 233 Zaccardo Road, Sequim, WA	Blyn (upper)	Vehicle storage/maintenance	M	H	M	M	L	H

Table 3-3 Jamestown S'Klallam Tribe Critical Infrastructure

Property	Planning Area	Importance to Tribe	Flood	Severe Weather	Earthquake	Ground Failure or Erosion	Tsunami	Wildland Fire
Maintenance Building 263 Zaccardo Road, Sequim, WA	Blyn (upper)	Equipment storage	M	H	M	M	L	H
Rental Dwelling (Carlson) 263 Zaccardo Road, Sequim, WA	Blyn (upper)	Tribal Rental	M	H	M	M	L	H
Scenic Pullout: Interpretive Display Bldg Hwy 101, Sequim, WA	Blyn (upper)	Cultural/Historical tourism	H	H	M	M	H	L
Scenic Pullout: Kiosk Hwy 101 Sequim, WA	Blyn (upper)	Cultural/Historical tourism	H	H	M	M	H	L
Scenic Pullout: Parking and Restrooms	Blyn (upper)	Infrastructure and tourism facilities	H	H	M	M	H	L
Social & Community 70-72 Zaccardo Road Sequim, WA	Blyn (upper)	Vulnerable populations, essential facility Offices and records	M	H	M	M	L	H
Tribal Campus Water Tower & Infrastructure 238	Blyn (upper)	Water Supply	L	H	M	H	L	M
Tribal Wastewater Infrastructure – Upper Campus	Blyn (upper)	Wastewater treatment and disposal	M	M	H	H	L	M
Storage Building (Gesdahl) 233 Zaccardo Road, Sequim, WA	Blyn (upper)	Storage	M	M	M	M	L	H

Table 3-3 Jamestown S'Klallam Tribe Critical Infrastructure

Property	Planning Area	Importance to Tribe	Flood	Severe Weather	Earthquake	Ground Failure or Erosion	Tsunami	Wildland Fire
271754 Hwy 101 Sequim, WA	Blyn (upper)	Tribe rental	M	M	M	M	L	H
395 Correia Rd. Sequim, WA	Blyn (upper)	Tribe rental	M	M	M	M	L	H
271756 Hwy 101 Sequim, WA	Blyn (upper)	Tribe rental	M	M	M	M	L	H
272172 Hwy 101 Sequim, WA	Blyn (upper)	Tribe rental	M	M	M	M	L	H
Carlsborg Self Storage 292 Business Park Carlsborg, WA	Carlsborg	Tribal economic asset; Tribal records, and cultural artifacts and	L	M	M	L	L	L
Parrish 431 Business Park Loop (Ruth's Pl.) Carlsborg, WA	Carlsborg	EDA (JKTX shop)	L	M	M	L	L	L
Economic Development 257 Business Park Loop, Sequim, WA	Carlsborg area	Tribal economic infrastructure, future Data Center and records storage facility	L	M	M	L	L	L
Cedar Greens, 52 Sophus Rd, Sequim, WA 98382	Casino subarea	Economic asset	H	M	M	L	M	M
Dwelling 271020 Hwy 101 Sequim, WA	Casino subarea	Residence	H	H	M	L	H	M

Table 3-3 Jamestown S'Klallam Tribe Critical Infrastructure

Property	Planning Area	Importance to Tribe	Flood	Severe Weather	Earthquake	Ground Failure or Erosion	Tsunami	Wildland Fire
Dwelling/Garage 192 Correia Sequim, WA	Casino subarea	Tribal storage - TGA	H	M	H	H	M	M
Fire Station 54 Sophus Road Sequim, WA	Casino subarea	Critical facility	H	M	M	L	M	M
Well Sophus Road Sequim, WA	Casino subarea	Infrastructure	L	L	L	L	L	L
Dwelling 270934 Highway 101 Sequim, WA	Casino subarea	Tribal Rental	H	H	H	M	H	M
Public Safety and Justice Center, 110 Sophus Rd	Casino subarea	Tribal Government & popup Emergency Operations Center	H	M	M	L	M	M
Seven Cedars Resort - Casino Sequim, WA	Casino subarea	Economic asset; Critical Facility	H	M	M	L	M	H
Seven Cedars Resort - Longhouse Market and Deli 271020 Hwy 101 Sequim, WA	Casino subarea	Economic asset; Critical Facility	H	M	M	L	M	H
Seven Cedars Resort – Wastewater System Sequim, WA	Casino subarea	Wastewater infrastructure	H	M	H	H	L	M
Seven Cedars Resort – Water Tower Sequim, WA	Casino subarea	Water supply and storage infrastructure	M	M	H	H	L	M

Table 3-3 Jamestown S'Klallam Tribe Critical Infrastructure

Property	Planning Area	Importance to Tribe	Flood	Severe Weather	Earthquake	Ground Failure or Erosion	Tsunami	Wildland Fire
TGA Office 192 Correia Sequim, WA	Casino subarea	Tribal offices and records	M	M	H	H	L	M
Dwelling 294 & 295 Woods Rd. Sequim, WA	Casino subarea	Dwelling	M	M	H	H	L	M
Pedestrian Tunnel under Highway 101	Connecting Blyn lower and upper	Transportation	M	M	H	H	L	M
Dwelling 2203 Woodcock Rd. Sequim, WA	Dungeness	Tribal Rental	L	M	H	L	L	M
Dwelling 5831 Woodcock Road Sequim, WA	Dungeness	NAHASDA Rental	M	H	H	L	M	M
Rental Dwelling (Craft) 182 Marinas Way, Sequim, WA	Dungeness	Tribal Rental; future 40 residences	H	M	M	L	L	M
Seven Cedars Resort – Cedars at Dungeness Golf Course Sequim, WA	Dungeness	Economic asset; tourism, recreation, retail, food service	H	H	M	L	L	H
Cemetery Pump House Sequim, WA	Jamestown	Water Supply	H	H	M	L	H	L
Dwelling 1272 Jamestown Rd Sequim, WA	Jamestown	Tribal Rental	H	H	H	M	H	L

Table 3-3 Jamestown S'Klallam Tribe Critical Infrastructure

Property	Planning Area	Importance to Tribe	Flood	Severe Weather	Earthquake	Ground Failure or Erosion	Tsunami	Wildland Fire
Jamestown Water System 1252 Jamestown Road, Sequim, WA	Jamestown	Water Supply	H	H	M	L	H	L
Wood I (no address)	Jamestown	Cultural/Recreational	H	H	M	L	H	L
Wood II (no address)	Jamestown	Cultural/Recreational	H	H	M	L	H	L
Woods III (no address)	Jamestown	Cultural/Recreational	H	H	M	L	H	L
593 Manyfeathers Way Sequim, WA	Jamestown	Tribe rental	H	H	M	L	H	L
Restrooms 593 Manyfeathers Way Sequim, WA	Jamestown	Community facility	H	H	M	L	H	L
Davis	Jamestown	Cultural	H	H	M	L	H	L
Davis II – Carving Shed	Jamestown	Cultural, Economic	H	H	M	L	H	L
281 Manyfeathers Way Sequim, WA	Jamestown	Tribe rental	H	H	M	L	H	L
Garage Building 244 Knapp Road, Sequim, WA	Miller Peninsula	Tribal Rental	L	M	M	L	L	H

Table 3-3 Jamestown S'Klallam Tribe Critical Infrastructure

Property	Planning Area	Importance to Tribe	Flood	Severe Weather	Earthquake	Ground Failure or Erosion	Tsunami	Wildland Fire
Olympic Discovery Trail Miller Peninsula	Miller Peninsula	Transportation, tourism	L	L	M	M	L	H
Rental Dwelling (McFarland) 244 Knapp Road, Sequim, WA	Miller Peninsula	Tribal Rental	L	M	M	L	L	H
Shannon Property Storage 274155 Highway 101, Sequim, WA	Miller Peninsula	Appurtenance	L	H	M	L	L	M
Backhaus Diamond Point Rd. Sequim, WA	Miller Peninsula Subarea	ODT, future economic enterprise	L	H	M	L	L	M
2209 E. 6th Ave. Port Angeles, WA	Port Angeles	Tribe rentals (NAHASDA)	L	H	M	L	L	M
827 W. 9th St. Port Angeles, WA	Port Angeles	Tribe rentals (NAHASDA)	L	H	M	L	L	M
1632 W. 6th St. Port Angeles, WA	Port Angeles	Tribe rentals (NAHASDA)	L	H	M	L	L	M
825 W. 9th St Port Angeles	Port Angeles	Tribe rentals (NAHASDA)	L	H	M	L	L	M
2243 W. 12th St. Port Angeles, WA	Port Angeles	Tribe rentals (NAHASDA)	L	H	M	L	L	M

Table 3-3 Jamestown S'Klallam Tribe Critical Infrastructure

Property	Planning Area	Importance to Tribe	Flood	Severe Weather	Earthquake	Ground Failure or Erosion	Tsunami	Wildland Fire
Bell Street Apts 410 W. Bell St. Sequim, WA	Sequim	Tribe rentals (NAHASDA)	M	H	H	L	L	L
41 Anchor Cove Lane	Sequim	Tribe rentals (NAHASDA)	M	H	H	L	L	L
43 Anchor Cove Lane	Sequim	Tribe rentals (NAHASDA)	M	H	H	L	L	L
109 E. Prairie St. (A&B)	Sequim	Tribe rentals (NAHASDA)	M	H	H	L	L	L
149 W. Alder St.	Sequim	Tribe rentals (NAHASDA)	M	H	H	L	L	L
230 N. Ryser Ave.	Sequim	Tribe rentals (NAHASDA)	M	H	H	L	L	L
286 W. Cedar St.	Sequim	Tribe rentals (NAHASDA)	M	H	H	L	L	L
9971 Old Olympic Hwy	Sequim	Tribe rentals (NAHASDA)	M	H	H	L	L	L
Jamestown Family Health Clinic	Sequim	Medical services	M	H	H	L	L	L
Sequim Sewer Line & Pump Stations	Blyn to Sequim	Wastewater infrastructure	M	L	H	H	H	L

Table 3-3 Jamestown S'Klallam Tribe Critical Infrastructure

Property	Planning Area	Importance to Tribe	Flood	Severe Weather	Earthquake	Ground Failure or Erosion	Tsunami	Wildland Fire
Log Cabin - Resort Training 3830 West Sequim Bay, Sequim, WA	Blyn (lower)	Historical building Tribal records	L	H	H	M	M	H
Log Cabin Pump Bldg 3830 West Sequim Bay Sequim, WA	Blyn (lower)	Critical infrastructure	L	H	H	M	M	H

Key:
NAHASDA = Native American Housing and Self-Determination Act
Source: Jamestown S'Klallam 2015

3.5 Land Use and Development Trends

FEMA	D1. Was the plan revised to reflect changes in development? (Requirement §201.7(d)(3))

The Tribe's Comprehensive Plan (2016) outlines its goals and priorities for continued growth and development. Through acquisitions of economic assets and expansion of existing assets, the Tribe's holdings have grown substantially since 2015.

Changes have been measured by accounting for shifts in land use and public awareness since the adoption of the 2010 County HMP and the 2015 Tribal HMP. Each hazard has been identified as having an increased, decreased, or unchanged vulnerability in this time. Table 3-4 provides a snapshot of how vulnerability has changed since the 2015 Tribal HMP.

Table 3-4 Vulnerability Changes Since 2015

Hazard	Status
Power Outages	+
Winter Storm	+
Earthquake and Tsunami	=
Flooding	+/-
Windstorm	+
Active Shooter	=
Hazardous Materials Incident	+
Disease	+
Landslide	=
Drought	+/-
Fire	+/-

Key:
+ Increased vulnerability
- Decreased vulnerability
+/- Increased vulnerability, but actions taken to decrease vulnerability
= Unchanged vulnerability

4 CAPABILITY ASSESSMENT

FEMA	C1. Does the plan include a discussion of the tribal government's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including an evaluation of tribal laws and regulations related to hazard mitigation as well as to development in hazard-prone areas? (Requirement §201.7(c)(3)(iv))

4.1 Human and Technical Resources

Table 4-1 describes the Tribe's human and technical capabilities to engage in and improve mitigation planning and program implementation.

Table 4-1 Human and Technical Resources Integrated with Hazard Mitigation

Resource	Department	Tasks and Activities Integrated into Mitigation Planning
Tribal Council	Government Office	Ensure mitigation program is incorporated into the Tribe's daily business
Planning Staff	Operations	Oversee mitigation program and encourage integration of mitigation planning into all Tribal activities.
Natural Resources Director	Natural Resources Department	Manage natural resources within the Tribe's properties. Capacities include environmental planning, habitat programs, and fisheries.
Construction Manager	Operations – Building Division	Repair and maintain tribal infrastructure. Oversees Tribal construction projects providing permitting, regulations and project management services.
Economic Development Authority Board of Directors and Staff	Economic Development Authority	Integrate risk reduction into Tribal economic development corporations and plan for strategic expansion.
Grant and Contract Specialist	Finance Department	Manage grant applications and project budgets for tribal programs.
GIS/Data Management Specialist	Natural Resources – Environmental Planning	Integrate hazard data into mapping capabilities of the Tribe.
Tribal Historic Preservation Officer	Operations – Tribal Historic Preservation Office	Integrate risk reduction into protection of Tribal cultural resources.
Other		
Planners or engineers	Operations	Integrate risk assessments and mitigation tactics into ongoing Tribal projects.
Construction professionals	Operations – Building Division	Manage structural mitigation activities for utility services.
Hazardous Materials Planning	Clallam County Local Emergency Planning Council	Develop capacity for local jurisdictions to prepare for and respond to hazardous materials incidents.

4.2 Financial Resources

FEMA	C2. Does the plan include a discussion of tribal funding sources for hazard mitigation projects and identify current and potential sources of Federal, tribal, or private funding to implement mitigation activities? (Requirement §201.7(c)(3)(iv and v))

The Tribe maintains many fiscal and financial resources to support its mitigation program. Table 4-2 identifies specific resources accessible for use.

Table 4-2 Accessible Financial Resources

Financial Resource	Accessible?
Community Development Block Grants	Yes
Capital Improvement Project Funding	Yes
Insurance	Yes
User fees for utility services	No
Incur debt	Yes
State-sponsored grant programs	Yes

Table 4-3 identifies current and potential sources of funding to implement identified mitigation actions contained within the HMP. As a federally recognized tribe, the Jamestown S'Klallam Tribe can access funding directly through the federal government. In addition, funding is also available from the State of Washington and potentially through Clallam County. Funding that is annually negotiated and acquired through self-governance is used to support Tribal programs and activities, including through Indian Health Services (mental health programs, alcohol and substance abuse support, and community health programs) (Jamestown S'Klallam 2018a).

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Federal		
Pre-Disaster Mitigation Program	Federal Emergency Management Agency (FEMA)	Provides funding to develop hazard mitigation plans and implement mitigation actions contained within.
Hazard Mitigation Grant Program	FEMA	Post-disaster funds to hazard reduction projects impacted by recent disasters.
Flood Mitigation Assistance Program	FEMA	Provides funds for flood mitigation on buildings that carry flood insurance and have been damaged by floods.
Community Development Block Grant Program	U.S. Department of Housing and Urban Development	Funds projects that benefit low- and moderate-income communities, prevent or eliminate slums or blight, or meet urgent community development needs posing a serious and immediate threat to community health or welfare.
Emergency Management Performance Grants Program	FEMA/Washington Department of Emergency Management	Provides funding to states for local or tribal planning, operations, acquisition of equipment, training, exercises, and construction and renovation projects.

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Flood Mitigation Assistance	FEMA/Washington Department of Emergency Management	Provides funding to support development of the flood hazard portion of state and local mitigation plans and up to 100% of the cost of eligible mitigation activities. This funding is only available to communities participating in the National Flood Insurance Program (NFIP).
Earthquake State Assistance Program	National Earthquake Hazards Reduction Program Interagency Coordinating Committee	Funds activities including seismic mitigation plans; seismic safety inspections of critical structures and lifelines; updates of building codes, zoning codes, and ordinances; and earthquake awareness and education.
National Fire Plan	U.S. Forest Service	Provides funding opportunities for local wildland-urban interface planning, prevention, and mitigation projects, including fuels reduction work, education and prevention projects, community planning, and alternative uses of fuels.
Risk Mapping, Assessing, and Planning	FEMA	Provides funding and technical support for hazard studies, flood mapping products, risk assessment tools, mitigation and planning, and outreach and support.
Strategic Economic and Community Development Grant	U.S. Department of Agriculture (USDA)	Provides funding in rural areas for multi-jurisdictional plan development and with a community development focus. Available only to rural areas outside of urbanized zone of any city with a population greater than 50,000.
Coastal Ecosystem Resiliency Program	National Oceanic and Atmospheric Administration	Provides funding for ecosystem restoration. Governor must approve project funds prior to award and there is a 2:1 cost-sharing ratio.
State		
Washington State Department of Transportation (WSDOT) Avalanche Forecasting and Control	WSDOT	Avalanche forecasting determines the potential risk along a particular mountain slope. When an avalanche hazard develops, WSDOT uses artillery, or explosives to trigger the avalanche. In addition to active avalanche control, WSDOT also uses passive control methods to control snow slides.
Washington Sea Grant	Washington Sea Grant	Washington Sea Grant provides funding opportunities through State and National competitions, program development services, and sponsorships.
Water Resources Program	Washington Department of Ecology (Ecology)	Ecology's Water Resources Program provides support in monitoring water supply, managing water supply projects, overseeing water rights, performing streamflow restoration, protecting streamflow, regulating well construction and licensing, and ensuring dam safety.
WSDOT Seismic Retrofit Program	WSDOT	WSDOT provides funding and project support to retrofit bridges at risk of failure due to seismic events.
Washington State Department of Agriculture (WSDA) Livestock Inspection Program	WSDA	Dedicated to providing asset protection for the livestock industry by recording brands, licensing feedlots and public livestock markets by conducting surveillance and inspection of livestock at time of sale and upon out of state movement. The program is funded by fees paid by the livestock industry and receives no general fund dollars.

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Washington Local Emergency Planning Committee Program	Washington Emergency Management Division (EMD)	Washington EMD provides funding support to ensure Local Emergency Planning Committees (LEPCs) can be implemented across the state.
Washington Pipeline Safety Program	Washington Utilities and Transportation Commission	The commission is responsible for developing and enforcing safety standards for natural gas and hazardous liquid pipelines located within the state. The commission also inspects the portions of interstate natural gas and hazardous liquid pipelines located within Washington State; the standards and enforcement actions are the responsibility of the federal Pipeline and Hazardous Materials Safety Administration (PHMSA).
State Water Pollution Control Revolving Fund	Washington DEC	This program provides funds to local governments to set up low-interest loan programs to repair or replace failing on-site sewage systems. Property owners unable to qualify for conventional bank loans and marine waterfront property owners can use the program to get loans to fix or replace their systems where failures might directly affect Puget Sound. Both the Clean Water State Revolving Fund and the Centennial Clean Water Program.
Other		
Community Planning Assistance Teams	American Planners Association Foundation	Provides pro bono technical assistance for planning frameworks or community vision plans for communities needing extra assistance. Local governments are responsible for travel costs.
Thriving Resilient Communities	Threshold Foundation	Wide-ranging resiliency project funding.
Kresge Foundation Environmental Grants	Kresge Foundation	Provides funding for climate adaptation and mitigation, as well as sustainable water resources management.

4.3 Legal and Regulatory Resources

Table 4-4 describes the legal and regulatory capabilities, including plans, policies, and programs that have integrated hazard mitigation principles into their operations. The capabilities below are County and Tribe specific.

Table 4-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2015-2019)	Hazard Mitigated
Plans	County Comprehensive Emergency Management Plan	Outlines roles and responsibilities of tribal government in mitigating potential hazards.	▪ Incorporation of partners into emergency planning into operations	All
	Comprehensive Plan	The Tribe's Comprehensive Plan establishes community and governance goals that guide the Tribe's self-reliance through future expansion.	▪ Develop plan to establish goals and priorities for Tribal citizens	All

Table 4-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2015-2019)	Hazard Mitigated
	Floodplain Management Plan	The County has developed a Dungeness River Comprehensive Flood Hazard Management Plan to study the risk of flooding along the river. The Tribe participated in plan development as co-leaders of the Dungeness River Management Team (DRMT)	▪ Plan was approved by Washington Department of Ecology in 2010	Flooding
	Dungeness Watershed Plan: Protecting and Restoring the Waters of the Dungeness	A watershed-based plan prepared in compliance with Section 319 of the Clean Water Act.	▪ Ongoing implementation	Flooding
	State of Washington Enhanced Hazard Mitigation Plan	Profiles hazards throughout the State, assesses risks, and outlines potential mitigation actions.	▪ Collaboration between State and County	All
Policies	Tribal Code Title 29: Building and Development Code	Provides code to cover the construction, renovation, and removal of buildings on, and the development of, the trust and reservation lands of the Jamestown S'Klallam Tribe.	▪ Current code May 1, 2017.	All
	Tribal Code Title 27: Building and Development Code	Tribal Environmental Policy Act (TEPA). Provides code to cover procedures for emergency construction and other activities directly related to emergencies.	▪ TEPA was approved on July 27, 2009.	All
	Coastal Zone Management Plan	Regulates development in potentially hazard prone areas.	▪ Ongoing implementation	Flooding
	National Flood Insurance Program (NFIP)	NFIP aims to reduce the impact of flooding on private and public structures.	▪ All participating jurisdictions currently participate in NFIP	Flooding

4.4 FEMA Funded Hazard Mitigation Projects

The County and Tribe have received funding for several hazard mitigation projects to date. Table 4-5 outlines past FEMA funded hazard mitigation projects.

Table 4-5 FEMA Funded Hazard Mitigation Projects

Disaster ID#	Program	Project Title	Sub Grantee
1361	Hazard Mitigation Grant Program (HMGP)	Clallam Hazard Mitigation Plan	Clallam County

Table 4-5 FEMA Funded Hazard Mitigation Projects

Disaster ID#	Program	Project Title	Sub Grantee
1037	HMGP	Bogachiel/La Push Road Bank Stabilization	Clallam County
1734	HMGP	Amendment 1 -Jamestown S'Klallam Tribe Hazard Mitigation Plan	Jamestown Reservation
4243	HMGP	Clallam County Hazard Mitigation Plan	Clallam County
1963	HMGP	Amend 1: Clallam County - GIS Data Enhancement and HAZUS Analysis	Clallam County

4.5 Continuity of Operations Planning

Continuity of government and continuity of operations (COOP) planning is an integral piece to any mitigation program. Ensuring the County has the ability to operate following an incident immediately mitigates the magnitude of many hazards. At this time, the Tribe does not have a COOP.

4.6 Coordination with Community Partners

The Tribe has longstanding relationships with community partners. As a reservation-less tribe to work alongside their community partners to address issues as they arise. Many of these community partners participated in the HMP update process and collaborate with the Tribe on an ongoing basis.

- **Education**
  - Cape Flattery School District
  - Quillayute Valley School District
  - Crescent School District
  - Port Angeles School District
  - Sequim School District
- **Business and Industry**
  - Local Chambers of Commerce
- **Healthcare**
  - Olympic Medical Center
  - Forks Community Hospital
- **Utilities**
  - Clallam County PUD (Water, Sewer, and Power)
  - Diamond Point Water System
  - Crescent Water Association

4.7 National Flood Insurance Program Participation

FEMA	C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.7(c)(3))

Clallam County, Forks, Port Angeles, and Sequim maintain active NFIP policies. The Lower Elwha Klallam Tribe also maintains active policies. The Jamestown S'Klallam Tribe is covered under the Clallam County policies.

Table 4-6 contains a summary of Clallam County, local jurisdiction, and Tribal government total coverage and losses under the NFIP.

Table 4-6 National Flood Insurance Program Coverage and Losses

Community Name (Number)	Total Coverage (in Thousands)	Total Dollars Paid
Clallam County * (530021)	$97,187	$903,327
Forks, City Of (530022)	$400	$--
Lower Elwha Klallam Tribe (530316)	$1,715	$--
Port Angeles, City Of (530023)	$6,001	$75,632
Sequim, City Of (530301)	$2,148	$55,798

Source: FEMA NFIP Policy and Loss Data by Geography (2019) https://www.fema.gov/policy-claim-statistics-flood-insurance

4.8 Integration of Mitigation into Existing Planning Mechanisms

Integration of the principles of mitigation into the Tribe's daily operations and ongoing planning activities is a priority of the County's mitigation program. These activities will support:

- Raising awareness of the importance of hazard mitigation for the whole community;
- Facilitating an understanding that hazard mitigation is not just an 'emergency services' function and building ownership of mitigation activities across the organization;
- Reducing duplication or contradiction between County and jurisdictional plans; and
- Maximizing planning resources through linked or integrated planning efforts.

The Tribe is encouraged to consider integration actions into planning mechanisms including:

- Budget decision-making;
- Building and zoning ordinances and decision-making;
- Emergency planning mechanisms; and
- Economic developing planning and decision-making.

4.8.1 Existing Plans

FEMA	C6. Does the Plan describe a process by which the tribal government will incorporate the requirements of the mitigation plan into other planning mechanisms, when appropriate? (Requirement §201.7(c)(4)(iii))

The following existing plans provide ongoing opportunity for integration of hazard mitigation and the County will work with plan owners and stakeholders to consider hazard mitigation data and principles when these plans are updated. Table 4-7 contains a summary of the Tribe's existing plans and how each incorporates the hazard mitigation planning.

Table 4-7 Summary of Tribal Plans

Tribal or County Plan	Hazard Mitigation Components
Comprehensive Emergency Management Plan (2016)	County-wide: Outlines hazard mitigation roles and responsibilities.
Comprehensive Land Use Plan (2016)	Identifies Tribal land use goals and priorities.
Lower Dungeness Flood Management Plan (2009)	Outlines strategies that directly or indirectly mitigate the risks posed by flood hazards.
Tribal Transportation Plan (2003)	Identifies strategies to move transportation goals forward. Identifies areas of potential traffic hazard.
Outdoor Recreation Plan (2010)	Prioritizes the Dungeness River as a greenway corridor for the benefit of fish, wildlife, flood protection, people and open space.

5 MITIGATION STRATEGY

FEMA	C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for the [Jamestown S'Klallam Tribe] being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.7(c)(3)(ii))

5.1 Review of 2015 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2015 plan were evaluated to determine what the status of the action was and whether any ongoing or incomplete actions should be included as actions in the 2019 plan update. The MPT worked through each previous action during MPT Meeting #1 to document steps taken to fulfill the action.

See Table 5-3 for an overview of the status of all actions from the 2015 plan in addition to new actions for the 2019 update.

5.2 Identification and Analysis of New Mitigation Actions

In order to achieve the mitigation goals identified above, the Tribe has identified a comprehensive series of mitigation objectives and supporting actions that are focused on reducing vulnerability and maximizing loss reduction. The actions can typically be broken out into the following types of activities, which are indicated in Table 5-1.

Table 5-1 2019 Mitigation Actions by Group

Mitigation Group	Related Mitigation Actions
Plans and Regulations	JSK01, JSK05, JSK16
Infrastructure/Capital Project	JSK02, JSK03, JSK04, JSK12, JSK17
Natural System Protection	JSK03, JSK06, JSK08, JSK09
Education and Awareness	JSK07, JSK09, JSK11, JSK13
Preparedness and Response	JSK14, JSK15, JSK16, JSK18, JSK19

All mitigation actions identified in the plan are addressed in the mitigation implementation plan, provided in Section 5.3. The actions include both interim- and long-term strategies for reducing vulnerability to hazard and are characterized as such in the 'life of action' column of the implementation plan.

5.2.1 2019 Mitigation Actions by Hazard

All mitigation actions identified in the plan address at least one priority hazard outlined in Chapter 4 of the HMP. Table 5-2 indicates which mitigation actions address which hazards.

Table 5-2 2019 Mitigation Actions by Hazard

Hazard	Related Mitigation Actions
All Hazards	JSK02
Power Outages	JSK11, JSK12
Winter Storm	JSK11, JSK12
Earthquake and Tsunami	JSK01, JSK04, JSK14, JSK15, JSK16, JSK17
Flooding	JSK03, JSK04, JSK05, JSK06, JSK07, JSK16, JSK17
Windstorm	JSK11, JSK12
Active Shooter	
Hazardous Materials Incident	
Disease	
Landslide	JSK08, JSK09
Drought	JSK12, JSK13
Fire	JSK18, JSK19

A complete mitigation implementation plan is provided in Table 5-3.

5.3 2019-2025 Mitigation Implementation Plan

FEMA	C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by [the City of Sequim]? (Requirement §201.7(c)(3)(iii))

The mitigation implementation plan lays the groundwork for how the mitigation plan will be incorporated into existing planning mechanisms and how the mitigation actions will be prioritized, implemented, and administered by the Tribe. The implementation plan includes both short-term strategies that focus on planning and assessment activities, and long-term strategies that will result in ongoing capability or structural projects to reduce vulnerability to hazards.

See Appendix D for Mitigation Action Worksheet instructions and completed Mitigation Action Worksheets for each action listed in Table 5-3.

Table 5-3 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
JSK01	Seismic assessment of Tribal facilities	New	3,4,5	Tribe	1-3 years	$10,000 - $20,000	No	FEMA	Tsunami, Earthquakes	19	6	25	11
JSK02	Improve communications in Blyn Basin, including building cellular tower and installing fiber internet.	New	1	Tribe	1 year	$400,000 for cellular tower	Yes	Tribe	All hazards	20	6	26	5
JKS03	Lower Dungeness River Floodplain Restoration, including 3 Crabs Rd.	2015 Action – Ongoing, funding secured, and removal of dikes and levees continues.	5	Tribe, Clallam County, Washington Department of Fish and Wildlife	5 years	$10 million	Yes	WA Floodplains by Design, Construction funding from ACOE	Flooding	20	8	28	3
JSK04	Structure elevation and/or relocation of Tribal facilities and infrastructure	2015 Action – Ongoing, Tribe is reducing investment in nearshore properties and moving sewers upgradient of flood-prone areas.	5	Tribe	Variable	TBD	Yes	HMGP	Flooding, Tsunami	19	8	27	4
JSK05	Coordinate with County on the implementation of the NFIP Program	2015 Action – Ongoing, Jimmycomelately Creek is still not mapped correctly by FEMA after reconstruction. Buildings are mapped in former floodplain. New Casino expansion may be in new floodplain.	5	FEMA, Tribe, County	Ongoing	Operations costs	Yes	FEMA, Tribe	Flooding	12	8	20	19
JSK06	Encourage native vegetation on shorelines and formation of dunes	2015 Action – Ongoing, Three Crabs area has been revegetated (2018). This is an ongoing focus for future flood plain restoration projects.	5	Tribe	Ongoing	Minimal	Yes	Pre-Disaster Mitigation Fund, U.S. Department of Agriculture	Flooding	21	4	25	12

Table 5-3 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
JSK07	Public education around flood mitigation, floodplain functions, emergency service procedures, and potential hazards.	2015 Action – Ongoing. The Tribe is building an educational center, tsunami signage is complete in Blyn. The evacuation plan is unchanged, but some elements will change with the addition of overnight guest facilities at Casino.	6	Tribe	Ongoing	Staff time	Yes	PDM	Flooding	18	6	24	13
JSK08	Limit removal of vegetation in areas prone to ground failure. Plan ground cover where appropriate.	2015 Action – Ongoing.	5	Tribe, County	Variable	Minimal	Yes	Tribe	Landslide	18	4	22	15
JSK09	Encourage residents and landowners to leave natural erosion barriers, such as driftwood logs on the shore, in place to reduce shoreline erosion.	2015 Action – Ongoing.	5,6	Tribe	Variable	Minimal, staff time.	Yes	Tribe	Landslide	18	4	22	16
	StormReady	2015 Action – Complete	5,6	Clallam County, State, Tribe	Ongoing	Staff time, in-kind services	Yes	Tribe	Windstorm, Winter Storm				
JSK11	Conduct severe weather awareness activities.	2015 Action – Ongoing. Main objective of creating home emergency kit was completed. Public communication is ongoing.	5,6	Clallam County, Tribe	Ongoing	Staff time, in-kind services	Yes	Tribe	Windstorm, Winter Storm	20	6	26	7
JSK12	Develop alternate water supplies to provide reserve water sources to be used in event of drought or water shortage.	2011/2015 Action – New for this 2019 Plan because of recent rapid population growth in Blyn.	4	Tribe	1-3 years	$1,000,000	Yes	HUD Indian Community Development Grand Program	Windstorm, Winter Storm, Drought	18	4	22	17
JSK13	Create and expand water efficiency/conservation programs.	2015 Action – Ongoing and Active.	5,6	Tribe	5 years	Up to $25,000	Yes	Tribe, Grants	Drought	18	4	22	18
JSK14	Continue to participate in TsunamiReady with Clallam County	2015 Action – Ongoing	6	Clallam County, Tribe	Ongoing	Staff or volunteer time, in-kind services	Yes	Minimal	Tsunami	20	6	26	8
JSK15	Develop advanced warning systems	2015 Action – Ongoing, continue to communicate with WEMD, Great Shakeout Official Partners, locations of AHAB have been determined.	3	Clallam County, Tribe	Ongoing	Staff or volunteer time, in-kind services	Yes	Minimal	Tsunami	20	6	26	9

Table 5-3 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
JSK16	Study and implement wellhead protection measures to ensure continued water supply for the Jamestown Beach community in the event of tsunami or extreme flooding.	2015 Action – Ongoing. Accessed funds, hired consultant, and study will be complete in 2019.	4	Tribe	1 year	<$5,000	Partial	CDBG-GP Grand, EPA Grants, USDA Rural Development Loans or Grants	Flooding, Tsunami	20	6	26	10
JSK17	Explore feasibility of incorporating elevated tsunami shelters or vertical evacuation structures in future construction plans in vulnerable zones in Blyn (7 Cedars Resort Casino & Tribal Government).	2015 Action – Not complete, especially with continued development in Blyn and expansion of Casino.	4	Tribe	5 years	Unknown	Yes	FEMA	Flooding, Tsunami	20	10	30	1
JSK18	Fuel reduction projects and defensible space around structures	2015 Action – Ongoing	5	Tribe and County	1-5 years	Unknown	Yes	U.S. Forest Service Grants	Wildfire	19	10	29	2
JSK19	Promote FireWise building design for construction in the Vision Master Plan and Housing Programs	2015 Action – Ongoing	5,6	Tribe and County	Ongoing	Staff Time	Yes	ICDBG, US Forest Service, BLM	Wildfire	17	6	23	14
Adopt the Hazard Mitigation Plan (HMP)		Completed – Re-adopting updated 2019 HMP		Planning Department	1 year	N/A	Yes	N/A	All hazards				

Key:
STAPLEE - Strategy and Prioritization Methodology

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Lower Elwha Klallam Tribal Annex – Clallam County Hazard Mitigation Plan

DRAFT – 2019 Plan Update

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

Tables

Figures

1 INTRODUCTION

1.1 Lower Elwha Klallam Tribe Hazard Mitigation Program

Throughout the hazard mitigation planning process, the Emergency Management Coordinator Glen Roggenbuck was the main point of contact for the Lower Elwha Klallam Tribe (herein referred to as 'Tribe'). He attended one or more Mitigation Planning Team (MPT) meetings.

See Appendix E for the completed Federal Emergency Management Agency (FEMA) Local Plan Mitigation Review Tool for the Lower Elwha Klallam Tribe.

2 COMMUNITY PROFILE

2.1 Tribal Sovereignty and Governance

The following text is excerpted from the 2011 Lower Elwha Klallam Draft Tribal Hazard Mitigation Plan (HMP):

> "The Lower Elwha Klallam Tribe is a sovereign, federally-recognized Indian Nation, with its own constitution and government. The Lower Elwha Tribal Council, or Business Committee, which consists of five elected officials serving staggered three-year terms, governs the Tribe.
>
> The Business Committee has full and ultimate responsibility for management of all Tribal programs operating on an annual budget. The C.E.O. oversees and manages all functions of the Lower Elwha Klallam Tribe, which includes the Tribe's enterprises. The Community Council, comprised of the eligible voting Tribal members, enacts the laws for the governance of the land and the people under its jurisdiction. In the absence of a quorum of the Tribal Council, a quorum of the Business Committee serves this function." (Lower Elwha Klallam Tribe 2011)

The Tribal departments are listed below:

- Carnegie Museum
- Education
- Elwha Klallam Heritage Center
- Elwha Klallam Veterans
- Elwha Library
- Employment Opportunities
- Klallam Counseling Services
- Lower Elwha Family Advocacy
- Low Income Home Energy Assistance Program
- Lower Elwha Head Start and Early Head Start
- Lower Elwha Dental Clinic
- Lower Elwha Health Clinic
- Lower Elwha Police Department
- Lower Elwha Social Services
- Lower Elwha Tribal Temporary Assistance for Needy Families
- Natural Resources
- River Restoration
- Tribal Court
- Tribal Programs
- Tribal Enrollment
- Tribal Government
- Vocational Rehabilitation Program

2.2 Geography and Climate

Figure 2-1 contains an overview of the planning area. The following text is excerpted from the 2011 Lower Elwha Klallam Draft Tribal HMP regarding the geography of the planning area:

> "The Lower Elwha Tribe is located near Port Angles, Washington, on the north shore of the Olympic Peninsula about 67 miles northwest of Seattle.
>
> The Elwha Tribal lands consist of the main reservation found at the mouth of the Elwha River. Additional land in the delta was added in 2001 and 2002. The Tribe has additional Reservation and Trust lands outside of the delta for housing near Price Road. The Tribe owns two fee properties on Highway 101 near Dry Creek Road and is currently occupied for its health clinic and police department. The Tribe has scattered fee properties in Port Angeles, including land at Tse-whit-zen and Ediz Hook. Individual Trust land is located east of Pysht, on Highway 112, about 22 miles west of the Reservation. Altogether Tribal lands make up about 1,780 acres or 2.8 square miles.
>
> The Elwha Reservation is split into multiple pieces with two parcels of land holding most of the residential areas. These are usually referred to as the Upper and Lower Reservations. The Lower Reservation, located at the Elwha Valley contains most of the Tribal facilities, the Tribal Center, and has 65 [Housing and Urban Development] HUD homes.
>
> The Upper Reservation is a large parcel of land (25.63 acres) that has 32 HUD homes plus a community center called The Gathering Place." (Lower Elwha Tribe 2011)

The following text is excerpted from the 2011 Lower Elwha Klallam Draft Tribal HMP regarding the climate of the planning area:

> "The climate of the Elwha River delta region is strongly influenced by the rainshadow effect of the Olympic Mountains and the moderating influence of the ocean. Precipitation in Port Angeles, just five miles to the east, averages 26 inches per year, while precipitation in the river's headwaters 25 miles to the south may reach 220 inches per year. The Elwha Ranger Station at RM 12 averages a total of 56 inches of precipitation per year (USDA-SCS 1987). Port Angeles averages 8 inches of annual snowfall while the western slope of the Olympic mountains may receive over 300. It is not unusual to have a 100-inch snowpack remaining in spring. The extreme variance in precipitation is caused by orographic cooling, in which moist Pacific air masses coming from the southwest are forced to rise in elevation when they meet the Olympic Mountains. As the air mass rises, it cools and loses most of its moisture in the form of precipitation on the windward side of the mountains. The high rainfall tends to drain to the west side of the Peninsula and result in a corresponding rainshadow effect to the northeast.

There is a distinct pattern of precipitation in this region, with ninety per cent of all precipitation occurring in the period from October to April. Peak rainfall typically occurs between late November and the end of January. Due to the barrier created by the Olympic Mountains to the south, prevailing winds tend flow primarily in an easterly direction, with maritime air flowing from the west. Gale force and higher wind speeds often occur in winter months. High pressure zones in the continental interior may cause strong northeasterly flows across the plan area. These events are usually associated with the coldest temperatures of the year. During periods of stagnant air flow, pollution originating in urban Puget Sound is common.

Temperature extremes tend to be moderated by summer winds and maritime influences. The mean annual temperature is 49.6°F. Average maximum summer temperatures seldom exceed 75°F, while average winter lows seldom drop below freezing. Temperatures recorded in Port Angeles between 1917 and 1965 show an extreme high of 94°F (July) and a low of 6°F in December (COE 1987).” (Lower Elwha Klallam Tribe 2011)

2.3 Population and Demographics

The following text is excerpted from the 2011 Lower Elwha Klallam Draft Tribal HMP regarding the history, population, and demographics of the Tribe:

“The Tribe is a party to the 1855 Treaty of Point No Point and its members are the direct successors of the Klallam people who lived for centuries in villages along the Peninsula’s north coast and southern Vancouver Island, from Port Angeles Harbor west to the Hoko River. The United States acquired the original land base in trust for the Tribe in 1936, and formally proclaimed these lands as the Lower Elwha Reservation in 1968. Today, the Lower Elwha Klallam Tribe governs the Lower Elwha Indian Reservation and adjacent trust lands, roughly 1,000 acres on the north coast of the Olympic Peninsula just 8 miles west of Port Angeles, Washington, where the Elwha River flows into the Strait of Juan de Fuca. The current enrolled Tribal membership stands at 887 members with approximately 580 living on reservation lands in the Elwha Valley and in the vicinity of Ranger Road approximately 8 miles to the west.” (Lower Elwha Klallam Tribe 2011)

2.4 Cultural Resources

The following text is excerpted from the 2011 Lower Elwha Klallam Draft Tribal HMP regarding the cultural and sacred resources of the Tribe:

“The Elwha River valley is the cultural and spiritual home of the Lower Elwha Klallam Tribe. The Klallam people have continually resided here for many centuries. Cultural resources include traditional sites, structures, landscapes, archaeological, ethnographic and ethnohistoric sites (ONP 1995). The river and surrounding land fed, sheltered, and sustained the people, as well as provided access to the interior of the Olympic

Peninsula. When the Elwha Dam was completed in 1912, the ensuing loss of anadromous fish runs and the loss of access to spiritual sites devastated the Elwha Klallam people.

Beach Lake

The southern (landward) shore of Beach Lake is known to be an area of historic gravesites that were used for many generations. However, the extent of the gravesite area has never been mapped or delineated. Prof. John Albright, of the University of Washington, unearthed approximately 100 pounds of beads, bracelets, and a variety of other 'curios' (grave goods) at this site in August 1923. A brief account of this 'discovery' was published in Port Angeles Evening News on August 30, 1923. The 'collection' was transported by Professor Albright to the American Museum of Natural History of New York, where it is assumed to remain today.

S'Klallam Villages

The S'Klallam, of which the Lower Elwha Tribe is the western band, had 32 villages spread along the north shore of the Olympic Peninsula and the south shore of Vancouver Island near Becher Bay and Cape Calver, 12 miles southwest of present-day Victoria. In the immediate area of the Reservation, there are at least four village sites and two in nearby Port Angeles, Tse-whit-zen and Ennis Creek. In the late 19th and part of the 20th century, Tribal members also lived on Ediz Hook before moving to the reservation area." (Lower Elwha Klallam Tribe 2011)

Additional information on the vulnerability of these resources to hazards is detailed in Chapter 3 of this Annex.

2.5 Tribal Land Use and Ownership

The following text is excerpted from the 2011 Lower Elwha Klallam Draft Tribal HMP regarding the current land use of the Tribe:

"Land use in the planning area generally complies with Clallam County zoning and shoreline management designations…A significant portion of privately owned land has been harvested and converted for residential uses. Individual Indian allotment and reservation land in the Elwha Heights area is used for rural residential purposes.

Most of the area that is not developed is covered with brush and unmanaged second growth timber. Both [Department of Natural Resources] and corporate timberlands hold acreage adjacent to the Elwha Heights area on Ranger Road. There are also large gravel pits in the vicinity of Elwha Heights and Place Road. Washington Department of Natural Resources (DNR) lands in the study area are used primarily for timber production. These are generally stocked with conifers (Douglas-fir) on short (50 year) rotations and were last harvested in the 1960s and 70s.

[The Elwha River] provides recreational, commercial, and Native American subsistence fisheries, as well as general recreational use. Salmon and steelhead fishing are a major recreational activity. A public access and boat launch below the Elwha Road Bridge and at the private levee at Place Road are well used during the fishing season by the general public. In addition, privately owned fishing camps adjoin the river below Hunt Road and trails follow the riverbanks in less accessible areas.

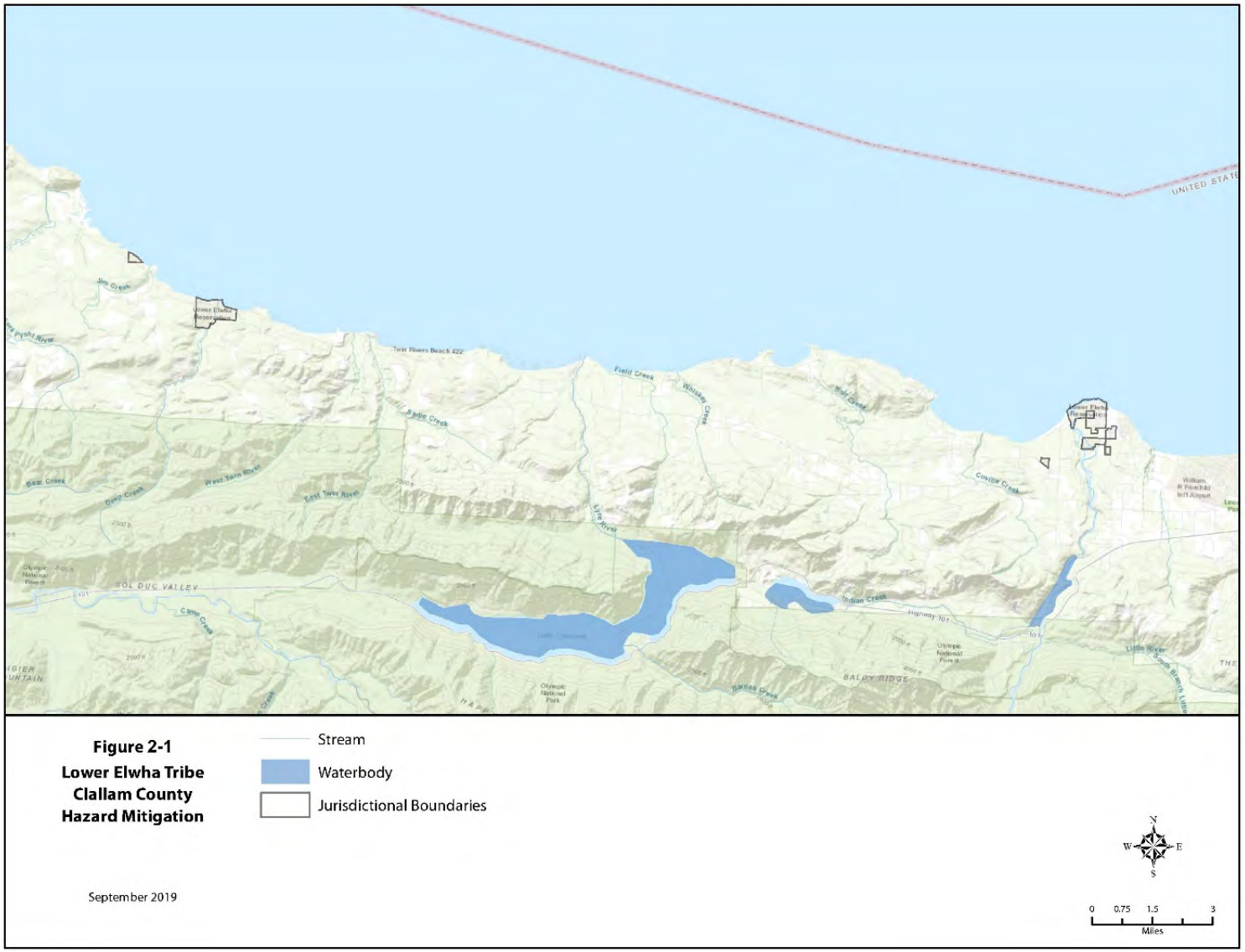
Other recreational activities include beach walking and birding, mainly by users of the public dike access on Place Road. An activity that has become popular is surfing the break on the east side of the mouth of the Elwha. Unfortunately, this has led to conflicts between Tribal members and some surfers. As a result, an ordinance was passed in 1998 that prevents non-Tribal members from accessing the beach areas without a Tribal escort.

Land use on the Lower Elwha Klallam Reservation is sharply delineated by the 7,700-foot-long levee built by the U.S. Army Corps of Engineers (USACE) in 1989. Approximately 215 acres of Trust and reservation land on the delta is protected from flooding while approximately 330 acres are dedicated to flood abatement. The Federal Flood Control Levee was constructed 400 to 3,000 feet from the existing Elwha River channel. It has since become accepted as a feature of the landscape, despite the relocation of some residents from their former homes. The landscape east of the levee is now thought of as 'the Tribal Community Side' while the land to the west belongs to 'the River.' The levee follows the 200-year flood contour, with the exception of a 450-foot opening adjacent to the beach and estuary.

The Tribal Community land to the east of the levee and above the 100-year flood elevation is held for rural residential use, agriculture, limited timber production and some industry. Agricultural use of the delta is primarily devoted to pasture: either via grazing or hay production. Much of the land formerly in pasture has, during the past decade, been converted to Tribal housing.

Tribal land within the 100-year floodplain on the River side of the levee is designated as Community Forest land and includes approximately 388 acres. Community Forest lands between the Flood Control Levee and the Elwha River are to be used for sustainable forestry practices, as directed by the L.E.K.T. Community Forest Management Plan (1996). Development is not permitted in this region." (Lower Elwha Klallam Tribe 2011)

Figure 2-1 Lower Elwha Tribe



3 HAZARD PROFILES AND VULNERABILITY ASSESSMENTS

Chapter 3 contains hazard profiles and vulnerability assessments to determine the potential impact of hazard to the people, economy, and built and natural environments of the Lower Elwha Klallam Tribe. They have been streamlined to increase the effectiveness and usability of the HMP.

FEMA	B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect [the Lower Elwha Klallam Tribe]? (Requirement §201.7(c)(2)(i)) B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for [the Lower Elwha Klallam Tribe]? (Requirement §201.7(c)(2)(i)) B3. Does the plan include a description of each identified hazard's impact as well as an overall summary of the vulnerability of the tribal planning area? [44 CFR § 201.7(c)(2)(ii)]

3.1 General

Clallam County has encountered several major disaster declarations that have affected the Lower Elwha Klallam Tribe. In total, the County has experienced 21 disaster declarations since 1953. Table 3-1 identifies the disaster declarations since 2010.

Table 3-1 Clallam County FEMA Disaster Declarations

Disaster ID	Date of Declaration	Disaster Type	Incident Period
DR-1956	05-Mar-12	Severe Winter Storms, Flooding, Landslides, and Mudslides	14-Jan-12 to 23-Jan-12
DR-4242	15-Oct-15	Severe Windstorm	29-Aug-15
DR-4249	1-Jan-16	Severe Storms, Straight-line Winds, Flooding, Landslides, and Mudslides	12-Nov-15 to 21-Nov-16
DR-4253	2-Feb-16	Severe Winter Storm, Straight-line Winds, Flooding, Landslides, Mudslides, and a Tornado	1-Dec-15 to 14-Dec-15
DR-4418	4-Mar-19	Severe Winter Storms, Straight-line Winds, Flooding, Landslides, Mudslides, Tornado	10-Dec-18 to 24-Dec-18

Source: FEMA, Washington Disaster History, Major Disaster Declarations (https://www.fema.gov/data-visualization-disaster-declarations-states-and-counties)

The hazard profiles and vulnerability assessments contained in this chapter represent a considerable amount of work performed by the MPT. MPT members ranked hazards using several key considerations, followed up by activities to validate hazard analysis results and identify specific areas of risk. Table 3-2 displays the hazards that MPT selected for further assessment.

Table 3-2 Hazards Addressed in Plan

Hazard Type	Hazard Name
Natural Hazards	Earthquake Cascadia Earthquake Landslide Winter Storm Windstorm Wildfire Flooding Tsunami

3.2 Hazard Ranking Methodology

The hazards identified in the HMP were initially ranked based on MPT feedback during MPT Meeting #1 and #2. The 2011 Lower Elwha Klallam Draft Tribal HMP was also consulted to ensure continuity of Tribal priorities.

Following the individual hazard ranking activity, the results were aggregated to show a final score for the Tribal MPT member. The hazard aggregate is available in Figure 3-1.

Figure 3-1 Lower Elwha Klallam Tribe Hazard Ranking

	Magnitude (1=lowest, 5=highest)	Onset (1=slowest, 5=fastest)	Duration (1=shortest, 5=longest)	Frequency (1=lowest, 5=highest)		Average	Rank
Earthquake	5	5	5	1		4	1
Cascadia Earthquake	5	5	3	1		4	2
Landslide	2	5	3	5		4	3
Winter Storm	2	3	3	5		3	4
Windstorm	2	4	2	5		3	5
Wildfire	3	5	2	3		3	6
Flooding	1	4	2	2		2	7
Tsunami	2	4	2	1		2	8

3.3 Hazard-Specific Profiles and Risk Assessments

The following section profiles each hazard identified in Section 3.2 and assesses the risk associated with each. Each risk assessment considers the following attributes:

- **Location:** An indication of geographic areas that are most likely to experience the hazard.
- **Past Occurrences/History:** Similar to location, a chronological highlight of recent occurrences of the hazard accompanied by an extent or damage cost, if available.
- **Extent/Probability:** A description of the potential magnitude of the hazard, accompanied by the likelihood of the hazard occurring (or a timeframe of recurrence, if available).
- **Vulnerability:** A description of the potential magnitude of losses associated with the hazard. Vulnerability may be expressed in quantitative or qualitative values depending upon available data. Identifies development trends impact on the Tribe's vulnerability to each hazard since the 2011 draft plan development (increased, decreased, unchanged).

Note: Hazard Descriptions, Potential Impacts from Future Climate Conditions, and Cascading Impacts can be found in Chapter 4 of the HMP Basic Plan, as these are not place-specific.

In addition, the hazards have been organized into three sub-sections (high-, medium-, and low-priority) to illustrate the risk-driven nature of the HMP. Each hazard has been given serious consideration of all attributes discussed within. However, low-priority hazards may be shorter in length and with less quantitative analyses, as a lack of usable data is frequently present when considering low-likelihood or low-magnitude events. The three sub-sections are as follows:

- **High-Priority:** Earthquake, Cascadia Earthquake, Landslide
- **Medium-Priority:** Winter Storm, Windstorm, Wildfire
- **Low-Priority:** Flooding, Tsunami

3.3.1 Earthquake

Earthquake

	Magnitude	Onset	Duration	Frequency	Average	Rank
Earthquake	5	5	5	1	4	1
Cascadia Earthquake	5	5	3	1	4	2
Tsunami	2	4	2	1	2	8

Location

The Cascadia Subduction Zone (CSZ), where the Juan De Fuca plate slides underneath the North American plate poses a great risk to the Tribe and all communities in the Pacific Northwest. A large earthquake would cause significant impacts to all Tribal properties with a structure, and liquefaction may pose a risk to properties without a structure (though the liquefaction risk in the area is graded as moderate). The region is also subject to smaller, crustal quakes near the Port Angeles/Sequim area associated with the Lake Creek Fault.

Previous Occurrence/History

The most recent earthquake that damaged the Tribe service area was the 2001 Nisqually Earthquake. Small earthquakes occur regularly throughout the region and go unnoticed by residents. Over the last 135 years, there have been nine earthquakes with a magnitude (M) greater than 6.0 in the area that we consider the Northwest. Five of those large quakes (including the Nisqually earthquake) directly impacted the Olympic Peninsula, according to eyewitness accounts.

- 1700, CSZ Earthquake, M 9.0
- 1909, San Juan Island, M 6.0
- 1939, Vashon Island, M 6.1
- 1949, Olympia, M 7.1
- 1965, Seattle – Tacoma, M 6.5
- 2001, Nisqually, M 6.8

Based on the geological record and first-hand accounts, tsunami from locations across the Pacific Ocean basin and from the CSZ off the Washington coast have hit Washington State coastal communities at least 7 times in the last 3,500 years. The largest of the nearby triggers, the CSZ, produced the most recent great tsunami in 1700 AD (Lange 2003).

- 2006 Kuril Islands, Japan Tsunami (La Push, 0.52 feet; Neah Bay, 0.01 feet; Port Angeles, 0.39; Westport, 0.16 feet)
- 1964 Alaskan Tsunami (Neah Bay, 0.7 feet)
- 1960 Chilean Tsunami (Neah Bay, 1.2 feet)
- 1700 Cascadia Tsunami (Washington Coast, 33 feet)

Earthquake

Extent and Probability

Earthquakes pose a widespread hazard throughout the Tribe service area. Tsunami post a widespread hazard throughout the coastal area. The cascading impacts of earthquakes, such as tsunami and liquefaction, are dependent on geography and soil type, as detailed above.

The Ring of Fire will continue to generate tectonic triggers. The CSZ has produced earthquakes measuring M 8.0 and above at least seven times in the past 3,500 years. The time intervals between these events has varied from 140 to 1,000 years, with the last event occurring just over 300 years ago.

There is evidence of two earthquakes on the Lake Creek Fault between 2,000 and 700 years ago. An earthquake of M 6.8 along the Lake Creek Fault would produce the greatest intensity shaking in the vicinity of Port Angeles and Sequim.

Future Probability Trend – Future weather and development trends play no known role in the probability of future earthquake events. However, both may play a role in the magnitude of earthquake impacts. Great earthquakes in the Pacific Ocean basin generate tsunamis that impact Washington's outer coast and the Strait of Juan de Fuca at a rate of about six every 100 years. In the CSZ, there is a 10 to 14% chance of a M 9.0 earthquake and tsunami in the next 50 years, so the likelihood of recurrence would be low.

Vulnerability

Vulnerability posed by earthquakes to the Tribe is measured by accounting for the critical infrastructure that are at risk. The following infrastructure/property types are at high to very high risk from combined earthquake hazards:

- Tribal Center
- Lower Elwha Klallam Casino
- Tribal Health Clinic
- Tribal Police Station
- House of Salmon Hatchery
- Emergency Operations Center
- USACE Flood Control Levee
- Bureau of Indian Affairs Roads (37.4 miles)

Awareness of the Tribe's vulnerability to earthquakes or tsunamis has increased with participation in regional drills and public outreach efforts. More structures are being designed to be resilient to tectonic activity. Given these changes, the vulnerability of the Tribe to earthquakes and tsunami is **unchanged**.

3.3.2 Landslide

Landslide

Magnitude	Onset	Duration	Frequency		Average	Rank
2	5	3	5		3.8	3

Location

Tribal facilities are not located adjacent to any bluffs. Lower Elwha Road crosses a bluff to come out of the valley, and this area is most vulnerable to landslides. Place Road cemetery could also be damaged by a landslide from the bluffs behind (Lower Elwha Klallam Tribe 2011).

Previous Occurrence/History

Historically, the damages with the highest consequence, either related to the value of the repair or by the impact on human activities, include slides that have closed US-101 and other major thoroughfares (Clallam County 2010).

No landslides have occurred on the Lower Elwha Klallam tribal area that have resulted in substantial damage.

Extent and Probability

The following is excerpted from the hazard assessment conducted by Clallam County Emergency Management Division (EMD) as part of the 2016 Cascadia Rising Exercise (Buck 2016):

> "It is very difficult to make quantitative predictions of the likelihood or the size of a future landslide event. An accurate understanding of the landslide hazard for a given facility requires a detailed landslide hazard evaluation by a geotechnical engineer. Such site-specific studies evaluate the slop, soil/rock and groundwater characteristics. Such assessments may require drilling to determine subsurface soil/rock characteristics. In some cases, landslide hazard assessments by more than one geotechnical engineer may reach confliction opinions."

Future Probability Trend – Based on potential increases in drought and wildfires, as well as potentially higher-intensity precipitation events, the Tribe may be impacted by an **increase** in the probability of future landslides.

Vulnerability

The landslides and erosion in upper watersheds and forest lands are causing recurring damage and disruption to important roadways. Sedimentation from these areas is accumulating in the rivers and streams, causing flooding and habitat degradation. It is uncertain what the precise causes of mass wasting are; whether the roads form a conduit, the failures originate from side cast, or a combination of factors is involved.

According to the landslide susceptibility geographic information system (GIS) data, the main Tribal holdings are in an area of low landslide susceptibility. The Tribe's vulnerability to landslide hazard is **unchanged** since the previous plan.

Refer to Appendix C for landslide hazard maps.

3.3.3 Winter Storm

Winter Storm

Magnitude	Onset	Duration	Frequency	Average	Rank
2	3	3	5	3.3	4

Location

Severe weather can affect whole regions; thus, the whole of the Lower Elwha Klallam Tribal Reservation can experience severe weather. Because storms often significantly affect utility and transportation systems, power and telephone outages are a frequent result of storms and ingress and egress may be limited. Consequently, isolated areas like the Lower Elwha Klallam Indian Reservation may experience greater effects from storms. Severe local storms significantly impact driving conditions on roads, and downed power lines can cause isolation. They can also hinder police, fire, and medical responses to urgent calls (Lower Elwha Clallam Tribe 2011).

Previous Occurrence/History

Recent winter storms occurring in the Tribal area resulting in major damage include (snowstorms listed below; see Section 3.3.4, Windstorms, for other types of winter weather):

- February 2019 – North Olympic Peninsula
- 17 March 2014 – Sequim/Port Angeles Blizzard
- 27 December 1996 – Christmas Snowstorm

Extent and Probability

Winter storm weather is common in the winter, but typically lasts a short time; ice storms (sleet and freezing rain) likewise are typically brief events.

Winter storms may be more extreme during La Niña weather years, such as the 1996 flooding associated with the 1996-1997 La Niña pattern.

Future Probability Trend – The impact of changing weather patterns may have an impact on the probability of future winter storm events. Based on potential decreases in annual snowpack and increases in the frequency and magnitude of drought and heat, it would seem the Tribe may be impacted by a **decrease** in the probability of future winter storms. However, it is also possible that changing weather patterns could result in an increased likelihood of precipitation during sub-zero temperatures, resulting in an **increase** in the probability of winter storms

Winter Storm

Vulnerability

The Tribe's primary vulnerability from severe weather is from power outages and impairment of transportation. Because nearly all social and economic activity is dependent on transportation, snow can have a serious impact. Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. Vehicle accidents rise among those who try to drive. Power outages can result from physical damage to electrical infrastructure as a result of ice or snow or increases in demand beyond the capacity of the electrical system.

Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe winter weather events. Persons who are older, are isolated or have disabilities may be more vulnerable, especially those that may be trapped in their homes from power failures, heavy snow and ice, and debris from falling trees and power lines. Power losses during winter storms have resulted in deaths from carbon monoxide poisoning if people attempt to keep warm by lighting charcoal fires or operating backup generators indoors.

Since the 2011 draft plan, the Tribe's vulnerability to winter storms has **increased** as weather patterns change due to climate change, and as increased development has resulted in more infrastructure that can be exposed to damage during severe weather.

3.3.4 Windstorm

Windstorm

Magnitude	Onset	Duration	Frequency
2	4	2	5

Average	Rank
3.3	5

Location

All County and Tribal properties and structures can be affected by windstorms. Properties with infrastructures, utilities, and tree stands can have more damaging impacts during windstorms, especially in coastal areas where winds speeds can reach 40 to 60 miles per hour (mph) during the winter months.

Previous Occurrence/History

Recent windstorms occurring in the Tribe service area resulting in major damage include:

- 17 December 2018 – Clallam and East Jefferson Counties Windstorm
- 15-16 October 2016 – Typhoon Songda
- 14 December 2006 – "Hanukkah Eve" Windstorm
- 20 January 1993 – "Inaugural Day" Storm

These windstorms have caused damage to County and Tribal structures and housing; extensive utilities damage; restricted access to public lands; and required increased strain on the government's and Tribe's operations.

Windstorm

Extent and Probability

Coastal areas of the Tribe service area experience higher winds than other areas. However, windstorms can occur anywhere throughout the area. Windstorms can damage buildings, structures, utilities, and tree stands, causing millions of dollars' worth of damage.

Future Probability Trend – Future weather conditions have the potential to lead to an increase in severe and extreme weather patterns, leading to an **increase** in the probability of a windstorm. In addition, increased development has the potential to expose more assets to the impacts of windstorms.

Vulnerability

The Tribe's vulnerability to severe windstorms are related to power outages and debris blocking land-based transportation routes. Because nearly all social and economic activity is dependent on transportation, damage from windstorms can have a serious impact.

Road closures and hazardous conditions can delay or prevent emergency vehicles from responding to calls. More rural communities located in the foothills are particularly vulnerable to road outages and face longer delays in debris removal. Additionally, vehicle accidents rise among those who try to drive during windstorms (U.S. Department of Transportation 2018).

Power outages can result from physical damage to electrical infrastructure as a result of downed trees and blown debris. Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe windstorms. Additionally, persons with electric-based health support systems are vulnerable to power outages everywhere.

Since the 2011 plan, the Tribe's vulnerability to windstorms has **increased** as weather patterns change due to climate change, and as increased development has resulted in more infrastructure that can be exposed to damage during severe weather.

3.3.5 Wildfire

Wildfire

Magnitude	Onset	Duration	Frequency
3	5	2	3

Average	Rank
3.3	6

Location

According to the *Community Wildfire Protection Plan* (CWPP), large fires in western Washington typically occur on steep south-facing slopes, and often result from a combination of circumstances including a source of ignition in areas of dry, heavy fuels, an extended period of drought, and dry east winds (Clallam County 2009). Forest fires in this area usually occur during the dry summer months of July, August, and early September, but they can occur anytime between April and October given the right conditions. Fire hazard increases in the late summer and early fall when hot, dry east winds (subsidence winds) occur more frequently and the area has experienced the low point of the annual precipitation cycle. The portion of the Peninsula with the highest potential for major fires is the area

Wildfire

between Port Angeles and Hood Canal, though as residents of Forks can attest, large forest can occur anywhere on the Peninsula (Clallam County 2010).

Previous Occurrence/History

Previous wildland fires that have affected Clallam County include "The Great Forks Fire of 1951," 1955 in the West Twin River area, and 2002 in the Clallam Bay area. The fires in 1951 began near Lake Crescent and burned into and around Forks. Approximately 30 buildings and between 33,000 and 38,000 acres of timber were lost. The 1955 fire burned approximately 5,000 acres of timber. The 2002 fire started as slash burnings on private land. In July 2004, a wildfire ignited near Joyce at Striped Peak, burning between three and four acres of private hillside land. Joyce experienced another wildfire in May 2006 when a controlled burn near the town grew into a five-acre wildfire. From January 2008 to August 2009, 38 different wildfire incidents have occurred within Clallam County, outside of Olympic National Park (Clallam County 2010).

Extent and Probability

A Headwaters Economics study found that Clallam County has more square miles of developed land within the wildland-urban interface than any other county in Washington State (72 square miles) and the fifth most area in the Wildland-Urban Interface (WUI) in the entire United States. The same study found that 13,271 homes were located within the WUI throughout the County (Headwaters Economics 2013).

Weather conditions greatly influence the impact and extent of wildfires. Drought, high temperatures, and wind contribute to a dynamic and changing conditions of wildfires. Fuel load and vegetation contribute to the size and intensity of wildfires.

Wildfires are frequent and inevitable. Within the region, most wildfires burn during the June to October time period.

Future Probability Trend – Based on potential decreases in annual snowpack and increases in the frequency and magnitude of drought and heat, the Tribe may be impacted by an **increase** in the probability of future fires.

Vulnerability

Past events indicate that wildfires would not be severe on the Lower Elwha Klallam Reservation. The Reservation is small, and thus a fire can be identified quickly. Secondly, the Reservation receives a large amount of rainfall, reducing the risk to dryness, which is an essential contribution of fires. In a worst-case scenario, a wildfire spread by heavy winds during extremely dry conditions may damage Tribal structures. DNR fire statistics indicate that a wildfire would be less than an acre in size. There are no Washington DNR WUI areas identified near the Reservation (Lower Elwha Klallam Tribe 2011).

Nonetheless, the Reservation is served by a small volunteer fire department which make take longer to deploy and fight the fire. Outside resources would also take a long time. The vegetation in the area is composed of thick forests and logging debris or beach grasses and driftwood, both of which are potential fuel sources for wildfires (Lower Elwha Klallam Tribe 2011).

According to GIS analysis, Tribal land is located in a low fire hazard area (Appendix C). The Tribe's vulnerability to wildfire is **unchanged** since the draft Tribal plan.

3.3.6 Flooding

Flooding

Magnitude	Onset	Duration	Frequency	Average	Rank
1	4	2	2	2.3	7

Location

The primary riverine hazard associated with Tribal lands is at the mouth of the Elwha River. Since the removal of the Lower Elwha Dam in 2014, the floodplain has been rejuvenated and what was formerly a constrained channel is now returning to its former state as a broad meander belt.

The land adjacent to the Elwha River is largely undeveloped because of its location within Olympic National Park.

Approximately 17 acres of land east of the flood control levee are located within the limits of the 100-year frequency floodplain (Base Flood). This parcel is located at the north end of the reservation, adjacent to the existing gap in the flood control levee (Lower Elwha Klallam Tribe 2011).

The Lower Elwha Klallam Tribal Flood Control Ordinance addresses development related concerns on this parcel. There are currently ten Tribal and two private residences located within the 100-year-frequency floodplain. Additional development within the 100-year floodplain is prohibited, unless the provisions of the Special Flood Hazard Ordinance (1999) are satisfied (Lower Elwha Klallam Tribe 2011).

On the west bank of the Elwha, a 900-foot-long private levee protects Place Road housing and about 30 acres below the bluff from the impacts of 30- to 50-year floods. Since its construction in the 1950s, the private levee has effectively prevented the shifting of the Elwha River mouth to the west and has resulted in aggradation of sediment adjacent to it (Lower Elwha Klallam Tribe 2011).

Previous Occurrence/History

The Draft Tribal HMP contains the following information about historic flood events on Tribal lands:

> "Historically, the Lower Elwha Reservation, by virtue of its location on the floodplain, has been subject to the natural meanders of the Elwha River channel and the seasonal flooding of its banks onto the floodplain. This flooding is typically bimodal in nature, with peaks associated with the late fall-early winter rains and the spring melting of the Olympic Mountain snowpack.
>
> Prior to [USACE] levee construction (1989), flooding often resulted in the temporary evacuation of floodplain occupants with very little warning. Consecutive winter flood events occurred in 1979 and 1980 causing extensive damage to Reservation residences and facilities." (Lower Elwha Klallam Tribe 2011).

Flooding

Extent and Probability

Severe floods may result in serious injuries and fatalities as well as damage to public facilities and private property. Extent of flooding can be determined by the height of river flows in comparison to flood stages determined by U.S. Geological Survey (USGS) stream gauges located throughout the area. It can also be measured by past damages of flooding.

The region experiences some flooding twice a year at minimum, while larger floods occur once a decade and major flood events occurring every 30-50 years.

The Lower Elwha Dam on the Elwha River was removed in 2014 as part of an effort to restore the floodplain to its historic condition and revitalize wildlife habitat along the river (Lower Elwha Klallam Tribe 2019).

Future Probability Trend – Based on potential increase in high-intensity precipitation events and increased development trends (resulting in additional impervious surfaces and stormwater runoff), the County may be impacted by an **increase** in the probability of future floods.

Vulnerability

All the Tribal facilities and homes in the lower valley are potentially vulnerable to flooding. At least 11 homes are in the 100-year floodplain (Lower Elwha Klallam Tribe 2011).

Since the 2011 plan, the Tribe's vulnerability to nuisance flooding has **increased** as precipitation patterns shift due to climate change. However, the Tribe is taking active steps to mitigate the impacts of flooding and is fairly protected by the USACE levee.

3.4 Vulnerability Assessment

3.4.1 Identifying Critical Infrastructure

Critical infrastructure was identified for this plan update using a combination of the methodology outlined in Section 4.6 of the Base Plan, in addition to referring to the comprehensive list of critical infrastructure outlined in the Tribe's draft plan in 2011. This list of critical infrastructure has been updated by the Tribal Emergency Management Director.

3.4.2 Severe Repetitive Loss Properties

There are no National Flood Insurance Program (NFIP)-identified severe repetitive loss properties located on Lower Elwha Klallam Tribal lands.

3.4.3 Exposure Assessment

Table 3-3 contains a summary of critical infrastructure associated with the Lower Elwha Klallam Tribe. This list was supplemented by critical infrastructure identified during the 2011 planning process. The vulnerability of each structure is to earthquake, tsunami, flooding, severe weather (which includes winter storm and windstorm), fire, and landslide is assessed.

Table 3-3 Lower Elwha Klallam Critical Infrastructure and Vulnerability Assessment

Community Name	Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard level	Tsunami Hazard	Floods	WUIF	Landslides
Lower Elwha Reservation				Government Building	80%	E	Very High	Very High	Very High				
Lower Elwha Reservation	Lower Elwha Klallam Tribal Police	HWY 101 & S Dry Creek Rd, Port Angeles, WA 98363	Port Angeles	Government Building	80%	C	High	Low	High	NO	NO	NO	NO

Key:
EQ = Earthquake
PGA = Peak Ground Acceleration
WUIF = Wildland Urban Interface Fire

The following is a list of critical facilities and infrastructure located on the Lower Elwha Reservation (Lower Elwha Klallam Tribe 2011):

- Tribal Center
- Lower Elwha Klallam Casino
- Tribal Health Clinic
- Tribal Police Station
- House of Salmon Hatchery
- Emergency Operations Center
- USACE Flood Control Levee
- Bureau of Indian Affairs Roads (37.4 miles)

3.5 Land Use and Development Trends

FEMA	D1. Was the plan revised to reflect changes in development? (Requirement §201.7(d)(3))

Changes have been measured by accounting for shifts in land use and public awareness since the adoption of the 2010 County HMP and the development of 2011 Draft Tribal HMP. Each hazard has been identified as having an increased, decreased, or unchanged vulnerability in this time. Table 3-4 provides a snapshot of how vulnerability has changed since the 2011 Draft Tribal HMP.

Table 3-4 Vulnerability Changes Since 2011

Hazard	Status
Earthquake	+/-
Landslide	=
Winter Storm	+
Windstorm	+
Wildfire	=
Flooding	+

Key:
+ Increased vulnerability
- Decreased vulnerability
+/- Increased vulnerability, but actions taken to decrease vulnerability
= Unchanged vulnerability

4 CAPABILITY ASSESSMENT

FEMA	C1. Does the plan include a discussion of the tribal government's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including an evaluation of tribal laws and regulations related to hazard mitigation as well as to development in hazard-prone areas? (Requirement §201.7(c)(3)(iv))

4.1 Human and Technical Resources

Table 4-1 describes the Tribe's human and technical capabilities to engage in and improve mitigation planning and program implementation.

Table 4-1 Human and Technical Resources Integrated with Hazard Mitigation

Resource	Department	Tasks and Activities Integrated into Mitigation Planning
Chief Executive Officer	Business Committee	Ensures the mitigation program is incorporated into the Tribe's daily business
Director of Emergency Management	Police Department	Oversee mitigation program and encourage integration of mitigation planning into all tribal activities
Natural Resources Director	Natural Resources Department	Manage natural resources within the Tribe's properties
Geographic Information System (GIS) Mapping Program Manager	Natural Resources Department	Integrate hazard data into mapping capabilities of the Tribe

4.2 Financial Resources

FEMA	C2. Does the plan include a discussion of tribal funding sources for hazard mitigation projects and identify current and potential sources of Federal, tribal, or private funding to implement mitigation activities? (Requirement §201.7(c)(3)(iv and v))

The Tribe maintains many fiscal and financial resources to support its mitigation program. Table 4-2 identifies specific resources accessible for use.

Table 4-2 Accessible Financial Resources

Financial Resource	Accessible?
Community Development Block Grants	Yes
Capital Improvement Project Funding	Yes
Insurance	Yes
Incur debt	Yes
State-sponsored grant programs	Yes

Table 4-3 identifies current and potential sources of funding to implement identified mitigation actions contained within the HMP. As a federally recognized tribe, the Tribe can access funding directly through

the federal government. In addition, funding is also available from the State of Washington and potentially through Clallam County.

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Federal		
Pre-Disaster Mitigation Program	Federal Emergency Management Agency (FEMA)	Provides funding to develop hazard mitigation plans and implement mitigation actions contained within.
Hazard Mitigation Grant Program	FEMA	Post-disaster funds to hazard reduction projects impacted by recent disasters.
Flood Mitigation Assistance Program	FEMA	Provides funds for flood mitigation on buildings that carry flood insurance and have been damaged by floods.
Community Development Block Grant Program	U.S. Department of Housing and Urban Development	Funds projects that benefit low- and moderate-income communities, prevent or eliminate slums or blight, or meet urgent community development needs posing a serious and immediate threat to community health or welfare.
Emergency Management Performance Grants Program	FEMA/Washington Department of Emergency Management	Provides funding to states for local or tribal planning, operations, acquisition of equipment, training, exercises, and construction and renovation projects.
Flood Mitigation Assistance	FEMA/Washington Department of Emergency Management	Provides funding to support development of the flood hazard portion of state and local mitigation plans and up to 100% of the cost of eligible mitigation activities. This funding is only available to communities participating in the National Flood Insurance Program (NFIP).
Earthquake State Assistance Program	National Earthquake Hazards Reduction Program Interagency Coordinating Committee	Funds activities including seismic mitigation plans; seismic safety inspections of critical structures and lifelines; updates of building codes, zoning codes, and ordinances; and earthquake awareness and education.
National Fire Plan	U.S. Forest Service	Provides funding opportunities for local wildland-urban interface planning, prevention, and mitigation projects, including fuels reduction work, education and prevention projects, community planning, and alternative uses of fuels.
Risk Mapping, Assessing, and Planning	FEMA	Provides funding and technical support for hazard studies, flood mapping products, risk assessment tools, mitigation and planning, and outreach and support.
Strategic Economic and Community Development Grant	U.S. Department of Agriculture (USDA)	Provides funding in rural areas for multi-jurisdictional plan development and with a community development focus. Available only to rural areas outside of urbanized zone of any city with a population greater than 50,000.
Coastal Ecosystem Resiliency Program	National Oceanic and Atmospheric Administration	Provides funding for ecosystem restoration. Governor must approve project funds prior to award and there is a 2:1 cost-sharing ratio.
State		
Washington State Department of Transportation (WSDOT)	WSDOT	Avalanche forecasting determines the potential risk along a particular mountain slope. When an avalanche hazard

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Avalanche Forecasting and Control		develops, WSDOT uses artillery, or explosives to trigger the avalanche. In addition to active avalanche control, WSDOT also uses passive control methods to control snow slides.
Washington Sea Grant	Washington Sea Grant	Washington Sea Grant provides funding opportunities through State and National competitions, program development services, and sponsorships.
Water Resources Program	Washington Department of Ecology (DEC)	DEC's Water Resources Program provides support in monitoring water supply, managing water supply projects, overseeing water rights, performing streamflow restoration, protecting streamflow, regulating well construction and licensing, and ensuring dam safety.
WSDOT Seismic Retrofit Program	WSDOT	WSDOT provides funding and project support to retrofit bridges at risk of failure due to seismic events.
Washington State Department of Agriculture (WSDA) Livestock Inspection Program	WSDA	Dedicated to providing asset protection for the livestock industry by recording brands, licensing feedlots and public livestock markets by conducting surveillance and inspection of livestock at time of sale and upon out of state movement. The program is funded by fees paid by the livestock industry and receives no general fund dollars.
Washington Local Emergency Planning Committee Program	Washington Emergency Management Division (EMD)	Washington EMD provides funding support to ensure Local Emergency Planning Committees (LEPCs) can be implemented across the state.
Washington Pipeline Safety Program	Washington Utilities and Transportation Commission	The commission is responsible for developing and enforcing safety standards for natural gas and hazardous liquid pipelines located within the state. The commission also inspects the portions of interstate natural gas and hazardous liquid pipelines located within Washington State; the standards and enforcement actions are the responsibility of the federal Pipeline and Hazardous Materials Safety Administration (PHMSA).
State Water Pollution Control Revolving Fund	Washington DEC	This program provides funds to local governments to set up low-interest loan programs to repair or replace failing on-site sewage systems. Property owners unable to qualify for conventional bank loans and marine waterfront property owners can use the program to get loans to fix or replace their systems where failures might directly affect Puget Sound. Both the Clean Water State Revolving Fund and the Centennial Clean Water Program.
Other		
Community Planning Assistance Teams	American Planners Association Foundation	Provides pro bono technical assistance for planning frameworks or community vision plans for communities needing extra assistance. Local governments are responsible for travel costs.
Thriving Resilient Communities	Threshold Foundation	Wide-ranging resiliency project funding.

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Kresge Foundation Environmental Grants	Kresge Foundation	Provides funding for climate adaptation and mitigation, as well as sustainable water resources management.

4.3 Legal and Regulatory Resources

Table 5-4 describes the legal and regulatory capabilities, including plans, policies, and programs that have integrated hazard mitigation principles into their operations.

Table 4-4 Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2012-2019)	Hazard Mitigated
Plans	Lower Elwha Klallam Comprehensive Emergency Operations Plan	Contains information that may be used to protect people and property on or near the Lower Elwha Klallam Reservation.	▪ Hiring of a Director of Emergency Management ▪ Incorporation of emergency planning into tribal operations	All
	Comprehensive Flood Hazard Management Plan	Examines flood related hazards that exist on the lower Elwha River near its confluence with the Strait of Juan de Fuca.	▪	Flooding
Policies	Special Flood Hazard Ordinance	A Tribal regulatory tool to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions in specific areas.	▪ Signed into agreement	Flooding
Programs	Northwest Tribal Emergency Management Council	Support tribal participation on homeland security and emergency management preparedness efforts.	▪ Joined the consortium	All
	Elwha River Restoration	Rehabilitation of formerly dammed floodplain.	▪ Removal of the Lower Elwha dams	Flooding
	National Incident Management System (NIMS) Compliance Training	Training of all tribal police officers, department heads, Board members, and relevant staff in NIMS	▪ Ongoing	All

4.4 FEMA Funded Hazard Mitigation Projects

The Tribe has not received funding for any hazard mitigation projects to date.

The County has received funding for several hazard mitigation projects to date. Table 4-5 outlines County-wide FEMA funded hazard mitigation projects.

Table 4-5 FEMA Funded Hazard Mitigation Projects

Disaster ID#	Program	Project Title	Sub Grantee
1361	Hazard Mitigation Grant Program (HMGP)	Clallam Hazard Mitigation Plan	Clallam County
1037	HMGP	Bogachiel/La Push Road Bank Stabilization	Clallam County
1734	HMGP	Amendment 1 -Jamestown S'Klallam Tribe Hazard Mitigation Plan	Jamestown Reservation
4243	HMGP	Clallam County Hazard Mitigation Plan	Clallam County
1963	HMGP	Amend 1: Clallam County - Geographic Information System (GIS) Data Enhancement and Hazus Analysis	Clallam County

4.5 Continuity of Operations Planning

Continuity of government and continuity of operations (COOP) planning is an integral piece to any mitigation program. Ensuring the County can operate following an incident immediately mitigates the magnitude of many hazards. Currently, the Tribe does not have a COOP.

4.6 Coordination with Community Partners

The Tribe works alongside their community partners to address issues as they arise. Many of these community partners participated in the HMP update process and collaborate with the Tribe on an ongoing basis.

- **Education**
  - Cape Flattery School District
  - Quillayute Valley School District
  - Crescent School District
  - Port Angeles School District
  - Sequim School District
- **Business and Industry**
  - Local Chambers of Commerce
- **Healthcare**
  - Olympic Medical Center
  - Forks Community Hospital
- **Utilities**
  - Clallam County Public Utility District (Water, Sewer, and Power)
  - Diamond Point Water System
  - Crescent Water Association

4.7 National Flood Insurance Program Participation

FEMA	C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.7(c)(3))

Clallam County, Forks, Port Angeles, and Sequim maintain active NFIP policies. The Lower Elwha Klallam Tribe also maintains active policies.

Table 4-6 contains a summary of Clallam County, local jurisdiction, and Tribal government total coverage and losses under the NFIP.

Table 4-6 National Flood Insurance Program Coverage and Losses

Community Name (Number)	Total Coverage (in Thousands)	Total Dollars Paid
CLALLAM COUNTY * (530021)	$97,187	$903,327
FORKS, CITY OF (530022)	$400	$--
LOWER ELWHA KLALLAM TRIBE (530316)	$1,715	$--
PORT ANGELES, CITY OF (530023)	$6,001	$75,632
SEQUIM, CITY OF (530301)	$2,148	$55,798

Source: FEMA NFIP Policy and Loss Data by Geography (2019c) https://www.fema.gov/policy-claim-statistics-flood-insurance

4.8 Integration of Mitigation into Existing Planning Mechanisms

Integration of the principles of mitigation into the Tribe's daily operations and ongoing planning activities is a priority of the County's mitigation program. These activities will support:

- Raising awareness of the importance of hazard mitigation for the whole community;
- Facilitating an understanding that hazard mitigation is not just an 'emergency services' function and building ownership of mitigation activities across the organization;
- Reducing duplication or contradiction between County and jurisdictional plans; and
- Maximizing planning resources through linked or integrated planning efforts.

The Tribe is encouraged to consider integration actions into planning mechanisms including:

- Budget decision-making;
- Building and zoning ordinances and decision-making;
- Emergency planning mechanisms; and
- Economic developing planning and decision-making.

4.8.1 Existing Plans

FEMA	C6. Does the Plan describe a process by which the tribal government will incorporate the requirements of the mitigation plan into other planning mechanisms, when appropriate? (Requirement §201.7(c)(4)(iii))

The following existing plans provide ongoing opportunity for integration of hazard mitigation and the County will work with plan owners and stakeholders to consider hazard mitigation data and principles when these plans are updated.

Table 4-7 contains a summary of the County's existing plans and how each incorporates the hazard mitigation planning.

Table 4-7 Summary of Tribal Plans

Tribal or County Plan	Hazard Mitigation Components
Comprehensive Emergency Management Plan (2016)	County-wide: Outlines hazard mitigation roles and responsibilities.
Lower Elwha Comprehensive Emergency Operations Plan (2005)	Describes actions that may be required for a specified hazard.
Comprehensive Flood Management Plan	The plan provides current and historical information about river morphology, flooding, storm water, and erosion and presents viable management alternatives. Tribal regulatory programs, proposed land-use activities, flood studies, and citations of available flood reduction resources are also provided.
Tribal Evacuation Plan	Evacuation planning for the Tribe in the event of a natural disaster.

5 MITIGATION STRATEGY

FEMA	C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for the [Lower Elwha Klallam Tribe] being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.7(c)(3)(ii))

5.1 Review of Draft 2011 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2011 draft plan were evaluated to determine what the status of the action was and whether any ongoing or incomplete actions should be included as actions in the 2019 plan update. Table 5-1 contains a summary of the previous mitigation actions and their 2019 status.

Table 5-1 2011 Mitigation Action Status

Action Description	2019 Status
Identify Elders and other vulnerable populations to prioritize for mitigation and disaster assistance	Started in 2018 in collaboration with Tribal Council and Elwha Health Clinic
Create new, and expand existing Evacuation Routes, including better signage	Kacee Way has been completed and one new Tsunami Evacuation Route sign was added on Lower Elwha Road
Acquire properties in low hazard areas in order to locate new development or relocate existing vulnerable structures and critical facilities	Construction on the new building for School and Head Start programs began in 2019. The new building is sited on high ground
Continue and expand disaster training programs such as Community Emergency Response Team (CERT) to train Tribal members and the local community to respond to an emergency	The new CERT Team has been started
Develop and/or improve Emergency Plans such as Evacuation Plans, Tribal Records Protection Plan, Continuity of Operations Plan etc.	Evacuation plan is done.
Partner with local jurisdictions and agencies in developing and implementing mitigation and emergency response strategies and actions	Ongoing
Develop a system to protect and maintain historical and archival Tribal records	Work on continuation of government planning will commence in 2020
Become a tsunami ready Community	Done
Maintain Office of Emergency Management	Done

Table 5-1 2011 Mitigation Action Status

Action Description	2019 Status
Become a StormReady community	Done
Develop interlocal agreements with local agencies and other jurisdictions for disaster planning and emergency preparedness and response	Ongoing
Implement Vegetation and other natural resource management practices to reduce landslides and coastal erosion	Ongoing

5.2 Identification and Analysis of New Mitigation Actions

In order to achieve the mitigation goals identified above, the Tribe has identified a comprehensive series of mitigation objectives and supporting actions that are focused on reducing vulnerability and maximizing loss reduction. The actions can typically be broken out into the following types of activities which are indicated in Table 5-2.

Table 5-2 2019 Mitigation Actions by Group

Mitigation Group	Related Mitigation Actions
Plans and Regulations	LEK08
Infrastructure/Capital Project	LEK01, LEK02, LEK06
Natural System Protection	LEK14
Education and Awareness	LEK05
Preparedness and Response	LEK03, LEK04, LEK07, LEK09, LEK10

All mitigation actions identified in the plan are addressed in the mitigation implementation plan provided in Section 5.3. The actions include both interim- and long-term strategies for reducing vulnerability to hazard and are characterized as such in the 'life of action' column of the implementation plan.

5.2.1 2019 Mitigation Actions by Hazard

All mitigation actions identified in the plan address at least one priority hazard outlined in Chapter 4 of the HMP. Table 4-2 indicates which mitigation actions address which hazards.

Table 5-3 2019 Mitigation Actions by Hazard

Hazard*	Related Mitigation Actions
All Hazards	LEK04, LEK05, LEK07, LEK08, LEK09, LEK10
Earthquake/Tsunami	LEK02, LEK03, LEK05
Landslide	LEK02
Winter Storm	LEK02

Table 5-3 2019 Mitigation Actions by Hazard

Hazard*	Related Mitigation Actions
Wildfire	LEK02
Flooding	LEK06

A complete mitigation implementation plan is provided in Table 5-4.

5.3 2019-2025 Mitigation Implementation Plan

FEMA	C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by [the City of Sequim]? (Requirement §201.7(c)(3)(iii))

The mitigation implementation plan lays the groundwork for how the mitigation plan will be incorporated into existing planning mechanisms and how the mitigation actions will be prioritized, implemented, and administered by the Tribe. The implementation plan includes both short-term strategies that focus on planning and assessment activities, and long-term strategies that will result in ongoing capability or structural projects to reduce vulnerability to hazards.

See Appendix D for Mitigation Action Worksheet instructions and completed Mitigation Action Worksheets for each action listed in Table 5-4.

Table 5-4 2019 - 2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
Lower Elwha Klallam Tribe													
LEK01	Move the tribal center from the tsunami inundation zone where it is currently located.	New	4,5	Lower Elwha Police Department, Emergency Management Division	3-5 years	Unknown	No	Federal Emergency Management Agency (FEMA)	Tsunami	14	10	24	6
LEK02	Widen and strengthen Lower Elwha Road from Stratton Road to Kacee Way.	New	1	Lower Elwha Police Department, Emergency Management Division	3-5 years	Unknown	No	FEMA	Earthquake, Flood, Landslide, Winter Storm, Tsunami, Wildfire	17	6	23	10
LWK03	Evaluate options to make new hotel in Port Angeles tsunami resistant.	New	4,5	Lower Elwha Police Department, Emergency Management Division	1-3 years	Unknown	No	FEMA	Earthquake, Flood, Tsunami	20	10	30	1
LEK04	Identify Elders and other vulnerable populations to prioritize for mitigation and disaster assistance	2011 Action – Ongoing. Started in 2018 in collaboration with Tribal Council and Elwha Health Clinic	5,6	Lower Elwha Klallam Emergency Management, Tribal Police, Enrollment, Tribal Clinic	1 year	Staff time	Yes	Operating Budgets	All hazards	20	6	26	4
LEK05	Create new, and expand existing Evacuation Routes, including better signage	2011 Action – Ongoing. Kacee Way has been completed and one new Tsunami Evacuation Route sign was added on Lower Elwha Road.	1,6	Lower Elwha Klallam Emergency Management	1 year	$500	Yes	Operating Budget	Tsunami, Earthquake	20	6	26	5

Table 5-4 2019 - 2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
LEK06	Acquire properties in low hazard areas in order to locate new development or relocate existing vulnerable structures and critical facilities	2011 Action – Ongoing. Construction on the new building for the school and Head Start programs began in 2019. The new building is sited on high ground.	5	Lower Elwha Klallam Emergency Management	1 -5 years	Varies depending on property. FEMA Cost Benefit Analysis software will be used to prioritize which structures to relocate.	No	Pre-Disaster Mitigation grant, Housing and Urban Development grants, U.S. Department of Agriculture (USDA) development grants	Flooding	14	10	24	7
LEK07	Continue and expand disaster training programs such as Community Emergency Response Team (CERT) to train Tribal members and the local community to respond to an emergency	2011 Action – Ongoing. The new CERT team has been started; training continues.	2,5	Lower Elwha Klallam Emergency Management	Annual	$10,000-20,000 per year	Yes	Emergency Management Performance grants, regional homeland security grants, Citizens Corps funding and other sources	All hazards	20	8	28	3
LEK08	Develop and/or improve Emergency Plans such as Evacuation Plans, Tribal Records Protection Plan, Continuity of Operations Plan etc.	2011 Action – Ongoing. The Evacuation Plan is complete. Tribal Records Protection Plan and continuity of operations (COOP) will be developed.	2,5,5	Tribal Council, Lower Elwha Klallam Emergency Management	1-5 years	Staff time to prepare plans, $30,000 - $80,000	Yes	Emergency Mgt Performance Grants, Dept of Health Grants, Regional Homeland Security funds and other sources	All hazards	19	10	29	2
LEK09	Partner with local jurisdictions and agencies in developing and implementing mitigation and emergency response strategies and actions	2011 Action – Ongoing.	5,6	Lower Elwha Klallam Emergency Management	Ongoing	Staff time	Yes	FEMA, Tribal Operating Budget	All hazards	18	6	24	8
LEK10	Develop a system to protect and maintain historical and archival Tribal records	2011 Action – Ongoing. Work on COOP will commence in 2020.	5,6	Tribal Council	1-3 years	Staff time	Yes	Tribal Operating Budget	All hazards	18	6	24	9
LEK14	Implement Vegetation and other natural resource management practices to reduce landslides and coastal erosion	2011 Action – Status unknown.	5										
Adopt the Hazard Mitigation Plan (HMP)		Completed – Re-adopting updated 2019 HMP	High	Planning Department	1 year	N/A		N/A	All hazards				

Key:
STAPLEE - Strategy and Prioritization Methodology

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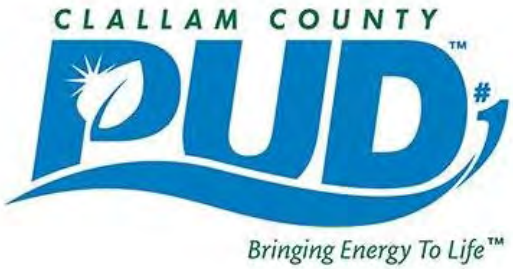
Special Hazard Districts Annex – Clallam County Multi-Jurisdictional Hazard Mitigation Plan



DRAFT – 2019 Plan Update

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

Tables

Figures

INTRODUCTION

1.1 Clallam County Special Hazard Districts Involved in Mitigation

For the purposes of the Clallam County Multi-Jurisdictional Hazard Mitigation Plan (HMP), Special Hazard Jurisdictions are defined as governmental or quasi-governmental entities that participated in the hazard mitigation planning process. Each of these jurisdictions contribute greatly to the County and local jurisdictions and in turn rely on County or local emergency services and utilities.

Throughout the hazard mitigation planning process, the following representatives from the Special Hazard Districts were present at one or more Mitigation Planning Team (MPT) meetings:

Clallam County Public Utilities District (PUD) No. 1

- Larry Morris, Safety Manager

Peninsula College

- Marty Martinez, Campus Safety Operations Manager
- Peninsula College served as the location for Public Meeting #1 in Port Angeles

Port of Port Angeles

- Dan Gase, Airport & Real Estate Manager
- Dan Shea, Operations Supervisor
- John Nutter, Airport Director

These partners play critical roles in mitigating and responding to the highest priority hazards affecting Clallam County, including earthquakes (including a Cascadia Subduction Zone Event), severe weather, and landslides. This annex provides information on the missions of these agencies, targeted hazard profiles and vulnerability assessments, the partners' capabilities, and updated mitigation actions.

1.2 What's New in the 2019 Update?

Clallam County PUD, Peninsula College, and Port of Port Angeles were included in the 2011 Hazard Mitigation planning process; however, their interests were not represented in a standalone annex. For the 2019 Clallam County HMP update, these districts have their own annex to present their unique hazard mitigation planning efforts.

DISTRICT PROFILES

2.1 Clallam County Public Utilities District No. 1

The Clallam County PUD No. 1 is located in Port Angeles, Sequim, and Forks. It is a nonprofit organization that provides electric, water, internet, and sewer services to the communities and citizens of Clallam County. PUD is based in the Port Angeles.

PUD is directed by a three-member Board of Commissioners elected by citizens of Clallam County (PUD 2014a).

2.2 Peninsula College

The only resident institution of higher education on the North Olympic Peninsula, Peninsula College is a comprehensive community college with a district that encompasses both Clallam and Jefferson Counties (Peninsula College 2019). The main campus is located in Port Angeles on 75 acres of land at the foot of the Olympic Mountains. Extension sites are located in Forks and Port Townsend (Peninsula College 2019).

As of the 2017–2018 school year, there were 4,454 enrolled students, 58 percent of which were full time (Peninsula College 2019).

2.3 Port of Port Angeles

The Port of Port Angeles, the Olympic Peninsula's only deepwater port, provides support for Clallam County industry and employs administrative and trades staff. The Port operates a 16.1-acre marina, with approximately 375 boat slips and 3,000 feet of dock for tie-ups, as well as a marine terminal and trades area, a log yard, and rental properties (Figure 2-1). The Boat Haven Marina was upgraded in 2007-2008. The Port operates the William R. Fairchild International Airport. The Port also currently houses a composites training institute (WA ESD 2017).

Figure 2-1 Location of Port of Port Angeles relative to the City of Port Angeles

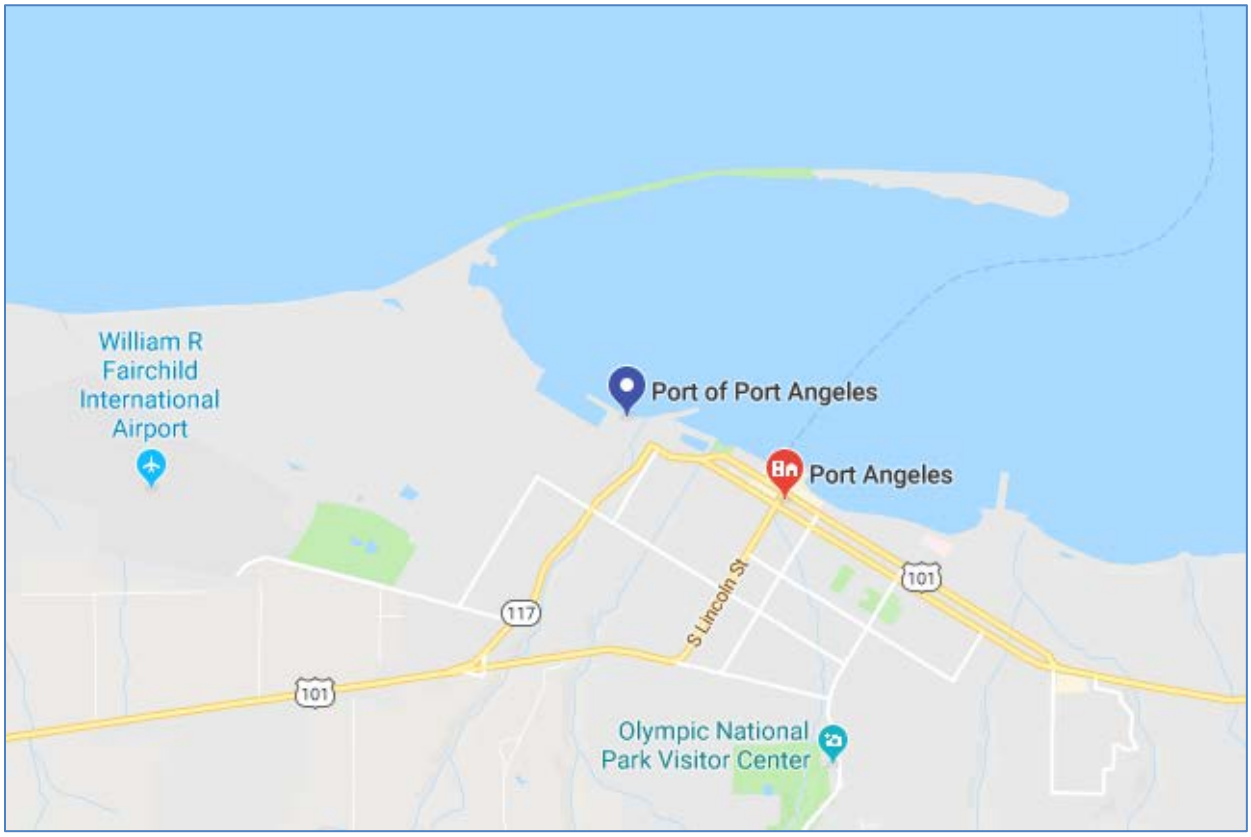
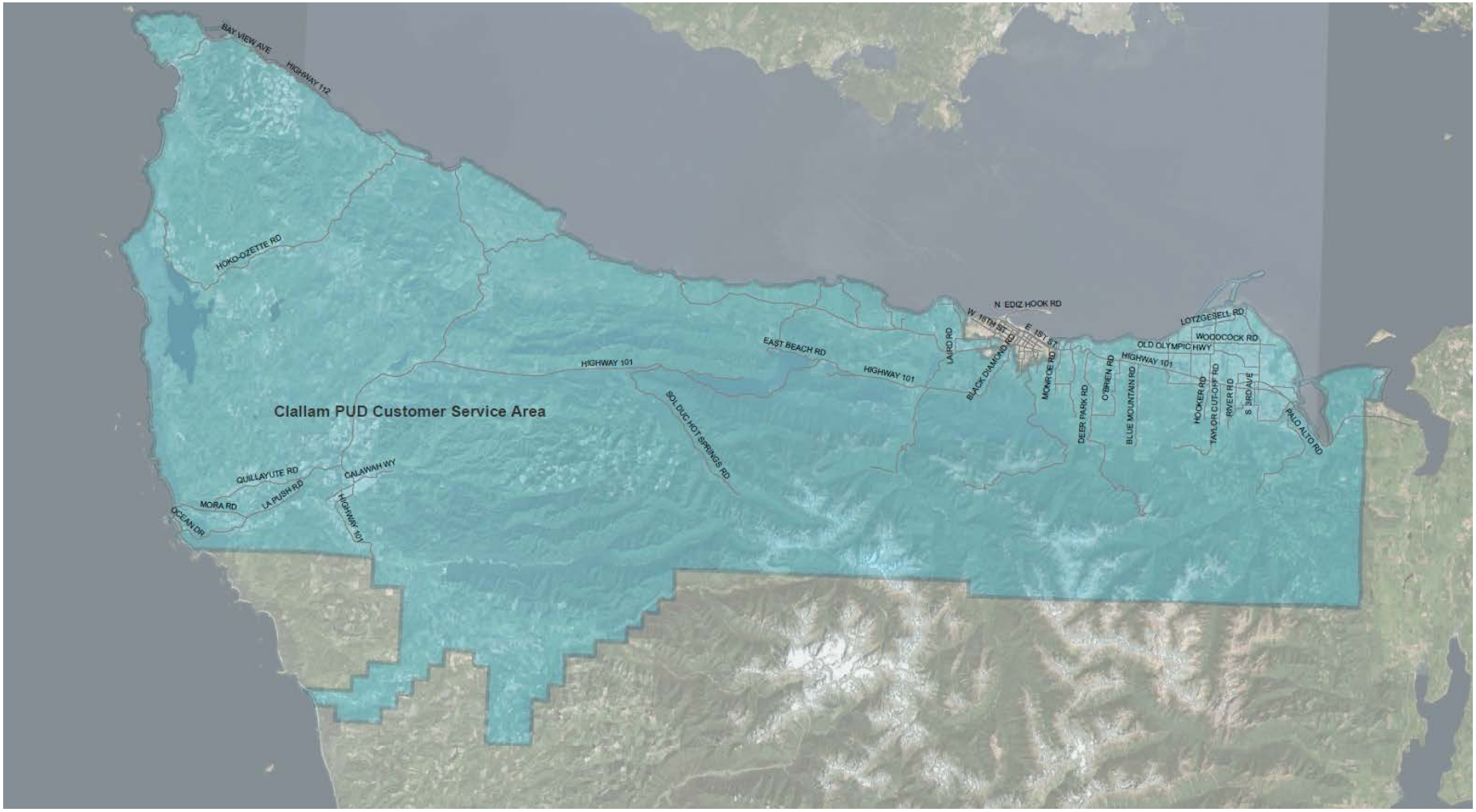


Figure 2-2 Clallam PUD Electrical Service Area



Source: Clallam PUD 2014b

Figure 2-3 Clallam PUD Water Service Areas.

http://clallamcountypud.maps.arcgis.com/apps/webappviewer/index.html?id=d69a40e3bd9149c789213eb7690575fa

1

BUSINESS HIGHLIGHT

The Port fuels the North Olympic Peninsula's economy by supporting job creation in industry and commerce. The Port's strategic position on the Strait of Juan de Fuca, its location on a deepwater harbor, the industrial facilities that support marine and air transportation, and access to natural resources all contribute to unique and robust economic engine (Port of PA 2019).

https://www.portofpa.com/92/About-Us

2

HAZARD PROFILES AND VULNERABILITY ASSESSMENTS

Chapter 3 contains hazard profiles and vulnerability assessments to determine the potential impact of hazards to the people, economy, and built and natural environments within the jurisdictions of special hazard districts in Clallam County. They have been streamlined to increase the effectiveness and usability of the HMP.

FEMA	B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect [the special hazard districts]? (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 [the special hazard districts]? (Requirement §201.6(c)(2)(i)) B3. Does the plan include a description of each identified hazard's impact as well as an overall summary of the vulnerability of the tribal planning area? [44 CFR § 201.6(c)(2)(ii)]

3.1 General

Clallam County has encountered several major disaster declarations that have affected the special hazard districts. In total, the County has experienced 21 disaster declarations since 1953. Table 3-1 identifies the disaster declarations since 2010.

Table 3-1 Clallam County FEMA Disaster Declarations

Disaster ID	Date of Declaration	Disaster Type	Incident Period
DR-1956	05-Mar-12	Severe Winter Storms, Flooding, Landslides, and Mudslides	14-Jan-12 to 23-Jan-12
DR-4242	15-Oct-15	Severe Windstorm	29-Aug-15
DR-4249	1-Jan-16	Severe Storms, Straight-line Winds, Flooding, Landslides, and Mudslides	12-Nov-15 to 21-Nov-16
DR-4253	2-Feb-16	Severe Winter Storm, Straight-line Winds, Flooding, Landslides, Mudslides, and a Tornado	1-Dec-15 to 14-Dec-15
DR-4418	4-Mar-19	Severe Winter Storms, Straight-line Winds, Flooding, Landslides, Mudslides, Tornado	10-Dec-18 to 24-Dec-18

Source: FEMA, Washington Disaster History, Major Disaster Declarations (https://www.fema.gov/data-visualization-disaster-declarations-states-and-counties)

The hazard profiles and vulnerability assessments contained in this chapter and Chapter 4 of the Basic Plan represent a considerable amount of work performed by the MPT. MPT members ranked hazards using several key considerations, followed up by activities to validate hazard analysis results and identify specific areas of risk.

3.2 Hazard Ranking Methodology

The hazards identified in the HMP were initially ranked based on MPT feedback during MPT Meetings #1 and #2.

Following the individual hazard ranking activity, the results were added up and aggregated to show an average score for the participating members and are available in Figure 3-1.

Figure 3-1 Special Hazard Districts

	Magnitude (1=lowest, 5=highest)	Onset (1=slowest, 5=fastest)	Duration (1=shortest, 5=longest)	Frequency (1=lowest, 5=highest)		Average	Rank
Power Outages	2	5	4	5		4	1
Earthquake	4	5	4.5	1		4	2
Cascadia Earthquake	5	5	3	1		4	3
Winter Storm	1.5	3.5	3	5		3	4
Windstorm	1.5	3.5	2.5	5		3	5
Tsunami	3	4	3.5	1		3	6
Wildfire	1.5	4	3.5	2.5		3	7
Hazardous Materials Incident	1.5	5	3.5	1		3	8
Flooding	2	3	3	2		3	9

3.3 Hazard-Specific Profiles and Risk Assessments

The following section profiles each hazard identified in Section 3.2 and assesses the risk associated with each. Each risk assessment considers the following attributes:

- **Location:** An indication of geographic areas that are most likely to experience the hazard.
- **Past Occurrences/History:** Like location, a chronological highlight of recent occurrences of the hazard accompanied by an extent or damage cost, if available.
- **Extent/Probability:** A description of the potential magnitude of the hazard, accompanied by the likelihood of the hazard occurring (or a timeframe of recurrence, if available).
- **Vulnerability:** A description of the potential magnitude of losses associated with the hazard. Vulnerability may be expressed in quantitative or qualitative values depending upon available data. Identifies development trends impact on the districts' vulnerability to each hazard since the 2010 plan development (increased, decreased, unchanged).

Note: Hazard Descriptions, Potential Impacts from Future Climate Conditions, and Cascading Impacts can be found in Chapter 4 of the HMP Basic Plan, as these are not place-specific.

In addition, the hazards have been organized into three sub-sections (high-, medium-, and low-priority) to illustrate the risk-driven nature of the HMP. Each hazard has been given serious consideration of all attributes discussed within. However, low-priority hazards may be shorter in length and with less quantitative analyses, as a lack of usable data is frequently present when considering low-likelihood or low-magnitude events. The three sub-sections are as follows:

- **High-Priority:** Power Outages, Earthquake/Cascadia Earthquake/Tsunami
- **Medium-Priority:** Winter Storm/Windstorm
- **Low-Priority:** Wildfire, Hazardous Materials Incident, Flooding

3.3.1 Power Outages

Power Outages

Magnitude	Onset	Duration	Frequency
2	5	4	5

Average	Rank
4	1

Location

Numerous County properties, including the special hazard districts, are at risk of being affected by utility failures. However, the risk posed by power outages to PUD is assessed primarily in this annex because it is the primary supplier of many County-wide utilities.

Rural and populated areas alike are known to experience power outages during winter and windstorms that can last anywhere from several hours to several weeks. In addition, the Clallam County PUD operates extensive utility and information technology networks that could be at a risk to exposure of a hazard that could lead to a utility failure.

A utility failure may impact any of the following services:

- Electric Power Systems (Clallam PUD, Port Angeles City Light, US Bonneville Power Administration)
- Water Supply (Clallam PUD, Crescent Water Association, Diamond Point Private Water System, City of Port Angeles Water System, City of Sequim Water System, Sunland Water System)
- Wastewater and Sewer Systems (Clallam PUD, City of Port Angeles, Clallam Bay Correction Center, Sunland Water System, City of Sequim Water System, City of Forks)

Source: Buck 2016

Previous Occurrence/History

Historically, utility disruptions and failures have been caused by natural disasters and human-caused accidents but have not been recorded in a way that is publicly accessible. Numerous utility failures occur every year, most frequently in the form of electricity outages that may last as short as hours or as long as weeks. Most recently, the County faced widespread utility failures during the December 2018 windstorms and during Hurricane Songda in 2016.

Downed Power Lines

Power Outages

Extent and Probability

It is difficult to predict the impacts of future utility failures, but they have the potential to impact all government and business operations and cause extensive economic losses among other impacts. Due to the sporadic nature of failures, it is also difficult to estimate how frequently such failures will occur or their duration. Various parts of Clallam County generally deal with power outages multiple times per year with many of them only lasting a matter of hours. Every several years, a large utility failure is experienced.

Future Probability Trend – Based on potential increases in heat waves and increasing development trends resulting in greater demand, the districts may be impacted by an increase in the probability of future utility failure. However, mitigation actions outlined in this annex are designed to decrease such strain on utility systems.

Vulnerability

Electric Power Systems
Severe weather (including winter storms and windstorms) likely present the greatest threat to PUD infrastructure. Power facilities in Clallam County are generally protected from wildland/urban interface fires by defensible space. A limited number are threatened by tsunami, flood, and landslide hazards. All facilities are threatened to varying degrees by destructive earthquakes.

Source: Buck 2016

Although utilities systems have expanded with new development in recent years, the PUD's vulnerability to utility failure is **unchanged** because new infrastructure has been constructed that are more resilient to natural hazards.

3.3.2 Earthquakes and Tsunami

Earthquakes and Tsunami

Hazard	Magnitude	Onset	Duration	Frequency		Average	Rank
Earthquake (other)	4	5	4.5	1		4	2
Cascadia Earthquake	5	5	3	1		4	3
Tsunami	3	4	3.5	1		3	7

Location

The Cascadia Subduction Zone (CSZ) poses a great risk to all coastal communities along its length. The special hazard districts are equally as susceptible to earthquakes as the jurisdictions in which they are located.

The relatively shallow Lake Creek – Boundary Creek Fault runs east-west through Clallam County, approximately from the vicinity of Lake Crescent to Siebert Creek. An earthquake along a shallow crustal fault such as the Lake Creek – Boundary Creek Fault could potentially lead to more widespread shaking and damage in the population centers of Port Angeles and Sequim.

Out of the special hazard districts, the Port of Port Angeles is most likely to be impacted by a tsunami due to its location along the Strait of Juan de Fuca.

Liquefaction typically occurs in areas with artificial fill or loose sandy soils that are saturated with water (e.g., low-lying coastal areas, lakeshores, and river valleys). The Port of Port Angeles is in an area with high susceptibility to liquefaction. Peninsula College is in an area with low susceptibility to liquefaction (DNR 2004).

Eastern and western section of Lake-Creek Boundary Creek fault (Nelson et al., BSSA, 2017)

Previous Occurrence/History

The most recent earthquake that damaged Clallam County was the 2001 Nisqually earthquake. Small earthquakes occur regularly throughout the region and go unnoticed by residents. Over the last 135 years, there have been nine earthquakes with a magnitude (M) greater than 6.0 in the area that we

Earthquakes and Tsunami

consider the Northwest. Five of those large quakes (including the Nisqually earthquake) directly impacted the Olympic Peninsula, according to eye-witness accounts (Clallam County 2010).

- 1700, CSZ Earthquake, M 9.0
- 1909, San Juan Island, M 6.0
- 1939, Vashon Island, M 6.1
- 1949, Olympia, M 7.1
- 1965, Seattle – Tacoma, M 6.5
- 2001, Nisqually, M 6.8

Based on the geological record and first-hand accounts, tsunamis from locations across the Pacific Ocean basin and from the CSZ off the Washington coast have hit Washington State coastal communities at least seven times in the last 3,500 years. The largest of the nearby triggers, the CSZ, produced the most recent great tsunami in 1700 AD (Lange 2003). Washington State's tsunamis also include a Puget Sound tsunami from the Seattle Fault between 900 AD and 930 AD, a Tacoma Narrows tsunami from a landslide in 1949, and a fatal wave from a rockfall into the Columbia River in 1965 (WA EMD 2012).

- 2006 Kuril Islands, Japan Tsunami (La Push, 0.52 feet; Neah Bay, 0.01 feet; Port Angeles, 0.39; Westport, 0.16 feet)
- 1964 Alaskan Tsunami (Neah Bay, 0.7 feet)
- 1960 Chilean Tsunami (Neah Bay, 1.2 feet)
- 1700 Cascadia Tsunami (Washington Coast, 33 feet)

Extent and Probability

Earthquakes pose a widespread hazard along the north side of the Olympic Mountains; however most of the County would be widely impacted by a CSZ earthquake or one along the Sequim Fault, including the special hazard districts. The cascading impacts of earthquakes, such as tsunamis and liquefaction, are dependent on geography and soil type, as detailed above.

The CSZ has produced earthquakes measuring M 8.0 and has hit this region at least seven times in the past 3,500 years. The time intervals between these events has varied from 140 to 1,000 years, with the last event occurring just over 300 years ago.

A comprehensive study of faults along the northern Olympic Mountains concluded that "there were three to five large, surface-rupturing earthquakes along the faults within the last 13,000 years" (Seismological Society of America 2017). The study notes that while the time intervals between earthquakes on shallow, or upper-plate, faults are thousands of years, "…the changes of a damaging earthquake on one of those many faults is higher than it is for a megathrust earthquake, at least on average, over the last few thousands of years" (Seismological Society of America 2017).

Future Probability Trend – Future weather and development trends play no known role in the probability of future earthquake events. However, both may play a role in the magnitude of earthquake impacts, as increased development may push populations into higher risk areas.

Earthquakes and Tsunami

Vulnerability

Vulnerability posed by earthquakes to the special hazard districts is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of the Basic Plan, the following County-wide infrastructure types within each special hazard district are classified as a **high to severe** combined earthquake hazard level (including earthquake shaking hazard and liquefaction potential):

PUD:
- Electric Systems (31 structures)
- Wastewater Systems (1 structure)
- Water Systems (15 structures)

Peninsula College:
- School (1 structure)
- Shelter (1 structure)

Port of Port Angeles:
- Government Building (8 structures)
- Hazardous Materials storage (1 structure)

Vulnerability posed by tsunamis to the special hazard districts is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of the Basic Plan, the following County-wide infrastructure types within each special hazard district are vulnerable to tsunami:

PUD:
- Electric System (1 structure)
- Water System (1 structure)

Port of Port Angeles:
- Government Building (5 structures)
- Hazardous Materials storage (1 structure)

Awareness of the County's vulnerability to a CSZ earthquake has increased with participation in regional drills and public outreach efforts and more structures are being designed to be resilient to tectonic activity. However, the Lake Creek Fault is located near the growing population centers of Port Angeles and Sequim. Given these changes, the vulnerability of the special hazard districts to earthquakes and tsunamis has remained **unchanged.**

See Appendix B for full Risk Exposure Tables and Appendix C for additional maps.

3.3.3 Winter Storm and Windstorm

Winter Storm and Windstorm

	Magnitude	Onset	Duration	Frequency		Average	Rank
Winter Storm	1.5	3.5	3	5		3	5
Windstorm	1.5	3.5	2.5	5		3	6

Location
All County and tribal properties and structures can be affected by windstorms and winter storms, including those owned and operated by the special hazard districts. Properties with infrastructures, utilities, and tree stands can have more damaging impacts during windstorms, especially in coastal areas where winds speeds can reach 40 to 60 miles per hour during the winter months. PUD utilities are widespread and are vulnerable to downed trees throughout much of the power service areas.

Previous Occurrence/History

Recent windstorms occurring in Clallam County resulting in major damage include:

- 17 December 2018 – Clallam and East Jefferson Counties Windstorm
- 15-16 October 2016 – Typhoon Songda
- 14 December 2006 – "Hanukkah Eve" Windstorm
- 20 January 1993 – "Inaugural Day" Storm

These windstorms have caused damage to County structures and housing; extensive utilities damage; restricted access to public lands; and required increased strain on the government's operations.

Recent snowstorms occurring in Clallam County resulting in major damage include (see Section 4.5.5, Windstorms, for other types of winter weather):

- 9 February 2019 – North Olympic Peninsula severe winter weather
- 17 March 2014 – Sequim/Port Angeles Blizzard
- 27 December 1996 – Christmas Snowstorm

Winter Storm and Windstorm

December 14, 2018—Wood debris at Lincoln Park in Port Angeles (Photo courtesy of Peninsula Daily News)

Extent and Probability

Coastal areas of Clallam County experience higher winds than other areas. However, windstorms can occur anywhere throughout the County. Windstorms can damage buildings, structures, utilities, and tree stands, causing millions of dollars' worth of damage, particularly to infrastructure associated with PUD.

Future Probability Trend – Future weather conditions have the potential to lead to an increase in severe and extreme weather patterns, leading to an **increase** in the probability of a windstorm. In addition, increased development has the potential to expose more assets to the impacts of windstorms.

Winter Storm and Windstorm

Vulnerability

The County's vulnerability to severe windstorms are related to power outages and debris blocking land-based transportation routes. Because nearly all social and economic activity is dependent on transportation, damage from windstorms can have a serious impact.

Power outages can result from physical damage to electrical infrastructure as a result of downed trees and blown debris. Power outages may disrupt businesses, especially facilities without back-up generators, potentially increasing the economic impact of severe windstorms. Additionally, persons with electric-based health support systems are vulnerable to power outages everywhere.

Since the 2010 plan, the special hazard districts' vulnerability to windstorms has **increased** as weather patterns change due to climate change, and as increased development has resulted in more infrastructure that can be exposed to damage during severe weather.

3.3.4 Wildfire

Wildfire

Magnitude	Onset	Duration	Frequency		Average	Rank
1.5	4	3.5	2.5		3	7

Location

According to the *Clallam County Community Wildfire Protection Plan*, large fires in western Washington typically occur on steep south-facing slopes, and often result from a combination of circumstances including a source of ignition in areas of dry, heavy fuels, an extended period of drought, and dry east winds (Clallam County 2009). Forest fires in this area usually occur during the dry summer months of July, August, and early September, but they can occur anytime between April and October given the right conditions. Fire hazard increases in the late summer and early fall when hot, dry east winds (subsidence winds) occur more frequently and the area has experienced the low point of the annual precipitation cycle. The portion of the Peninsula with the highest potential for major fires is the area between Port Angeles and Hood Canal, though as residents of Forks can attest, large forest can occur anywhere on the Peninsula (Clallam County 2010).

Wildfire

Previous Occurrence/History

Previous wildland fires that have affected Clallam County include "The Great Forks Fire of 1951," 1955 in the West Twin River area, and 2002 in the Clallam Bay area. The fires in 1951 began near Lake Crescent and burned into and around Forks. Approximately 30 buildings and between 33,000 and 38,000 acres of timber were lost. The 1955 fire burned approximately 5,000 acres of timber. The 2002 fire started as slash burnings on private land. In July 2004, a wildfire ignited near Joyce at Striped Peak, burning between 3 and 4 acres of private hillside land. Joyce experienced another wildfire in May 2006 when a controlled burn near the town grew into a 5-acre wildfire. From January 2008 to August 2009, 38 different wildfire incidents have occurred within Clallam County, outside of Olympic National Park (Clallam County 2010).

In December 2003, the City of Port Angeles experienced a significant fire at the Elks Naval Lodge, one of the City's largest structures located in the downtown core (Clallam County 2010).

March 13, 2015—Garage fire east of Port Angeles (Photo courtesy of Peninsula Daily News)

Wildfire

Extent and Probability

A Headwaters Economics study found that Clallam County has more square miles of developed land within the Wildland Urban Interface (WUI) than any other county in Washington State (72 square miles) and the fifth most area in the WUI in the entire United States. The same study found that 13,271 homes were located within the WUI throughout the County (Headwaters Economics 2013).

Weather conditions greatly influence the impact and extent of wildfires. Drought, high temperatures, and wind contribute to a dynamic and changing conditions of wildfires. Fuel load and vegetation contribute to the size and intensity of wildfires.

Wildfires are frequent and inevitable. Within the region, most wildfires burn during the June to October time period.

Future Probability Trend – Based on potential decreases in annual snowpack and increases in the frequency and magnitude of drought and heat, the County may be impacted by an **increase** in the probability of future fires.

Vulnerability

Wildfires in Clallam County generally occur in the lower lying, WUI areas, particularly near Forks, Sequim, and Blyn. Port Angeles (and therefore the Port of Port Angeles and Peninsula College) are not as vulnerable to WUI fires as PUD infrastructure, which extends further into the WUI.

Vulnerability posed by wildfires (particularly WUI fire) to special hazard districts is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of the Basic Plan, the following infrastructure types are classified as being vulnerable to WUI fire:

PUD:

- Electric Systems (11 structures)
- Water Systems (6 structures)

Since the 2010 County HMP, development in Clallam population centers has expanded further into the WUI; therefore, the vulnerability has **increased**.

3.3.5 Hazardous Materials Incident

Hazardous Materials Incident

Magnitude	Onset	Duration	Frequency		Average	Rank
1.5	5	3.5	1		3	9

Location

Numerous fixed-location storage sites exist near County properties but have rarely caused an incident. The Port of Port Angeles is a major shipping facility with an increased potential for hazardous materials incident. The Port is classified as a Class 3 State-regulated facility, which "applies to small tank farms and terminals that transfer oil to non-recreational vessels that have a fuel capacity of 10,500 gallons or more. This definition does not include facilities that transfer to tank vessels and pipelines, as they are Class 1 facilities" (Ecology 2019).

Hazardous Materials Incident

Previous Occurrence/History

There have been several oil spills with volumes less than 10 gallons in the vicinity of the Port of Port Angeles and Ediz Hook since 2015. There was a single spill that was over 100 gallons in the area: on May 19, 2019, 123 gallons of diesel marine gas were spilled (Ecology 2019).

Before the Washington State Department of Ecology record, the following large oil spills were reported in Port Angeles Harbor:

- 1985, ARCO Anchorage Spill, 270,000 gallons
- 2001, ATC Prince William Sound, 500 gallons
- 2003, GA2 Diamond, 500 gallons

A review of the Pipeline and Hazardous Materials Safety Administration incident reporting database showed there were no land-based transportation-related hazardous materials spills that occurred in the vicinity of the Port of Port Angeles (PHMSA 2019).

Extent and Probability

The uncontrolled release of hazardous materials during transport can result in death or injury to people and damage to property and the environment through the material's flammability, toxicity, corrosiveness, chemical instability, and/or combustibility. Individuals may be exposed to hazardous materials at acute or chronic levels. In the event of a marine oil spill, ecological systems could be damaged from the pollution and recreational activities subsequently limited.

Future Probability Trend – Increased development trends and potential increase in high-intensity precipitation events present the potential for an increase in hazardous materials passing through the Port of Port Angeles. However, the Port maintains a hazardous materials program that prevents and manages hazardous materials incidents.

Vulnerability

The Port of Port Angeles is the most vulnerable special hazard district to hazardous materials incidents. Workers and recreational users of the marina and airports are vulnerable to potential impacts from hazardous materials incidents. The Port of Port Angeles is a major staging area for oil spill response by Marine Spill Response Corp. of the Pacific Northwest (Ecology 2019).

Since the 2010 plan, the Port's vulnerability to hazardous materials incidents is **unchanged**.

3.3.6 Flooding

Flooding

Magnitude	Onset	Duration	Frequency		Average	Rank
2	3	3	2		3	10

Location

Beyond the County-wide flood hazards outlined in the Basic Plan, the Port of Port Angeles is the only special hazard district that is vulnerable to flooding, due to its low-lying coastal location between the City of Port Angeles and Ediz Hook.

Previous Occurrence/History

Flooding at the Port of Port Angeles has been mitigated by improvements to stormwater. However, severe weather events result in flooding of the airport runway.

Extent and Probability

Severe floods may result in serious injuries and fatalities as well as damage to public facilities and private property. Extent of flooding can be determined by the height of river flows in comparison to flood stages determined by United States Geological Survey stream gauges located throughout the area. It can also be measured by past damages of flooding.

Future Probability Trend – Based on potential increase in high-intensity precipitation events and increased development trends (resulting in additional impervious surfaces and stormwater runoff), the County may be impacted by an **increase** in the probability of future floods.

Vulnerability

Vulnerability posed by flooding to special hazard districts is measured by accounting for the critical infrastructure that are at risk. Based on the methodology outlined in Section 4.6 of the Basic Plan, the Port of Port Angeles contains the only critical infrastructure that are vulnerable to flooding. These buildings are the Port of Port Angeles Office Building and the Port of Port Angeles Maintenance Facility, both located on 1st Street.

Since the 2010 plan, the County's vulnerability to nuisance flooding has **increased** as precipitation patterns shift due to climate change. However, the County and partners are taking active steps to mitigate the impacts through floodplain restoration activities.

3.4 Vulnerability Assessment

3.4.1 Identifying Critical Infrastructure and Asset Inventory

Critical infrastructure for the special hazard districts following the methodology outlined in Section 4.6 of the Basic Plan.

Appendix B contains the complete vulnerability assessment and associated methodology.

3.4.2 Repetitive Loss Properties

No properties associated with the special hazard districts that meet the criteria for severe repetitive loss.

3.4.3 Exposure Assessment

Table 3-2 contains a summary of the critical infrastructure associated with the special hazard districts (Buck 2016). The vulnerability of each structure to earthquake, tsunami, flooding, wildfires, and landslides is assessed.

Table 3-2 Critical Infrastructure Associated with Special Hazard Districts

Community Name	Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard Level	Tsunami Hazard	Floods	WUIF	Landslides
Clallam County Public Utilities District No. 1													
Clallam PUD	Main Office	104 Hooker Road, Carlsborg	Sequim	Electric System	60%	C	Mod	Mod	High	NO	NO	NO	NO
Clallam PUD	Forks Office	31 Spartan Ave	Forks	Electric System	80%	B	Low	Low	High	NO	NO	NO	NO
Clallam PUD	Forks Warehouse	441 W E St	Forks	Electric System	80%	B	Low	Low	High	NO	NO	NO	NO
Clallam PUD	Sekiu Office & warehouse	15 Sekiu Airport Rd	Port Angeles	Electric System	80%	B	Low	Low	High	NO	NO	NO	NO
Clallam PUD	Carlsborg Warehouse	100 Hooker Rd, Carlsborg	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Clallam PUD	Carlsborg OPS Center, Engineering, crew, shop and storage	110 Idea Pl, Carlsborg	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Clallam PUD	Carlsborg Substation	112 Idea Pl, Carlsborg	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Clallam PUD	Carlsborg Utility Services	83 Idea Place, Carlsborg	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Clallam PUD	Port Angeles Warehouse	1936 W 18th St, Port Angeles	Port Angeles	Electric System	80%	C	Low	Low	High	NO	NO	NO	NO

Table 3-2 Critical Infrastructure Associated with Special Hazard Districts

Community Name	Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard Level	Tsunami Hazard	Floods	WUIF	Landslides
Clallam PUD	Blyn Substation	83 Zaccardo Rd	Sequim	Electric System	60%	C	Mod	Mod	High	NO	NO	YES	NO
Clallam PUD	Johnson Creek Substation	400 Washington Harbor Loop	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Clallam PUD	Sequim Substation	410 E Washington St	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Clallam PUD	Sunland Substation	1971 Sequim-Dungeness Way	Sequim	Electric System	60%	D	High	High	High	NO	NO	NO	NO
Clallam PUD	Prairie Power Substation	670 S 3rd Ave	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Clallam PUD	Evergreen Substation	9701 Old Olympic Hwy	Sequim	Electric System	60%	C	High	Very High	Very High	NO	NO	NO	NO
Clallam PUD	Dungeness Substation	761 Hogback Rd	Sequim	Electric System	60%	C	Mod	High	High	NO	NO	NO	NO
Clallam PUD	Olympic Substation	630 Carlsborg Rd	Sequim	Electric System	60%	D/E	High	Very High	Very High	NO	NO	NO	NO
Clallam PUD	Agnew Substation	31 Spring Rd	Port Angeles	Electric System	60%	D	Mod	Mod	High	NO	NO	NO	NO
Clallam PUD	Deer Park Substation	101 Old Deer Park Rd	Port Angeles	Electric System	60%	C	Mod	Low	Mod	NO	NO	NO	NO
Clallam PUD	Monroe Substation	311 Gales St	Port Angeles	Electric System	60%	C	Mod	Low	Mod	NO	NO	NO	NO
Clallam PUD	Airport Substation	4528 S Airport Rd	Port Angeles	Electric System	80%	C	Mod	Low	High	NO	NO	NO	NO
Clallam PUD	Laird's Corner Substation	813 Power Plant Rd	Port Angeles	Electric System	80%	C	Mod	Low	High	NO	NO	NO	NO

Table 3-2 Critical Infrastructure Associated with Special Hazard Districts

Community Name	Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard Level	Tsunami Hazard	Floods	WUIF	Landslides
Clallam PUD	Silverado Substation	1201 Joyce Piedmont Rd	Port Angeles	Electric System	80%	C	Mod	Low	High	NO	NO	YES	NO
Clallam PUD	Sol Duc Rd Substation	216395 Hwy 101 W	Port Angeles	Electric System	80%	C	Mod	Low	High	NO	NO	YES	NO
Clallam PUD	Pysht Substation	23133 State Route 112W	Clallam Bay	Electric System	80%	B	Low	Low	High	NO	NO	YES	NO
Clallam PUD	Sekiu Substation	15 Sekiu Airport Rd	Sekiu	Electric System	80%	B	Low	Low	High	NO	NO	NO	NO
Clallam PUD	FAA Substation	5000 HWY 112	Sekiu	Electric System	80%	B	Low	Low	High	NO	NO	YES	NO
Clallam PUD	Neah Bay Substation	Backtrack Rd & Roosevelt St	Neah Bay	Electric System	80%	D	High	High	High	YES	NO	YES	NO
Clallam PUD	Mill Substation	200657 Hwy 101	Port Angeles	Electric System	80%	B	Low	Low	High	NO	NO	YES	NO
Clallam PUD	Old Beaver Camp Substation	97 La Push Rd	La Push	Electric System	80%	B	Low	Low	High	NO	NO	YES	NO
Clallam PUD	Calawah Substation	513 Calawah Way	Forks	Electric System	80%	C	Mod	Low	High	NO	NO	YES	NO
Clallam PUD	Forks Substation 1	441 W East St	Forks	Electric System	80%	B	Low	Low	High	NO	NO	YES	NO
Clallam PUD	Forks Substation 2	441 W East St	Forks	Electric System	80%	B	Low	Low	High	NO	NO	YES	NO
Clallam PUD – Fairview Water System (Mt Pleasant & Monroe Rds)	Deer Park Reservoir	1771 Deer Park Rd	Port Angeles	Water Systems	60%	C	High	Low	High	NO	NO	YES	NO

Table 3-2 Critical Infrastructure Associated with Special Hazard Districts

Community Name	Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard Level	Tsunami Hazard	Floods	WUIF	Landslides
Clallam PUD – Fairview Water System (Mt Pleasant & Monroe Rds)	Bobcat Hollow Well	152 Bobcat Hollow Rd	Port Angeles	Water Systems	60%	C	High	Low	High	NO	NO	YES	NO
Clallam PUD – Fairview Water System (Mt Pleasant & Monroe Rds)	Bluff's Well	1433 Gasman Rd	Port Angeles	Water Systems	60%	C	High	Low	High	NO	NO	YES	NO
Clallam PUD – Fairview Water System (Mt Pleasant & Monroe Rds)	Harbor Heights Pump Station	76 Harbor Heights Rd	Port Angeles	Water Systems	60%	C	High	Low	High	NO	NO	YES	NO
Clallam PUD – Fairview Water System (Mt Pleasant & Monroe Rds)	Township Line Well & Reservoir	496 Township Line Rd	Port Angeles	Water Systems	60%	C	High	Low	High	NO	NO	YES	NO
Clallam PUD – Fairview Water System (Mt Pleasant & Monroe Rds)	Old Olympic Hwy Well	991 Old Olympic Hwy	Port Angeles	Water Systems	60%	C	High	Low	High	NO	NO	NO	NO

Table 3-2 Critical Infrastructure Associated with Special Hazard Districts

Community Name	Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard Level	Tsunami Hazard	Floods	WUIF	Landslides
Clallam PUD – Gales Addition Water System (Deer Park Rd to Shore Rd to Strait)	Gales Addition Reservoir & Pump Station	75 Round Tree Ln	Port Angeles	Water Systems	80%	C	High	Low	High	NO	NO	NO	NO
Clallam PUD – Gales Addition cont.	LUD #3 Upper Reservoir w/ Booster Pump	5112 S. Mt Angeles Rd	Port Angeles	Water Systems	80%	C	High	Low	High	NO	NO	NO	NO
Clallam PUD – Gales Addition cont.	Mt Pleasant E. Pump Station	1210 Mt Pleasant Rd	Port Angeles	Water Systems	80%	C	High	Low	High	NO	NO	NO	NO
Clallam PUD – Gales Addition cont.	Office Warehouse	15 Sekiu Airport Rd	Sekiu	Water Systems	80%	B	High	Low	High	NO	NO	NO	NO
Clallam PUD - Clallam Bay/Sekiu Water System	Sekiu Reservoir & Pump Station	174 Sekiu Airport Rd	Sekiu	Water Systems	80%	B	High	Low	High	NO	NO	NO	NO
Clallam PUD – Island View Water System (10 miles west of Sekiu)	LUD# 9 TP and Pump Station	7372 Hwy 112	Sekiu	Water Systems	80%	B	High	Low	Very high	YES	NO	YES	NO
Clallam PUD - Carlsborg Water System (Carlsborg)	Carlsborg Well & Pump Station	315 Business Park Loop	Sequim	Water Systems	60%	C/D	High	Very High	High	NO	NO	NO	NO

Table 3-2 Critical Infrastructure Associated with Special Hazard Districts

Community Name	Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard Level	Tsunami Hazard	Floods	WUIF	Landslides
Clallam PUD - Evergreen Water System (South of Sequim)	Duxbury Reservoir & Pump Station	2294 S 7th Ave	Sequim	Water Systems	60%	60%	High	Low	High	NO	NO	NO	NO
Clallam PUD - Panoramic Heights (South of PA)	Panoramic Heights Well and Reservoir	5740 S Pastoral Dr	Port Angeles	Water Systems	60%	60%	High	Low	High	NO	NO	NO	NO
Clallam PUD	Clallam Bay/Sekiu			Wastewater System	80%	B	High	Very Low	High	NO	NO	NO	NO
Peninsula College													
	Peninsula College	1502 E Lauridsen	Port Angeles	School	80%	C	Very	Low	Very	NO	NO	NO	NO
	Peninsula College	1502 E Lauridsen Blvd	Port Angeles	Shelter	80%	D/E	High	Low	High	NO	NO	NO	NO
Port of Port Angeles													
Port Angeles	Port of Port Angeles	Port	Port Angeles	Hazardous Materials Storage	80%	E	Very	Very	Very	Yes	NO	NO	NO
	Port of Port Angeles - Port Facilities	Port Angeles Harbor	Port Angeles	Government Building	80%	E	Very High	Very High	Very High	YES	NO	NO	NO
	Port of Port Angeles Air Terminal Buildings	Airport Rd	Port Angeles	Government Building	80%	C/D	High	Low	High	NO	NO	NO	NO

Table 3-2 Critical Infrastructure Associated with Special Hazard Districts

Community Name	Name of Facility	Facility Address (if applicable)	City	Type of Infrastructure	EQ shaking 2% in 50 yrs - % PGA	Site Class	EQ Shaking Hazard Level	Liquefaction Potential	Combined EQ Hazard Level	Tsunami Hazard	Floods	WUIF	Landslides
	Port of Port Angeles Boat haven	Port Angeles	Port Angeles	Government Building	80%	E	Very High	Very High	Very High	YES	NO	NO	NO
	Port of Port Angeles Hangers	Airport Rd	Port Angeles	Government Building	80%	C/D	High	Low	High	NO	NO	NO	NO
	Port of Port Angeles John Wayne Marina	Sequim	Port Angeles	Government Building	80%	E	Very High	Very High	Very High	YES	NO	NO	NO
	Port of Port Angeles Maintenance	1st St	Port Angeles	Government Building	80%		Very High	Very High	Very High	YES	YES	NO	NO
Port of Port Angeles	Port of Port Angeles Office Building	1st St	Port Angeles	Government Building	80%	E	Very High	Very High	Very High	YES	YES	NO	NO
	Port of Port Angeles Rental Buildings	W 16th St	Port Angeles	Government Building	80%	C/D	High	Low	High	NO	NO	NO	NO

1

3.5 Land Use and Development Trends

FEMA	D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

No potential developments are actively being considered in known hazard areas. Vulnerability changes have been measured by accounting for shifts in land use and public awareness since the adoption of the 2010 County HMP. Each measure has been identified as having an increased, decreased, or unchanged vulnerability. Table 3-3 provides a snapshot of how vulnerability has changed since development of the 2010 HMP.

Table 3-3 Recent Development Trends

Hazard	Vulnerability Changes Since 2010
Power Outages	+
Earthquakes and Tsunami	=
Winter Storm and Windstorm	+/-
Wildfire	+
Hazardous Materials Incident	+
Flooding	+/-
+ Increased vulnerability - Decreased vulnerability +/- Increased vulnerability, but actions taken to decrease vulnerability = Unchanged vulnerability	

CAPABILITY ASSESSMENT

FEMA	C1. Does the plan document [special hazard districts'] existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? [Requirement §201.6(c)(3)]

4.1 Human and Technical Resources

Table 4-1 describes the special hazard districts' human and technical capabilities to engage in and improve mitigation planning and program implementation.

Table 4-1 Human and Technical Resources Integrated with Hazard Mitigation

Resource	Department	Tasks and Activities Integrated into Mitigation Planning
PUD		
Commissioners	Board of Commissioners	Publicly elected Board overseeing PUD activities, including hazard mitigation planning.
Safety Manager	PUD	Liaison with the County to oversee hazard mitigation planning.
Peninsula College		
Emergency Manager	Administrative Services	Emergency management and campus public safety.
Geology Instructor	Geosciences Department	Staff with education or expertise to assess vulnerability to hazards.
Port of Port Angeles		
Director of Engineering	Engineering Department	Engineer trained in construction practices related to Port buildings and/or infrastructure.
Airport & Real Estate Manager	N/A	Oversees management of real estate associated with the airport and facilities.
Operations Supervisor	N/A	Oversees management and day-to-day operations onsite.

4.2 Financial Resources

The special hazard districts maintain fiscal and financial resources to support their mitigation programs. Table 4-2 identifies specific resources accessible for use.

Table 4-2 Accessible Financial Resources

Financial Resource	Accessible?
Community Development Block Grants	Yes
Capital Improvement Project Funding	Yes
Insurance	Yes
User fees for utility services	Yes, PUD only
Incur debt	Yes
State-sponsored grant programs	Yes

Table 4-3 identifies current and potential sources of funding to implement identified mitigation actions contained within the HMP. The special hazard districts may access these by working in conjunction with the County or participating jurisdictions.

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Federal		
Pre-Disaster Mitigation Program	Federal Emergency Management Agency (FEMA)	Provides funding to develop hazard mitigation plans (HMPs) and implement mitigation actions contained within.
Hazard Mitigation Grant Program	FEMA	Post-disaster funds to hazard reduction projects impacted by recent disasters.
Flood Mitigation Assistance Program	FEMA	Provides funds for flood mitigation on buildings that carry flood insurance and have been damaged by floods.
Community Development Block Grant Program	U.S. Department of Housing and Urban Development	Funds projects that benefit low- and moderate-income communities, prevent or eliminate slums or blight, or meet urgent community development needs posing a serious and immediate threat to community health or welfare.
Emergency Management Performance Grants Program	FEMA/Washington Department of Emergency Management	Provides funding to states for local or tribal planning, operations, acquisition of equipment, training, exercises, and construction and renovation projects.
Flood Mitigation Assistance	FEMA/Washington Department of Emergency Management	Provides funding to support development of the flood hazard portion of state and local mitigation plans and up to 100% of the cost of eligible mitigation activities. This funding is only available to communities participating in the National Flood Insurance Program National Flood Insurance Program (NFIP).
Earthquake State Assistance Program	National Earthquake Hazards Reduction Program Interagency Coordinating Committee	Funds activities including seismic mitigation plans; seismic safety inspections of critical structures and lifelines; updates of building codes, zoning codes, and ordinances; and earthquake awareness and education.
National Fire Plan	U.S. Forest Service	Provides funding opportunities for local wildland-urban interface planning, prevention, and mitigation projects, including fuels reduction work, education and prevention projects, community planning, and alternative uses of fuels.

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
Risk Mapping, Assessing, and Planning	FEMA	Provides funding and technical support for hazard studies, flood mapping products, risk assessment tools, mitigation and planning, and outreach and support.
Strategic Economic and Community Development Grant	U.S. Department of Agriculture	Provides funding in rural areas for multi-jurisdictional plan development and with a community development focus. Available only to rural areas outside of urbanized zone of any city with a population greater than 50,000.
Coastal Ecosystem Resiliency Program	National Oceanic and Atmospheric Administration	Provides funding for ecosystem restoration. Governor must approve project funds prior to award and there is a 2:1 cost-sharing ratio.
State		
Washington State Department of Transportation (WSDOT) Avalanche Forecasting and Control	WSDOT	Avalanche forecasting determines the potential risk along a particular mountain slope. When an avalanche hazard develops, WSDOT uses artillery, or explosives to trigger the avalanche. In addition to active avalanche control, WSDOT also uses passive control methods to control snow slides.
Washington Sea Grant	Washington Sea Grant	Washington Sea Grant provides funding opportunities through State and National competitions, program development services, and sponsorships.
Ecology Water Resources Program	Washington State Department of Ecology (Ecology)	Ecology's Water Resources Program provides support in monitoring water supply, managing water supply projects, overseeing water rights, performing streamflow restoration, protecting streamflow, regulating well construction and licensing, and ensuring dam safety.
WSDOT Seismic Retrofit Program	WSDOT	WSDOT provides funding and project support to retrofit bridges at risk of failure due to seismic events.
Washington State Department of Agriculture (WSDA) Livestock Inspection Program	WSDA	Dedicated to providing asset protection for the livestock industry by recording brands, licensing feedlots and public livestock markets by conducting surveillance and inspection of livestock at time of sale and upon out of state movement. The program is funded by fees paid by the livestock industry and receives no general fund dollars.
Washington Local Emergency Planning Committee Program	Washington Emergency Management Division (WA EMD)	WA EMD provides funding support to ensure Local Emergency Planning Committees (LEPCs) can be implemented across the state.
Washington Pipeline Safety Program	Washington Utilities and Transportation Commission	The commission is responsible for developing and enforcing safety standards for natural gas and hazardous liquid pipelines located within the state. The commission also inspects the portions of interstate natural gas and hazardous liquid pipelines located within Washington State; the standards and enforcement actions are the responsibility of the federal Pipeline and Hazardous Materials Safety Administration (PHMSA).

Table 4-3 Financial Resources Integrated with Hazard Mitigation

Funding Source	Fund Administrator	Description
State Water Pollution Control Revolving Fund	Washington DEC	This program provides funds to local governments to set up low-interest loan programs to repair or replace failing on-site sewage systems. Property owners unable to qualify for conventional bank loans and marine waterfront property owners can use the program to get loans to fix or replace their systems where failures might directly affect Puget Sound. Both the Clean Water State Revolving Fund and the Centennial Clean Water Program.
Other		
Community Planning Assistance Teams	American Planners Association Foundation	Provides pro bono technical assistance for planning frameworks or community vision plans for communities needing extra assistance. Local governments are responsible for travel costs.
Thriving Resilient Communities	Threshold Foundation	Wide-ranging resiliency project funding.
Kresge Foundation Environmental Grants	Kresge Foundation	Provides funding for climate adaptation and mitigation, as well as sustainable water resources management.

4.3 Legal and Regulatory Resources

FEMA	C6. Does the Plan describe a process by which the [special hazard districts] will incorporate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(iii))

Tables 4-4 through 4-6 describe the legal and regulatory capabilities, including plans, policies, and programs that have integrated hazard mitigation principles into their operations.

Table 4-4 PUD Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2012-2018)	Hazard Mitigated
Plans	County Comprehensive Emergency Management Plan	Outlines roles and responsibilities of tribal government in mitigating potential hazards.	▪ Incorporation of partners into emergency planning into operations	All
	2019 Strategic Plan	Outlines actions to continue serving PUD customers.	▪ Plan updated in 2019.	N/A
	State of Washington Enhanced Hazard Mitigation Plan	Profiles hazards throughout the State, assesses risks, and outlines potential mitigation actions.	▪ Collaboration between State and County	All

Table 4-4 PUD Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2012-2018)	Hazard Mitigated
	Capital Improvements Plan	Identifies capital improvement projects to be undertaken by the County over the next five-year period.	▪ Inclusion of hazard mitigation and maintenance projects	All
	Continuity of Operations (COOP) Plan	Outlines the County's procedures for establishing continuity of critical services following a disruption.	▪ Update of plan currently in progress – aligns COOP procedures for all County partners	All

1

Table 4-5 Peninsula College Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2012-2018)	Hazard Mitigated
Plans	County Comprehensive Emergency Management Plan	Outlines roles and responsibilities of tribal government in mitigating potential hazards.	▪ Incorporation of partners into emergency planning into operations	All

2

Table 4-6 Port of Port Angeles Legal and Regulatory Resources Integrated with Hazard Mitigation

Capability Type	Capability	Description	Key Accomplishments (2010-2019)	Hazard Mitigated
Plans	County Comprehensive Emergency Management Plan	Outlines roles and responsibilities of tribal government in mitigating potential hazards.	▪ Incorporation of partners into emergency planning into operations	All
	State of Washington Enhanced Hazard Mitigation Plan	Profiles hazards throughout the State, assesses risks, and outlines potential mitigation actions.	▪ Collaboration between State and County	All
	Storm Water Management Planning	Port has maps of stormwater infrastructure along waterfront and airport property per Industrial Stormwater General Permit	▪ Update of stormwater management practices	Flooding
	Capital Project Prioritization	Current plan detailing Port improvements is in place.	▪ Updated within the last 5 years, with capital projects focused on hazard mitigation	All

3

4.4 Integration of Mitigation into Existing Planning Mechanisms

Integration of the principles of mitigation into each of the special hazard districts' daily operations and ongoing planning activities is a priority of the respective mitigation programs. These activities will support:

- Raising awareness of the importance of hazard mitigation for the whole community;
- Facilitating an understanding that hazard mitigation is not just an 'emergency services' function and building ownership of mitigation activities across the organization; and
- Maximization of planning resources through linked or integrated planning efforts.

The special hazard districts are encouraged to consider integration actions into planning mechanisms, including:

- Budget decision-making;
- Emergency planning mechanisms; and
- Development planning and decision-making.

MITIGATION STRATEGY

FEMA	C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for the [special hazard districts] being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))

5.1 Review of 2010 Hazard Mitigation Actions

As part of the mitigation strategy update, all mitigation actions identified in the 2010 plan were evaluated to determine what the status of the action was and whether any ongoing or incomplete actions should be included as actions in the 2019 plan update. The MPT worked through each previous action during MPT Meeting #1 to document steps taken to fulfill the action.

See Table 5-1 for an overview of the status of all actions from the 2010 plan update and new actions.

5.2 2019-2025 Mitigation Implementation Plan

FEMA	C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by [the special hazard districts]? (Requirement §201.6(c)(3)(iii))

The mitigation implementation plan lays the groundwork for how the mitigation plan will be incorporated into existing planning mechanisms and how the mitigation actions will be prioritized, implemented, and administered by the special hazard districts. The implementation plan includes both short-term strategies that focus on planning and assessment activities, and long-term strategies that will result in ongoing capability or structural projects to reduce vulnerability to hazards.

See Appendix D for Mitigation Action Worksheet instructions and completed Mitigation Action Worksheets for new mitigation actions listed in Table 5-1.

Table 5-1 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
Clallam County Public Utilities District No. 1 (PUD)													
PUD01	Establish Reliable Power Source for Battelle Industries	2010 Action	4	PUD, Battelle	3-5 years	$##	No	City of Sequim general fund, property owners, developers, PUD	Winter Storms, Flooding	13	6	19	6
PUD02	Move overhead powerlines underground in select areas.	2010 Action – Ongoing. Areas of continued focus are the North Shore of Lake Crescent, South Shore Lake Sutherland, Diamond Point Road, Deer Park Road, and Hoko Ozette Road	4	PUD	1-5 years	TBD	Yes	PUD operating budget	Severe Weather, Winter Storms	15	10	25	3
PUD03	Replace Asbestos-Cement Pipe throughout County	2010 Action – Ongoing	4,5	PUD	1-5 years	TBD	Yes	PUD operating budget	Earthquake	18	10	28	1
PUD04	Replace ultra-high-risk water mains in the event of erosion or landslide.	2010 Action – Ongoing. Areas that have been reviewed are: water main from Morse Creek to Treatment Plant to Deer Park; water main from Hoko-Ozette Road to Eagle Point Road; Water Main to Upper Sekiu Reservoir; Replace Buried Creek	4,5	PUD	Ongoing	TBD	Yes	PUD operating budget	Landslide	18	8	26	2

Table 5-1 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
		crossing with bridge crossing in 4 Seasons Park; Replace buried creek crossing in 4 Seasons Ranch and eliminate White Creek crossing to Lower LUD #3 Pump Station.											
PUD05	Fairview – Morse Creek Drought Plan	2010 Action – Ongoing as conditions worsen at Morse Creek.	5	PUD	Ongoing	TBD	Yes	PUD operating budget	Drought	16	6	22	5
PUD06	Additional tree trimming in high risk wind areas to protect overhead lines.	2010 Action - Ongoing	3,4,5	PUD	Ongoing	TBD	Yes	PUD operating budget	Severe Weather, Windstorms	17	8	25	4
Adopt the Hazard Mitigation Plan		Completed – Re-adopting updated 2019 HMP	All	Planning Department	1 year	N/A	Yes	N/A	All hazards				
Port of Port Angeles													
POPA01	Strengthen airport runway to facilitate landing of large emergency aircraft.	New	4,5	Port of Port Angeles	1-3 years	$2,000,000	No	FEMA Grant, Operating Budget (Larger cost savings will be realized by completing this project in conjunction with the 2022 runway rehab project)	Earthquakes, Tsunami, Water Shortages, Windstorm	20	8	28	1
POPA02	Install protective safety glass in the windows of the airport terminal building complex to hold shattered glass in place in the event of a major windstorm or earthquake.	New	4,5	Facilities Maintenance/Airport - Port of Port Angeles	<1 year	$2,500	No	FEMA Grant, Operating Budget	Earthquakes, Winter Storm, Tsunami, Windstorm	19	6	25	3
POPA03	Purchase fuel tanks and build a fuel transfer station at the Port's newly constructed and located shop outside of the tsunami zone.	New	4,5	Facilities Maintenance - Port of Port Angeles	1-3 years	$10,000 - $20,000	Yes	Operating Budget, Grant	Utility Failure, Winter Storm, Tsunami	18	8	26	2
POPA04	Build a portable emergency water supply.	New	4,5	Facilities Maintenance - Port of Port Angeles	1-3 years	$1,500	No	Operating Budget	All Hazards	18	6	24	4

Table 5-1 2019-2025 Mitigation Implementation Plan

Action ID#	Mitigation Action Description	Action Status	Goals Supported	Lead Department	Timeframe	Anticipated Cost	Funding Available?	Funding Source	Hazards Addressed	STAPLEE Score	Mitigation Effectiveness Score	Total Score	Priority
POPA05	Strengthen airport taxiway to increase weightbearing capacities for emergency aircraft.	New	4,5	Port of Port Angeles	1-3 years	$2,000,000	No	FEMA Grant, Operating Budget (Larger cost savings will be realized by completing this project in conjunction with the 2022 runway rehab project)	Earthquakes, Tsunami, Water Shortages, Windstorm	20	8	28	1
Adopt the Hazard Mitigation Plan		Completed – Re-adopting updated 2019 HMP	All	Planning Department	1 year	N/A		N/A	All hazards				
Peninsula College													
PC01	Renovate/Replace N Building, Main Campus	2010 Action – Ongoing	5	Finance and Administration	Ongoing	N/A	N/A	FEMA, Capital Funds	All hazards	17	10	27	1
PC02	Renovate/Replace J Building, Main Campus	2010 Action – Ongoing	5	Finance and Administration	Ongoing	N/A	N/A	FEMA, Capital Funds	All hazards	17	10	27	2
PC03	Renovate/Replace Q Building, Main Campus	2010 Action – Ongoing	5	Finance and Administration	3-5 years Approx.	N/A	N/A	FEMA, Capital Funds	All hazards	17	10	27	3
PC04	Renovate/Replace P Building, Main Campus	2010 Action – Ongoing	5	Finance and Administration	Ongoing	N/A	N/A	FEMA, Capital Funds	All hazards	17	10	27	4
PC05	Incorporate hazard mitigation into Master Plan	2010 Action – Ongoing	5	Finance and Administration	Ongoing	N/A	N/A	FEMA, Capital Funds	All hazards	17	10	27	5
Adopt the Hazard Mitigation Plan		Completed – Re-adopting updated 2019 HMP	All	Planning Department	1 year	N/A		N/A	All hazards				

Key:
STAPLEE - Strategy and Prioritization Methodology

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